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Environmental Design in University Curricula and Architectural Training in Europe

State of the Art of Environmental Sustainability in Academic Curricula and Conditions for Registration

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To the memory of Prof. Giorgio Peguiron,
University of Rome La Sapienza,
for his lifelong contribution and dedication to
the teaching, research and practice of
Environmental Design

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The consolidation of the state of the art of environmental sustainability in academic curricula and in the conditions for accreditation and registration has been conducted via analysis of information sourced from web sites, publications and other resources published by selected higher education and professional institutions, and via surveys addressed to academics and representatives of regulatory bodies. This information has been analysed by the Action Consortium to build a picture concerning the implementation of sustainable environmental design and energy efficiency in higher education in the contexts investigated. Institutions represented in this report were selected exclusively on the basis of availability of information and existing networks and contacts with organisations partner of EDUCATE. The choice of curricular activities herein presented is not intended to be exhaustive but has the sole objective of giving exempla of pedagogical implementation of sustainable environmental design at the different higher education institutions selected, and may not reflect entirely the spread of educational practices in the various countries analysed.

Whereas direct feedback has been given by the academics and professionals contacted, the Action Consortium has made any possible effort to safeguard the confidentiality of all the information received. Individual identities of respondents have not been - and will not be - revealed to any third party and none of the personal comments has been made recognisable or traceable to the author in any of the published material. If you believe that any information or material herein published is inaccurate, incomplete or is not treated according to the above conditions, please let us know and we will correct or delete it, where we agree, as soon as it is reasonably practical.

Table of Contents

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Introduction – The EDUCATE Action

The EDUCATE (*Environmental Design in University Curricula and Architectural Training in Europe*) Action is funded by the European Commission - Energy Agency for Competitiveness and Innovation (EACI) - under the "Intelligent Energy Europe" 2008 Programme (Contract n. IEE/08/635/SI2.528419).

EDUCATE is built on a consortium of seven European academic partners: the University of Nottingham (UNOTT, UK; Coordinator); the Architectural Association School of Architecture (AA, UK); the Catholic University of Louvain (UCL, Belgium); the Technical University of Munich (TUM, Germany); the Department ITACA, University of Rome La Sapienza (ITACA, Italy); the Seminar of Architecture and Environment S.C. (SAMA, Spain); and the Budapest University of Technology and Economics (BME, Hungary).

The Action started in June 2009 and is supported by the Chambers of Architects in the six participating countries (United Kingdom, Belgium, Germany, Italy, Spain, Hungary), by building professionals internationally renowned in the field of sustainable architecture, by experts of cognate disciplines (e.g. education, engineering, information technology, ecology, etc.) and by associations of educators and practitioners, which - throughout the 36 months of duration of the Action - will assist the Consortium in fostering the integration of sustainable environmental design in architectural education and practice and propose the harmonisation of academic curricula, as well as of the criteria for accreditation and professional qualification, across European Member States.

The mission of EDUCATE is to "*foster knowledge and skills in sustainable environmental design aiming to achieve comfort, delight, well-being and energy efficiency in new and existing buildings. This will be promoted and demonstrated within a culturally, economically and socially viable design process, at all stages of architectural education*" (EDUCATE Kick-off meeting, 7th July 2009).

To these aims, EDUCATE is set to achieve the following objectives:

- Remove existing pedagogical barriers to the integration of principles of sustainable environmental design within a creative architectural discourse;
- Propose, implement and disseminate a curriculum and pedagogical framework which bridges current divides between sustainability-related technical information and the design studio at different levels and stages of architectural education to meet current professional demands and expectations;
- Develop an intelligent Portal on sustainable environmental design and energy efficiency in architecture that facilitates such integration in higher education and supports Continuing Professional Development for building practitioners;
- Promote and disseminate environmental know-how and exempla of best practice amongst students, educators, building professionals and the public, towards change of behaviour and expectations;
- In collaboration with European Chambers of Architects, propose the harmonisation of the criteria for accreditation of university curricula fostering the implementation of environmental design in higher education, and recommend a new set of European-wide registration requirements establishing the level of knowledge, understanding and skill in terms of environmental awareness and energy efficiency that practitioners must acquire in the process of qualifying as architects.

EDUCATE is set to have significant impacts, in the short as in long term, on the sustainability of the built environment and the successful application of European regulations such as the Directive on Energy Performance of Buildings, the Action Plan on Energy Efficiency and the Energy Policy for Europe. These impacts could be measured, amongst other indicators, by significant advances in:

- Integrated learning outcomes of students and building professionals on sustainable environmental design and energy efficiency in architecture;
- Increase of environmental awareness and energy-efficient building practices and change of behaviour by the general public (e.g. homeowners);
- Number of academic institutions and professional bodies signing up to the proposed pedagogical method, course structure and accreditation and qualification criteria;
- Achievement of targeted environmental objectives in Europe.

Further information on the EDUCATE Action - together with downloadable documents, news and an overview of current and future activities - is available on www.educate-sustainability.eu

State of the Art of Environmental Sustainability in Academic Curricula and Conditions for Registration

The analysis and consolidation of the state of the art of environmental sustainability in higher education and in the conditions for accreditation and professional registration has constituted one of the tasks of the 6-month long Work Package 2 - the first stage of development of EDUCATE - so as to build a comprehensive picture in terms of integration of environmental design and energy efficiency in current academic pedagogies and in the criteria that control access to the practice of architecture.

This task has been performed through analysis of current curricular structures and contents, course syllabuses, delivery methods, assessment criteria, etc. within architectural-accredited degrees at partner institutions, at selected academic organisations in participating countries, and in a number of other European and non-European countries, so as to facilitate the systematisation of the current state of play and the implementation of external inputs to the development of a curricular framework successfully embedding environmental sustainability in architectural education and practice.

The structure and contents of higher education pedagogies in the contexts analysed have been related to the criteria for accreditation of architectural curricula and to the conditions for qualification and registration as established by the competent bodies in the countries considered. Specifically, the activities of the first stage of development of EDUCATE have led to the following outcomes:

- Detailed description of architectural-accredited degrees at the 7 partner academic institutions;
- Significant exempla of architectural curricula per each of the 6 participating countries (United Kingdom, Belgium, Germany, Italy, Spain, Hungary: 29 curricula);
- Paradigmatic models of architectural curricula across 16 non-participating EU countries (23 curricula);
- Exempla of architectural curricula in 7 selected non-EU countries (10 curricula);
- Criteria for accreditation of academic curricula and conditions for professional registration in 22 European countries and in 7 selected non-European countries.

To conduct this analysis, partners have reviewed and consolidated materials published by the selected academic and professional institutions (e.g., web sites, yearbooks, pedagogical publications, conference and journal papers, works of students, etc.) and have obtained direct feedback from local academics and representatives of accrediting bodies via interviews and surveys specifically developed by the Action Consortium. To select the specific institutions herein presented, partners have exploited existing links with academic organisations and national and international association of educators and have been supported by local Chambers of Architects and building professionals in the various contexts of investigation. Each curriculum/country analysed has been reviewed under the following headings:

- **Name and Duration of the Course and/or Degree**: distinguishing between Undergraduate (3 years), Graduate (2 years) and Postgraduate (1 year) degrees, following the structure of the higher education system as established by the 1999 Bologna Declaration;
- **Accrediting Body**: indicating the national (or international) organisation delegated to evaluate, on behalf of the higher education and professional sector, about the status, legitimacy and pedagogical and professional appropriateness of a course and/or degree;
- **Educational Aims**: highlighting the targets of a specific degree and course/programme, basing on the structure and overall educational and professional aims of the hosting institution;
- **Outline Description of the Course**: emphasising the organisation of the course, the pedagogical objectives to be achieved at each level of education and the different options available for students;
- **Course Structure**: illustrating in detail the educational path of the programme, the specific modules (core, optional and electives) at each year of progression, the credit structure, specialist and advanced modules, etc.;
- **Learning Outcomes**: describing the knowledge, awareness and skills that students are expected to achieve upon successful completion of the programme and the eventual further training/examination needed to gain professional qualification;
- **Environmental Design in the Academic Curriculum**: illustrating in detail the modules and/or academic units of teaching at each year of progression throughout a degree, which specifically focus on themes of environmental sustainability, including description of contents, delivery and assessment methods (e.g., considering integration with studio modules);

- **Integration of Environmental Design with Studio Modules**: visualising in a simplified graphical manner the structure of the course (modules and credits), and indicating the level of integration of technical taught contents with design applications (studio modules) basing on a satellite, partially-integrated or fully-integrate structure;
- **Strengths and Opportunities**: highlighting, basing on direct feedback by academics, existing assets, qualities, advantages and opportunities of specific pedagogies;
- **Summary of Criteria for Accreditation and Professional Qualification:** describing how the reviewed curricula are related to accreditation requirements in their own country (e.g., illustrating if an accreditation process is performed by the competent professional body and the criteria/procedure on which this is based) and the existing conditions for qualification and registration with indication of the specific knowledge, awareness and skill requested for professional practice as an architect.

As a result of this stage of analysis, it is evident that environmentally-responsive design and energy efficiency in buildings have been taught at many schools of architecture all over the world for many years. Nevertheless, pedagogical methodologies, course structures and contents, learning outcomes and delivery methodologies - specifically in terms of the integration of environmental design and energy efficiency within a creative architectural discourse - are still rather inhomogeneous across Europe and throughout extra-European countries, although some parallelisms can be drawn.

Amongst north European countries, in the **United Kingdom** the achievement of professional qualification involves a combination of academic studies and professional experience within an architectural firm and takes a minimum of seven years to compete. This includes three key stages of study on recognised courses (Part I, II and III) validated by the Royal Institute of British Architects (RIBA). The RIBA currently validates courses at over 40 schools of architecture in UK, establishing the effectiveness of programmes and examinations in achieving the standards necessary in preparing students for professional practice. There is a long tradition of environmental design education in UK, especially at postgraduate and post-professional level. This can be traced back to the aftermath of the 1973 energy crisis, when Master level postgraduate courses were started in several schools across the country, following the example of the Architectural Association Graduate School and that of the Bartlett School, University College London. At present, however, architecture is taught in rather different ways across UK, although most of the curricula are based in the studio for design work, tutorials and critiques. Almost all of the courses on offer in UK feature some aspects of environmental design education in their curriculum, as the implementation of these principles is required as part of the accreditation and validation process. There are also several post-professional courses offering specialised MA, MSc or MArch degrees in aspects of sustainability and environmental design. Seven UK schools of architecture were selected for the EDUCATE analysis, as representing the broad range of experience in undergraduate, graduate and postgraduate environmental design education. These are: the *University of Nottingham*; the *Architectural Association School of Architecture*, London; the *University of Bath*; the *University of Cambridge*; the *Cardiff University*; the *Glasgow School of Art*; and the *Oxford Brookes University*. There seems to be a clear awareness in all of these schools of the need to do more in order to better integrate the theory and practice of environmental sustainability in meaningful architectural design, though how this is to be achieved is not as immediately clear. At some schools, environmental design is actually taught as a compulsory core module (possibly in several years, at both undergraduate and graduate level), whilst in others some components can be optional. Conversely, although environmental principles and practices have been traditionally taught as stand-alone “satellite” contents, there is a general current tendency for these subjects to be more and more integrated within design studio modules (especially at the final year of undergraduate and graduate degrees). Environmental awareness together with fundamental knowledge of environmental design principles also feature widely among UK building professionals. This is especially the case in the larger architectural practices, most of which now have their own sustainability teams as well as involving specialist external consultants.

Of the schools reviewed in non-participating northern European countries, in **Ireland** the structure of the curriculum is quite similar to the UK, also in consideration that programmes accredited by RIAI (Royal Institute of Architects of Ireland) are generally also accredited by RIBA. After two years of approved practical experience, holders of a 5-year graduate degree in Architecture are entitled to take the examination for the Certificate in Professional Practice and Practical Experience, which gives exemption from the examinations in Professional Competence of the RIAI and the RIBA Part 3, and qualifies for membership of both institutes. The academic curriculum analysed at the *University College Dublin* revealed that environmentally-oriented modules, particularly at undergraduate level, are generally delivered through satellite lectures and are assessed by a final examination and/or a project study involving computer-based modelling. These modules explore the basic relationship between the built and natural environments in the context of sustainability, between external microclimate, indoor environment and occupant comfort through theory and application, and approach the contemporary debate on sustainability, viewed not only as an environmental issue but also as a socio-cultural subject. It is worth noting that throughout the duration of the undergraduate course, technology principles and applications are introduced and analysed in order to provide a foundation for an understanding of the construction methods and performance of a building, and part of the assessment is allocated to design projects. Conversely, at graduate level, themes of sustainable design and technology tend to be more fully integrated with design studio modules.

Sweden must be singled out as having a strong tradition in the field of environmental education that shares a great deal with the UK experience. The curriculum analysed at the *KTH Royal Institute of Technology* highlights the presence of specialised studio modules on sustainable environmental design to be chosen as an option in the final years of the course. Conditions for qualification include a requirement for at least one year of professional practice. Conversely, the architectural programme investigated at the *Aarhus School of Architecture* in **Denmark** reveals that although no explicit reference is made to sustainable environmental design within the structure of the pedagogy, these issues are integral to the delivery of the course, with specific reference to design studio projects. The structure and methodological dynamics of the education itself allows and fosters the development of an environmental sensibility in the teaching sphere, particularly in one of the vertical teaching lines available in the curriculum. Conditions for qualification for Danish graduates require evidence of professional production resulting from training activities carried out in the years after completion of the higher education programme.

In central Europe, in **Belgium**, **France** and the **Netherlands** sustainable environmental design is not new in architectural education, since notions of solar architecture and bioclimatic design have being included in the curriculum of some schools for almost 30 years. Initially, these educational contents were related to an ecological dimension of architecture and were often developed in dedicated research groups such as: Architecture et climat (*Université Catholique de Louvain*), Ceraa (*Institut Supérieur d'Architecture Saint-Luc de Bruxelles*), CRESSON and CRAterre (*Ecole Nationale Supérieure d'Architecture de Grenoble*), GRECO (*Ecole Nationale Supérieure d'Architecture de Toulouse*), etc. Although environmental considerations were not initially embraced by all the actors of the construction sector and academic staff members, however, at present, things seem to move with the current environmental context. Today, the presence of similar dedicated research departments actually seems to be a leitmotiv for a strong education in sustainable environmental design in all of the schools considered in these contexts. The analysis of the state of the art shows that schools are embracing mainly three strategies for the introduction of sustainable design in their curriculum. The first strategy is the creation of specific compulsory (and/or elective) "satellite" technical modules that meaningfully support the design development, particularly in undergraduate degrees (e.g., several of these modules are on offer at the *Technical University of Delft*). The second approach, on the other hand, is oriented towards the creation of optional integrated studio modules and/or specialist Master/graduate degrees where sustainable design is distilled throughout the progression of design exercises and other coursework. In some cases, students can choose a specific Minor (i.e., a series of dedicated thematic teaching units) during their degree and/or a specialised Master (e.g., the Climatic Design Minor and the Master Degree in Physics of Built Environment at the *Technical University of Eindhoven*; the Minor in Sustainable Design and the Master Degree in Architectural Engineering at *TU Delft*). Besides some compulsory modules delivering the basic notions of sustainable design, these options/orientations generally propose a strong education concerning environmental sustainability in architecture. However, due to their optional nature, it is also possible for students to choose different pedagogical paths and therefore completing their degree without having considered sustainable environmental design in a comprehensive manner. Nevertheless, the third strategy embraced by the schools analysed in these countries seems to be the most relevant and corresponds to a progressive and consistent attitude to the field of sustainable design. In this case in fact, the curriculum presents a holistic approach introducing the themes of sustainable environmental design in the whole educational program (in undergraduate, graduate and postgraduate degrees), in theoretical courses as well as in design studios, and at various levels of design intervention. However, the interactions between the theoretical courses and their application in the design studios, as well as the "learning by doing" approach, are still too inhomogeneous. The education generally is not robust enough to lead students to acquire the necessary autonomy for the development of their own sustainable environmental design process. In this framework, the introduction of an environmental dimension in the program of schools should be more emphasised and aimed at an open-mindedness, not only at the levels of contents of the courses, but also concerning tools and educational methods. Students should be lead to deal with the multidisciplinary aspects and the links between the different themes of sustainable environmental design basing on a culture of dialogue, collective intelligence and sharing of experience, so as to promote the specific skills of each and the consolidation of knowledge. In terms of conditions for professional qualification, in Belgium a professional training (*stage*) of minimum two years is obligatory for the practice of architecture, whilst in France and the Netherlands a period of practical training experience is not compulsory for registration as architects, although highly recommended. In both these latter countries, however continuing professional training and the involvement in activities of life-long learning is required for professional practice.

In **Germany** and **Austria**, the subject of environmental awareness in architecture is well developed, and both countries have a number of universities and schools that teach sustainable environmental design with meaningful learning outcomes. This corresponds to a high level of building standards that focus on energy efficiency, such as the *Energieeinsparverordnung* (Energy Saving Code) in Germany and the *Richtlinie für Energieeinsparung und Wärmeschutz* (Guideline for Energy Saving and Thermal Insulation) in Austria. In both countries, the energy efficiency of newly built structures is acknowledged through an energy certificate and specifications of their energy performance. The knowledge that students gain during their education is of practical relevance for their professional career. As an example, the *University of Stuttgart* and the *Technical University of Munich* have pioneered the concept of energy efficient buildings throughout the last 30 years. Nevertheless, architecture faculties in Germany and Austria have introduced the Bologna process only in the last two years, making it hard to find up-to-date experience and comprehensive conclusions on the implementation of this new curricular structure. Architectural courses usually integrate the subject of sustainable environmental design both in Pre-Diploma and Diploma level, equally in schools of applied sciences as in the university higher education structure. The system of professors who conduct a parallel architectural practice offers a tight relation between the curricular pedagogy and the realities of building. On the other hand, this system offers curricula that are relatively open in terms of the contents of their education, with a clear dependency to the personal interest and focus of the professor and his/her academic department. Sustainable environmental design is usually taught within the subjects of building physics, building services, building construction and urban design. Incorporation in architectural design development is achieved by cross-department seminars and integrated studio design modules. Further to this, some of the analysed universities are offering or developing Master and postgraduate courses that specifically focus on the subject of sustainability and energy efficiency. In both Germany and Austria, graduates of architectural disciplines obtain professional qualification after two (three for Austria) years of practical experience. In Austria, an additional professional exam is also required.

Poland, **Czech Republic** and **Slovakia** have developed their academic curricula according to the Bologna process already for a number of years and also offer their courses partly in English language. Sustainable environmental design is generally included in all undergraduate and graduate degrees, with teaching professionals showing a great deal of interest in the area. The subject has a relevant importance in the curricula with a spread of the topic in different subjects. The level of integration of the subject however varies widely from it being the focus of whole departments (e.g., at the *Slovak University of Technology in Bratislava*) dedicated to the subject, to a more sparse diffusion throughout the curriculum. Conditions for professional qualification in these countries generally require, after completion of a graduate degree, three years of certified practical training and a professional examination.

As far as southern European countries are concerned, in **Italy** the teaching of architecture reflects a variety of approaches, both in terms of curricular structure and delivery/implementation of contents of environmental sustainability, due to a high number of accredited degrees currently on offer (48 undergraduate 3-year courses; 33 graduate 2-year courses; 22 graduate 5-year courses; 26 first level postgraduate 1-year Master courses; 38 second level postgraduate 1-year Master courses; available at 25 different faculties of architecture and 12 engineering faculties). The multiplicity of higher education degrees offered is also further amplified by the current transition derived from the application of the Bologna process; therefore, the implementation of sustainable environmental design and energy efficiency in the educational progression towards professional qualification is rather diverse. As an example, the undergraduate BArch in Architectural Science at the *University of Rome La Sapienza* was recently reorganised with the removal of several specialist teaching units, most of which were concentrated in fields of sustainable environmental design and integrated in architectural and urban design studio modules. With the current structure, the implementation of environmental sustainability at undergraduate left is generally left to the discretion of the convenors and their specific expertise and interest in the field. Conversely, at postgraduate level, the University La Sapienza is one of the several institutions offering a professional 1-year Master degree fully focusing on environmentally conscious design, eco-efficiency and sustainable processes, renewable energies, systems and technologies, etc., and their applications in design. Amongst several other curricular models analysed, the academic path at the *University of Ferrara* is an example of a 5-year graduate degree where principles and practices of environmental sustainability are taught in modules which are partially integrated in the structure of the design studio, whilst a more focused analysis of themes of sustainable design constitutes the core of final year design modules that can be optionally chosen by the students. Conversely, other universities feature degrees where environmental design occupies a more explicit role in the educational agenda, as for the *Polytechnic of Milan*, which offers a focused undergraduate degree in environmental architecture, where design is developed at all different scales and is related to environmental quality and sustainability of transformation processes via the integration of specialist teaching units within design studio modules. At both undergraduate and graduate level, the curriculum in Milan also offers a number of satellite optional units aimed to provide students with useful knowledge and tools to control the environmental performance of buildings, interaction with climate, energy efficiency and aspects related to cost and regulations. In Italy, professional qualification can be achieved in two stages (Junior Architect after attainment of an undergraduate degree, and Architect at completion of 5 years of graduate studies) and requires passing a theoretical and practical national examination.

In **Greece**, the architectural curriculum is generally structured in a 5-year graduate Diploma degree, where specialist modules focused on environmental sustainability (compulsory or optional) are offered in support (yet, normally separate) of design courses. The curriculum analysed at the *National Technical University of Athens* is rather design-oriented and reveals the presence of both core and elective modules focusing on principle of environmental sustainability, with particular reference to their application in urban and regional planning. Professional qualification is achieved following an examination. Conversely, higher education programmes analysed in **Slovenia**, **Croatia** and **Cyprus** currently present both a 3+2 or a 5-year structure, whereas at least one specialist core module on sustainable environmental design is commonly present in the curriculum (often with a specific technical bias), supported by several optional teaching units (in some cases offered as summers schools as at the *University of Zagreb*). Proof of working experience, ranging from one (Cyprus) to three (Croatia) years, is requested for professional practice in these countries.

In western Europe, **Spain** is currently delved in the process of discussing the powers granted to architects as practitioners at a national level, and schools of architecture are simultaneously working on the adaptation of their curricular structures according to the Bologna process. Very few schools have actually already fully embraced this protocol; many curricula are being developed and therefore are still not accredited or validated by the Ministry of Education. Due to this situation, it is difficult to find examples where environmental contents in teaching have been consistently implemented and tested, both at undergraduate and graduate level. Conversely, several consolidated exempla are to be found at postgraduate level (e.g., at the Universities of *Seville* and *Andalusia*, and at the Polytechnic Universities of *Catalonia* and *Madrid*), which specifically deal with environmental issues, although only at a theoretical level since - due to the lack of experience at earlier stages of education - the focus of advanced studies is set on the change of mentality and raising of awareness, as well as in communicating knowledge previously unknown to the students. However, the organizational and methodological structures proposed by some architectural curricula show the potential opportunities that they can develop. This is the case, for example, of the *University of La Coruña* where, throughout the 300-credit graduate degree, teaching is approached through the ‘Workshop’ (a form of integrated design studio) as a learning tool. The Workshop is a working space to exchange knowledge and has been conceived to facilitate the confluence of contents of different subjects around the architectural design project. The aim for this is to ensure optimization of teaching resources and rationalization of student work, therefore also offering significant opportunities for meaningful implementation of environmental issues. This curricular structure is being followed by the *School of Architecture of Seville* where six teachers teach simultaneously different architectural disciplines, promoting interchange and an integral approach, which is very suitable to deal with transversal aspects to architectural knowledge such as environmental sustainability. In terms of conditions for qualification, the CSCAE (Consejo Superior de Arquitectos de España) is responsible for authorizing architects to practice the profession, provided they comply with the academic requisites established by the Spanish Law and the EU Directive on the recognition of professional qualifications.

In **Portugal**, the analysis of the different curricula at schools of architecture shows that environmental issues are being introduced sporadically and in a very little systematic way through specific modules taught by very conscious teachers, although there is generally a lack of a coherent and comprehensive integration of these topics at an overarching curricular level. A period of two years of practical training following the completion of graduate studies is requested for professional qualification.

In eastern Europe, **Hungary**, **Bulgaria** and **Romania** are generally aligning their curricular structures to the Bologna process, although some institutions such as the analysed *Budapest University of Technology and Economics*, the *Ion Mincu University* in Bucharest and the *University of Architecture, Civil Engineering and Geodesy* of Sofia also offer a 5-year (or 6-year) graduate Master degree in architecture, generally articulated in two consecutive uninterrupted cycles of study. At the early stages of the programme, students normally develop their knowledge in technical fields (e.g. building physics, architectural construction and technology) and are introduced to principles of bioclimatic architecture, human comfort and energy efficiency. The teaching generally also includes analysis of the latest EU and national energy regulations, in order to provide the theoretical background necessary to comprehend the complex idea of energy conscious design of buildings. During the following stage of graduate architectural education, optional technical modules introduce specialist knowledge in a more systematic way to support design applications, although consistent consideration of environmental aspects in design studio is generally missing. The expected results of the training include obtaining knowledge of the principles set at the root of the idea of sustainable development, and acquiring skills for definition and critical assessment of strategies for environmental protection and energy efficiency in particular spatial, social and cultural conditions. In all these countries, conditions for registration require a period of professional practice, whose duration varies according to the level of qualification aimed for (e.g., restricted, unrestricted, self-employed, etc.).

Amongst the extra-European countries analysed, in **Switzerland** the *Ecole Polytechnique Fédérale de Lausanne* offers a 3-year undergraduate degree, whose programme includes one parallel satellite module in building physics per each semester of study, therefore conveying all the theoretical background needed for application in design. After completion of the undergraduate Bachelor degree, students must undertake a period of compulsory validated practice of 12 months at an architectural firm, following which they have access to a 2-year graduate Master program structured in compulsory courses, design projects and electives, a specialization or a Minor, and a final thesis. Minors could have a specific emphasis on sustainable design, therefore leaving to the students the capacity of deepening their interests in the field, choosing amongst a number of available modules. A number of optional units within the social and human science modules analyse themes related to sustainable development and environmental design, therefore allowing students to develop critical thinking skills with regard to social, ethical and environmental implications. The *Projeter Ensemble* (Design Together) strategy responds to the need for increased cooperation and integration on projects between engineers and architects. In this context, focused weeks or summers schools are organised where students work together on a selected joint theme in a workshop/charrette-type exercise. Access to the architectural profession is granted to graduates with recognized Master degree or equivalent qualification and with at least 3 years of practical experience.

In the **United States of America**, at least eight years of a combination of education and training are needed to practice architecture, together with passing a professional registration examination. Duration of higher education programmes however can vary, since they can be organised on the traditional 4+2 (or 4+3)-year structure or, in specific cases, they can be constituted by a condensed 5-year course (e.g., at the *Illinois Institute of Technology* in Chicago), yet being accredited by NAAB (National American Accrediting Board). In terms of implementation of sustainable environmental design, the structure of the curricula generally includes compulsory satellite modules (particularly at undergraduate level), which impart general knowledge on the physical principles and concepts associated with buildings and environment and introduce a variety of building support systems. Sustainable design is however also integrated in a number of advanced design studios, particularly during the last years of the curriculum (Master degrees), and represents the focus of a number of electives from architectural departments, from other majors or from social/liberal arts optional education courses, investigating issues related to environmental quality and design, social and economic responsibility, exploring the basics of climate responsiveness, heating, cooling, lighting design, indoor air quality, etc. In some cases, as for example at the *University of California – Berkeley*, students are able to take up to one-quarter of their curriculum as electives, therefore potentially focusing on themes of sustainable environmental design. The programmes generally include collaboration with a variety of other disciplines, such as anthropology, international studies, engineering, new media, and urban studies. Most curricula also leave to the students the possibility to pursue a Minor in a department different from architecture. Minors generally consist of at least five modules (minimum 15 credits) and are optional and frequently cross-disciplinary, and can include innovation and exploration of environmental awareness and sustainable design. In several cases, the schools also offer combined tracks which bring together graduate Master degrees with postgraduate courses in order to provide a detailed specialisation in a discipline, such as the MSc in Architecture-Sustainable Design Track offered at the *University of Minnesota*.

In **Canada**, the two-stage Bachelor + Master curriculum analysed at *McGill University* complies with the requirements of the Canadian Architecture Certification Board (CACB), and is also recognized as accredited by the NAAB in the USA. The programme is structured as a four-and-a-half-year, or nine-term, course of study divided into a six-term design-based program, and a three-term or four-term professional degree, which can be focused on design studio coursework or directed research. The nature of the curriculum is relatively flexible and leaves the opportunity for students to take a number of complementary courses within the Department of Architecture or from other disciplines, which could take a specific focus on sustainable design. Of specific interest within the undergraduate degree are the Design and Construction modules which explore the major social, technological, environmental, and symbolic aspects of the design process, whilst two compulsory undergraduate teaching units explore the interrelationship between energy, environment and buildings, addressing core concepts of sustainability, bioclimatic design, building assessment tools, the integrated design process, site analysis, water conservation, passive and renewable energy sources, healthy and low embodied energy material choices, and high quality indoor environments. To achieve qualification in Canada, holders of a graduate degree must have sufficient pre-registration practice (a minimum of 5,600 hours of mandatory and discretionary experience), which is typically achieved by an internship programme. At the end of the internship, passing an exam is the final step for becoming a licensed Architect so as to ensure relevancy, effective delivery, and administrative control of professional practice.

In **Mexico**, amongst the various architectural programmes investigated, it is interesting to point out the case of the *University of Colima*, where sustainable design plays a pivotal role in the structure of the curriculum, and the training is based upon environmental topics that can stimulate the attainment of an ecological sensitivity in the formation of future architects. Environmental aspects, together with those of habitability, appear transversely throughout the degree in the different fields where they can be applied - technology, construction and design, among others - therefore obtaining a consistent education and capacity of application in the future professional practice. There are various integrated studio modules focusing on sustainable architectural design in the intermediate years, which provide important guidelines for the progression to the following stages of education. The University also offers a postgraduate Master degree in Sustainable Design for those who decide to extend their studies in these topics, aimed at both professional architects and those who want to follow a teaching and/or research career.

In **Brazil**, the curriculum analysed at the *Faculty of Architecture of Sao Paolo* highlights a satellite structure of delivery, with technical contents focusing on themes of environmental sustainability being generally imparted via a lecture series and typically assessed separately from design studio (e.g. by examination or independent coursework). The teaching of building physics principles and strategies is generally conveyed as part of the modules offered by the Department of Architectural Technology (primarily within 5 courses of Environmental Comfort) to be taken in the first four years of the degree, with the fifth year being mainly dedicated to optional units and the design thesis. Conversely, themes of ecology, social sustainability and applications to design case studies are normally introduced as part as the modules offered by the Department of Project. In order to achieve professional qualification in Brazil, in addition to personal documents, a recently graduated architect needs to provide CONFEA (Federal Council of Architects) with a full academic record including the disciplines undertaken, the durations of those and the marks obtained.

In **Singapore**, at NUS (*National University of Singapore*) the structure of the curriculum and the professional qualification process is similar to that of the United Kingdom, also in consideration of the fact that RIBA gives validation to the architectural programme. In particular, students wishing to enrol to the graduate 1-year Master course require an additional year (Honours Year) after having obtained a RIBA Part 1 undergraduate 3-year degree. The honours year is offered under different tracks that include architectural design, design technology and management. Holders of a graduate degree are awarded RIBA Part 2 accreditation and, after no less than two years of architectural practice, can apply for professional registration in Singapore. The implementation of sustainable principles and strategies at NUS is generally done via satellite modules in the undergraduate degree, which cover the principles of environmental responsive architecture and focus on passive modes and other low energy design strategies in various climates and contexts (with specific emphasis to tropical architecture). Further opportunities are offered by a number of electives that students can choose at various stages of their progression, but particularly in their honours year or during the final year of their study (1-year Master). It is worth noting that in the final year of the undergraduate degree, the curriculum presents a good spread of studio programmes addressing carbon neutrality and sustainability in design. Therefore, principles and strategies of sustainable environmental design are consistently introduced as the foundation of such final design studio modules. Other than the traditional 1-year graduate Master degree, NUS also offers a MArch option with specialisation in Design Technology and Sustainability. This programme offers a broad-based education in construction and management to enhance the knowledge and abilities of the professional architect involved in the development of sustainable architectural design.

In **Australia**, graduate of an architectural degree are required to complete additional two years of practical experience under the supervision of a registered architect in order to apply for registration with the local Architects Registration Board and the Australian Institute of Architects. In the curriculum analysed at *Deakin University*, in addition to the traditional accredited 5-year path Bachelor+Master of Architecture, students have the opportunity to enrol in a distinctive undergraduate Architecture/Construction Management course which can be taken in 5 years (or 4 years under the accelerated curriculum) and that is then followed by a 1-year graduate Master of Architecture. The structure and contents of these curricula are consistent in technical, theoretical and design disciplines, in order for sustainable environmental design not to be isolated in one single stream. Specific emphasis to the themes of environmental sustainability is given within the undergraduate degree where the contents are generally imparted in satellite lectures and are then transferred in design studio. In the undergraduate degree, compulsory modules cover the environmental significance of materials within the framework of sustainability and embodied energy, the climatic and environmental factors that influence the design and construction of buildings in the context of ecologically sustainable development, and the range of building services used primarily in commercial buildings. At graduate Master level, further obligatory technical modules examine thermal, visual and aural environments through a series of case studies and practical applications, and investigate contemporary building design in the context of the use of technology and environmental impact. These teaching units are generally divorced from studio and are typically assessed via tutored exercises, an assignment of system integration and/or case studies. It is however worth noting that most studio units (particularly at Master level and in the final thesis project) throughout the curriculum do introduce a critical analysis of the contemporary social, economic and environmental challenges that shape architectural design, towards a comprehensive embracement of an environmentally sustainable approach to the practice of architecture.

European Countries

Austria

TECHNISCHE UNIVERSITÄT GRAZ
FAKULTÄT FÜR ARCHITEKTUR

Bachelor of Architecture (3 years) + Master of Architecture (2 years)

Level: Undergraduate (BSc in Architecture, 3 years) + Graduate (MSc in Architecture, 2 years)

Accrediting Body: Chamber of Architects and Engineers of Styria and Carinthia (Kammer der Architekten und Ingenieurkonsulenten für Steiermark und Kärnten)

Educational Aims: Architects are very much involved in the design of our environment. Architecture's field of action has technical, economic, legal, political and cultural aspects. As a consequence, the study programme in architecture at the Technical University of Graz has a strong generalist character and promotes a holistic way of working and thinking basing on a project-oriented teaching. The university teachers, some of whom come from all around the world, can provide a wealth of practical experience. Graduates of the Faculty of Architecture at the TU Graz have gained a good reputation on the national and international level due to their ability to think in a critical and innovative way and their professional competence, which extends beyond the traditional fields of the architectural practice.

Outline Description of Course: The degree programme introduces students to the fundamental issues of the profession and their complex interrelationships on the broadest possible basis. Work tasks range from the large-scale view of landscape, region and the city to individual types of buildings, culminating in design and space at the detailed level. As well as learning the methodological basis, students acquire a broad range of cultural knowledge, an understanding of cultural interrelations, and social skills.

Course Structure: The course in Architecture has duration of 5 years. The programme is divided into a six-semester Bachelor's programme and a postgraduate, four-semester Master programme. The *Bachelor of Science in Architecture* begins with a two-semester orientation phase followed by a four-semester foundation phase. Teaching content is arranged in the following four thematic groups: History of architecture, architectural theory, art and cultural studies; Architectural drafting (core competence); Design, technology, materials; and, Architectural representations and artistic practices. Architectural Design is handled comprehensively as an overall subject, which includes all gathered knowledge. Within the second part of the programme, architectural design and development in studio is supported by elective subjects (arts and sciences). The University also encourages students to do courses abroad in other schools. The Bachelor's programme ends with the academic degree of Bachelor of Science (BSc). Being a first degree, however, a BSc is not sufficient for professional qualification. The *Master of Science in Architecture* treats the knowledge acquired in the Bachelor's programme in more depth and requires 2 additional years of study. In addition to the central task of drafting, a variety of areas of investigation has been planned into the Master's programme in Architecture and is accompanied by specialised optional subjects. Each area of analysis is completed by the end of each semester in order to enable students to plan parts of their studies at other universities at home or abroad. The four-semester course of study is completed with a Master's thesis in the fourth semester. Graduates are awarded the academic degree of "Diplom-Ingenieurin", which is internationally equivalent to a Master of Science (MSc.). The degree entitles the student to embark on an engineering doctoral programme.

Bachelor + Master of Architecture (5 years)

The course is structured in 2 divisions and an overall amount of 300 ECTS Credits. For the 1st section, 180 Credits are needed. The first study section begins with an orientation phase in the first two semesters and teaches basic knowledge. For the second section, 120 Credits are needed. Free choice elective fields amount to 30 ECTS. The final Diploma thesis counts 24 ECTS.

Division of teaching according to contents:
1. Section: Basics
2. Section: Consolidation
Overall Teaching: Architectural Design

Topics:
1. Material, Construction, Statics
2. Theory of Architecture, Arts and Culture
3. Space Design and Graphics
4. Space Organisation and Planning

Kind of Courses:
Lectures (VO): teach contents of architecture and includes deeper practical work

Practical work (UE): apply gained knowledge and develop skills
Seminars (SE): foster discourse to initiate own research
Excursions (EX): force experience and dispute with architectural phenomena

Division of subjects

1. Compulsory modules	225 ECTS
2. Electives	45
3. Free electives	30
Total	300 ECTS Credits

Compulsory Modules have to be done in the 1st section and within the thematic topics assigned; Architectural Design is obligatory in both sections. Electives are in the 2nd section, divided into 2 catalogues, from which 24 ECTS have to be chosen to develop a specialisation. Free electives can be done in both sections and can be done freely and also abroad. Building physics is a subject not integrated into design.

Division of subjects to study sections:

1. Section	180 ECTS
Compulsory	165 ECTS
(of whom Orientation:	60 ECTS)
Free electives	15 ECTS
2. Section	120 ECTS
Compulsory (Architectural Design)	36 ECTS
Electives (Catalogue1 and 2)	45 ECTS
(of whom from Catalogue 1:	24 ECTS min)
free electives	15 ECTS
Diploma thesis	24 ECTS

Division of teaching per semester
First section (6 semesters)
1. - 2.Orientation
3. - 6. Basics
Second section (4 Semester)
7.- 9. Deepening
10. Diploma

Working hours of study
7.500 Student hours of study

1. Section	4.500 h
2. Section	3.000 h

1 ECTS Credit is 25 working hours

1. Section - Orientation Art

Title	*Type*	*Credits*
Design	SE	10
Design	EX	2
Workshop 1	SE	3
Construction 1	VO	6
Statics 1	VO	3
Material and Form	SE	6
History of Architecture and Arts	VO	3
Theory, History and Method	SE	3
Space Reception	VO	1.5
Space Reception	UE	4.5
Graphics	VO	3
Graphics	UE	6
Space Organisation and Planning	VO	3
Space Organisation and Planning	SE	6

Orientation: 60 Credits ECTS

1. Section – Basics Art

Design1	UE	9
Design 2	UE	9
Design and Construction 3	UE	16.5
Workshop 2	SE	3
Workshop 3	SE	3
Building Physics	VO	3

Construction 2	VO	5
Construction 2	UE	7
Statics 2	VO	4
Statics 2	UE	2
Experimental High-Rise Architecture	SE	3
Organisation and Management	VO	3
Arts and Cultural Sciences	VO	3
Arts and Cultural Sciences	EX	1.5
Architectural Theory		
Architectural History	VO	4.5
Arts 1	SE	6
Digital Graphical Methods 1	SE	6
Building Science	VO	3
Urbanism	VO	3
Architecture and Landscape	VO	3
Housing	SE	4.5
Free Electives		15
First Section: 180		

2. Section		
Design		27
Electives		30
Free Electives		10
Study Section		67 (Working Hours)
Design 4	UE	12
Design 5	UE	12
Design 6	UE	12
Electives		45
Free Electives		15
Diploma		24
Second Section 120		

Electives Catalogue Art		
Group 1: Materials, Construction, Structure		
Construction 3	SE	3
Construction 4	SE	3
Materials	VO	3
Statics	SE	3
Group 2: Theory		
Arts And Cultures	VO	3
Architectural History	SE	3
Art- And Architectural Theory	SE	3
Revitalisation	SE	3
Group 3: Architectural Design and Graphics		
Space, Material, Detail	SE	3
Design 2	SE	3
Digital Methods 2	SE	3
Light T	SE	3
Group 4: Space Organisation and Planning		
Building Theory	SE	3
Urbanism	SE	3
Domestic Planning	SE	3
Regional Building	VO	3

Electives Catalogue 1 Art		
Structural Framework Planning		
Lightweight Construction	SE	4.5
New Materials and Use In Structure	VO	3
Static Systems	VO	3
Static Systems	UE	1.5
Halls	VO	4
Halls	UE	1
New Tendencies in Statics	VO	3
Architectural Technology		
Steel	SE	3
Industrialized Building	SE	3
'Developing Countries'	SE	4.5

Building Physics	VO	3
Building Physics	UE	3
Natural Stones	VO	2
Industry	VO	2
Industry	UE	2
Building Technology and Ecology		
Architecture and Energy	VO	3
Ecological Design	VO	4
Ecological Design	UE	1.5
Energy And Building Technology	VO	4
Energy And Building Technology	UE	4.5
Smart Technologies – Intelligent Buildings	SE	3
Basics Technology	VO	3
Solar Building	VO	2
Management		
Planning Methods	SE	3
Law	VO	1
Law and Orders	VO	3
Financial Management	SE	3
Management	VO	1
Management	SE	3
Law for Architects	VO	3
Architectural Theory And History		
Construction History	VO	3
Antique	VO	3
Non-European Building Cultures	VO	3
Horticulture	VO	3
History of the City	VO	3
Electives Catalogue 2 Art		
Art and Culture		
Actual Tendencies In Architecture	SE	3
Aesthetics	SE	3
Creative Writing	SE	3
Cultural Studies	SE	3
Gender Studies	SE	3
City Receptions	VO	3
Rehabilitation and Conservation		
Preservation Sciences	SE	3
Structural Damage	VO	3
Structural Damage	SE	3
Intervention In Historical Buildings	UE	9
Building Research		
Analysis	SE	6
Photogrammetrics	VO	2
Photogrammetrics	UE	2
Art		
Drawing	UE	3
Photography	SE	3
Art Project	SE	3
Media Project	SE	3
Art And Public	SE	3
New Media		
Digital Methods 3	SE	3
Digital Methods 4	SE	3
Film	SE	3
Innovative Methods	SE	3
Simulation technology	SE	3
Geometry	VO	2
Space Design		
Experiments	SE	4.5
Acoustics	VO	3
Light Design	VO	1,5
Light Design	UE	4.5
Stage Design	UE	6
Furniture	SE	3
Carpenters Workshop	UE	3

Carpenters	UE	3
Product Design	SE	3
Colours	SE	3
Building Design		
Architecture	UE	6
Tourism	SE	3
Building for Disabled	VO	3
Electrics	VO	3
Regional Design	UE	6
Urbanism		
Theory	VO	3
Urban Research	SE	6
Urban Development	VO	3
Urban Development	UE	6
Local Design	VO	3
Super-Local Design	VO	3
GIS	SE	3
Urban Infrastructure	VO	3
Simulation	SE	3
Mobility	SE	3
Landscape Design		
Landscape Design	VO	3
Landscape Design	UE	6
Landscape Design	SE	6
Architecture and Society		
Psychology	SE	3
Sociology	SE	3

Learning Outcomes: The curriculum at the Technical University of Graz prepares graduates to the occupational field of architecture, which is very varied and open. Architectural activity traditionally involves elaborating and producing building designs and is carried out in an architecture firm or planning office. Architects also take on tasks of co-ordination and shape development and building projects in teams composed of different professional groups. Fields of operation that the programme targets therefore include the building industry in the context of property developers, construction and project management with different authorities at state, municipal and federal level, as well as visualisation in the field of new media, exhibition design, communication and graphics. Architects graduating from the Faculty of Architecture can join the market as freelance professionals or can be employed in private or state-run offices.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

The curriculum is based on studio design courses that integrate additional modules. A number of compulsory and elective modules deal with the issues of environmental design. A specific feature of the TU Graz in the field of sustainable environmental design is represented by the **Department of Building and Energy** of Prof. Brian Cody, where topics of environmental sustainability are taught at a high level of scientific research and professional experience. Students gain a sound knowledge in this area at the end of their degree. Another interesting feature is the design studio and other correlated courses held by this department, which are based on the attitude of creating architectural form by using aspects of energy efficiency and technology.

The Department offers seminar work in the fields of construction physics, building engineering and architecture and energy. In cooperation with other Departments, it offers consultancy to students in focus topics. Since October 2009, the department also offers design studio courses that are supported by additional seminars such as introduction to simulation software. A fundamental part of the education imparted by the Department consists in working on projects, and to learn throughout the course of the design process. The focus of the Department is not building engineering in itself, but rather the design of inherent energy efficient buildings and the integration of the necessary building physics principles. Therefore, the purpose is primarily an architectural one. The field's core consists of the interaction between human and building and between building and environment. Subsequently, the building acts as a filter between humans and the environment which they inhabit. Within the courses which are managed by the Department, one important aspect of engineering is represented by the analysis of the room climate that is generated by building design. In the best case, it is especially caused by the optimisation of the building facade and construction. The alignment of the energy demand of a building with the comfort of its user is the challenge. A basic knowledge in the laws of physics is learned with real situations like those occurring following the interconnections between environment, human, building and building engineering.

The student learns to understand this interaction without calculating the mathematical backgrounds. With basic examples and analysis, experience is gained and a kind of intuition develops. At a later time, case studies and further analysis of current projects and architectural styles are discussed to increase and assure the knowledge. The goal is not just to convey a great deal of theoretical knowledge, but to give the students a perspective, which allows them to solve real situations and problems in practice. Computer simulation is used as a teaching aid to clarify the physical processes in the building. Similarly, the purpose is not to train the computer handling, but rather to get an intuition and a feeling for the interrelations. Some kind of curiosity for the dynamics of room climatic processes in a building is getting motivated. The development of the intuition and the feeling for the processes allow students to find answers. This should not describe a closed process, but rather the beginning of continuity of thinking, which conducts the architect within his whole professional activity. Amongst the modules taught in the Bachelor programme are the following:

Construction physics (compulsory subject): The course provides basic knowledge of those aspects of construction physics which are relevant for the architectural design such as: temperature and air quality inside and outside the building, heat transfer, the thermal and hygrometric behaviour of building construction, heat protection, light, natural air-conditioning, acoustics, noise protection.

Building engineering (compulsory subject): The module focuses on basics principles for designing the most essential building engineering systems (heating engineering, ventilation engineering, air-conditioning, refrigeration engineering, sanitary engineering, electrical engineering, communication technology, fire protection engineering) and integration of these systems in the architectural design. Broadening and deepening of knowledge by means of work reports, case studies and analysis of contemporary project examples represents the basis of the pedagogical methodology applied.

Architecture and energy (compulsory subject): The unit analyses the interplay of the triad of minimized energy consumption, optimum air and temperature conditions inside the building and architectural quality or aesthetics, with the aim of developing highly energy-efficient buildings by means of form and construction. The module conveys an understanding of the fact that this challenge will lead to a new architectural quality and should not be seen as a limitation to design liberties.

Modules taught under the responsibility of the Department of Building and Energy at Master level comprise:

Energy design (elective course): Focusing on the conception and development of air-conditioning and energy concepts for highly energy-efficient buildings.

Computer simulation (elective course): Exploring thermal, light and air flow simulations in building design.

Advanced facade technologies (elective course): The modules brings to the fore innovative high-performance façade solutions for highly energy-efficient buildings that are inherently energy-saving owing to their form and construction and that combine minimized energy consumption with optimum indoor environment and the highest architectural quality.

Advanced architectural science (elective course): The module provides scientific basis for designing sustainable energy-efficient solutions for buildings and urban development, particularly with regard to indoor environment, light, ventilation and acoustics.

Advanced building systems (elective course): This course introduces and analyses in detail innovative high-performance building services engineering solutions for energy-efficient buildings.

STRENGTHS AND OPPORTUNITIES

Strengths:

- Sustainable environmental design represents a core part of the curriculum;
- There is a strong investment in the necessary resources;
- Passive environmental design, energy efficiency and carbon neutrality, renewable energy systems, occupant comfort and well being , ecological resource management and social sustainability are represented in the curriculum;
- Architectural quality is given a main priority within the design solutions proposed;
- Sustainable environmental design is implemented at all stages of the undergraduate and graduate curriculum.

Opportunities:

- The organisation of interdisciplinary projects with other institutions and the presence of integral design studios specifically at Master level;
- The coupling of design studio with specialist elective courses, such as advanced façade technology and computer simulation.

SOURCES AND REFERENCES

Faculty of Architecture website: portal.tugraz.at/portal/page/portal/TU_Graz/Einrichtungen/Fakultaeten
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Chamber of Architects and Engineers of Styria and Carinthia

An architect who lives in Styria and Carinthia and wants to become a registered member of the Chamber of Architects and Engineers of Styria and Carinthia (Kammer der Architekten und Ingenieurkonsulenten für Steiermark und Kärnten) needs the following:

- Diploma degree or Master Degree in Architecture, Landscape Architecture or Interior Architecture of an Austrian University or School of Applied Sciences or Academy of Arts (or European equivalent);
- At least three years of professional experience according to the specific area of study. The professional training has to include all phases of planning, design development, contracting and construction management;
- Successful passing of the exam for Civil Technician (Ziviltechniker). The exam includes matters of Austrian Administrational Law, Business management, Professional Law, Austrian building codes and related laws, rules and acts.

SOURCES AND REFERENCES

Chamber of Architects and Engineers of Styria and Carinthia web site: www.aikammer.org

Belgium

UNIVERSITE CATHOLIQUE DE LOUVAIN
FACULTY OF ARCHITECTURE

Bachelor and Master of Engineering Science: Architectural Engineering

Level: Undergraduate (Bachelor of Eng. Science, 3 years) + Graduate (Master of Eng. Science, 2 years)

Accrediting Body: CNOA Conseil National de l'Ordre des Architectes de Belgique

Educational Aims: The Bachelor degree of Engineering Sciences: Architect–Engineer (3 years, 180 credits) consists of foundation studies in the basic disciplines in which the Architect - Engineer needs to acquire theoretical and practical skills. It provides an initiation and initial instruction in subjects which will be studied in depth and consolidated during the Master programme of Engineering Sciences: Architect - Engineer. The Master degree in Civil Engineer Architect (2 years, 120 credits) consists of the continuation of the formation in the disciplines where the civil engineer has to acquire the necessary knowledge and practice, following the principles defined, introduced and developed during the program of the Bachelor of Engineering Sciences, with orientation in Architecture. After being awarded the Master degree, the Architect - Engineer (like all Junior Architects in Belgium) has to do two years of architectural practice before being officially registered as an independent architect by the CNOA. Special conditions apply for admission to the course, since the access to the first cycle of Engineering Sciences, with specialization in Civil Engineering, requires passing an admission examination. Access to the studies is always subordinate to passing this initial assessment.

Outline Description of Course: The function of the Architect - Engineer is clearly defined from the outset of the Bachelor program. It is mainly characterized by three key features: the Architect - Engineer is a "generalist" architect (capable of intervening on every level of inhabited environments, including territory, landscape, towns and buildings), whose engineering skills are particularly developed (including construction technologies and building physics); the architectural design studio is important in the program both on a quantitative and a qualitative level (ongoing practical work for which the student is responsible; active pedagogical tools; the place where different kinds of working experience come together); the courses related to the "physical conditions" and the "cultural conditions" which govern the milieu where architectural practices are carried out guarantee the overall balance of the program and call upon both the Human Sciences and the Exact Sciences.

Course Structure: Each year of study consists of a minimum of 60 credits. Each module has a credit value. 1 credit is designed to require around 24 hours of student work, including taught courses and contact time, assessment work and 'student-centred learning'.

<u>Bachelor of Engineering Science: Architectural Engineering (3 years)</u>

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
FSAB1101	Mathematics	6	Autumn
FSAB1201	Physics 1	6	Autumn
AUCE1701	Construction: Structure	3	Autumn
AUCE1101	Cross-disciplinary approaches: Anthropology	2	Autumn
AUCE1301	History of architecture: Antiquity	2	Autumn
ANGL1871	English: Reading comprehension	2	Autumn
AUCE1501	Drawing 1: City and territory	4	Autumn
AUCE1502	Drawing 2: Places	4	Autumn
AUCE1503	Drawing 3: Composition and compositional techniques	3	Spring
AUCE1601	Design Studio 1: Landscape and edifice	4	Spring
AUCE1702	Construction: Materials	3	Spring
AUCE1201	Theory of architecture 1: Introduction	2	Spring
ARKE1445A	Art and Civilization: the Middle Ages	2	Spring
FSAB1102	Mathematics 2	9	Spring
FSAB1202	Physics 2	6	Spring
FSAB1801	Critical History of Science and Technology	2	Spring
Credit Total	**60**		

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
FSAB1109	Mathematical structures for spaces	4	Autumn
FSAB1203A	Physics 3	3	Autumn
FSAB1104	Numerical methods	5	Autumn
AUCE1801	Construction	3	Autumn
AUCE1102	Cross-disciplinary approaches 2: Philosophy	2	Autumn

AUCE1302	History of architecture: the contemporary	2	Autumn
AUCE1602	Design Studio 2: History and habitat	4	Autumn
AUCE1603	Design Studio 3: Institution and edifice	4	Autumn
AUCE1604	Design Studio 4: City and edifice	4	Spring
FSAB1209	Advanced Statics	2	Spring
FSAB1309	Chemistry	5	Spring
AUCE1504	Drawing 4: Presentation and presentation techniques	3	Spring
AUCE1171	Geology and mineralogy	3	Spring
AUCE1202	Theory of architecture 2: Theories	2	Spring
ARKE1445A	Art and civilization: Modern times	2	Spring
ANGL1872	English: Listening comprehension	2	Spring
Credit	**50 (*compulsory modules*)**		

(*Optional Modules*) - Students must take 30 credits (during the second and third year) from a long list of courses on offer at various Faculties (Architecture, Civil Engineering and Construction, Applied Mathematics, Chemical and Material Sciences, Mechanics, Philosophy, History, Management and Business, etc.)
Credit Total 60

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
MECA1901	Continuum mechanics	5	Autumn
AUCE1172	Soil mechanics	4	Autumn
AUCE1103	Cross-disciplinary approaches 3: Aesthetics	2	Autumn
AUCE1403	Architecture and city	3	Autumn
AUCE1605	Design studio 5: Architecture, technology, sustainable development	4	Autumn
AUCE1606	Design studio 6: Architecture, city and landscape	4	Autumn
AUCE1607	Design studio 7: Synthesis	7	Spring
MECA1100	Deformable solid mechanics	5	Spring
AUCE1901	Comfort and building physics (thermal principles, acoustics, lighting)	2	Spring
AUCE1203	Theory of architecture: Composition	2	Spring
ANGL1873	English: Communication skills for engineers	2	Spring
Credit	**40 (*compulsory modules*)**		

(Optional Modules) - Students must take 30 credits (during the second and third year) from a long list of courses on offer at various Faculties (Architecture, Civil Engineering and Construction, Applied Mathematics, Chemical and Material Sciences, Mechanics, Philosophy, History, Management and Business, etc.)
Credit Total 60

Master of Engineering Science: Architectural Engineering (2 years)

Year 4 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
AUCE2349	Special questions in theory and history of the architecture	4	Autumn
AUCE2181	Structures mechanics: Hyperstatic problems	2	Autumn
AUCE2182	Conception of metallic and mixed structures	4	Autumn
AUCE2350	Civil architecture	4	Autumn
AUCE2370	Analysis and composition: City	3	Autumn
AUCE2601	Comprehensive design project: Architecture, city, landscape, sust. dev.	9	Autumn
AUCE2602	Comprehensive design project: Architecture, city, landscape, sust. dev.	9	Spring
AUCE2371	Analysis and composition: Buildings	3	Spring
AUCE2360	Domestic and urban living practices	3	Spring
AUCE2380	Economy and politics of the construction	2	Spring
AUCE1031	Structural materials	3	Spring
AUCE1173	Soil mechanics: Applications	4	Spring
AUCE2363	Building physics: HVAC and lighting	4	Spring
Credit	**54 (*compulsory modules*)**		

(*Optional Modules*) - Students must take at least 15 credits (during the two years of the Master) from elective modules in a special theme. See below
Credit Total 60

Year 5 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
ARCH2990	Thesis: design studio or dissertation	27	All year
AUCE2344	Project management: programming, specifications, etc.	4	Autumn
AUCE2031	Organic calculation of concrete	4	Autumn
AUCE2495	Urban hydraulics	3	Autumn

TECO2100	Questions of religious sciences	2	Autumn
AUCE2340	Methodological seminary integrated into the final project	2	Autumn
AUCE2591	Law of built and not built spaces	3	Autumn
AUCE2341	Initiation seminary to research	3	Spring
AUCE2372	Analysis and composition: landscape	3	Spring
Credit	**51 (*compulsory modules*)**		

(*Optional Modules*) - Students must take at least 15 credits (during the two years of the Master) from elective modules in a special theme:

Group 1 Elective m*odules in architecture of the edifice and urban architecture*

Code	*Title*	*Credits*	*Taught*
AUCE2386	Architectural conception with wood	2	Autumn
AUCE2501	Architectural drawing: complements	2	Autumn
AUCE2603	Complementary Design studio	6	Autumn
AUCE2032	Prestressed concrete	3	Spring
AUCE2364	Building physics: complements	2	Spring
AUCE2387	Civil architecture: Renovation, restoration	2	Spring

Group 2 Elective modules in territorial development

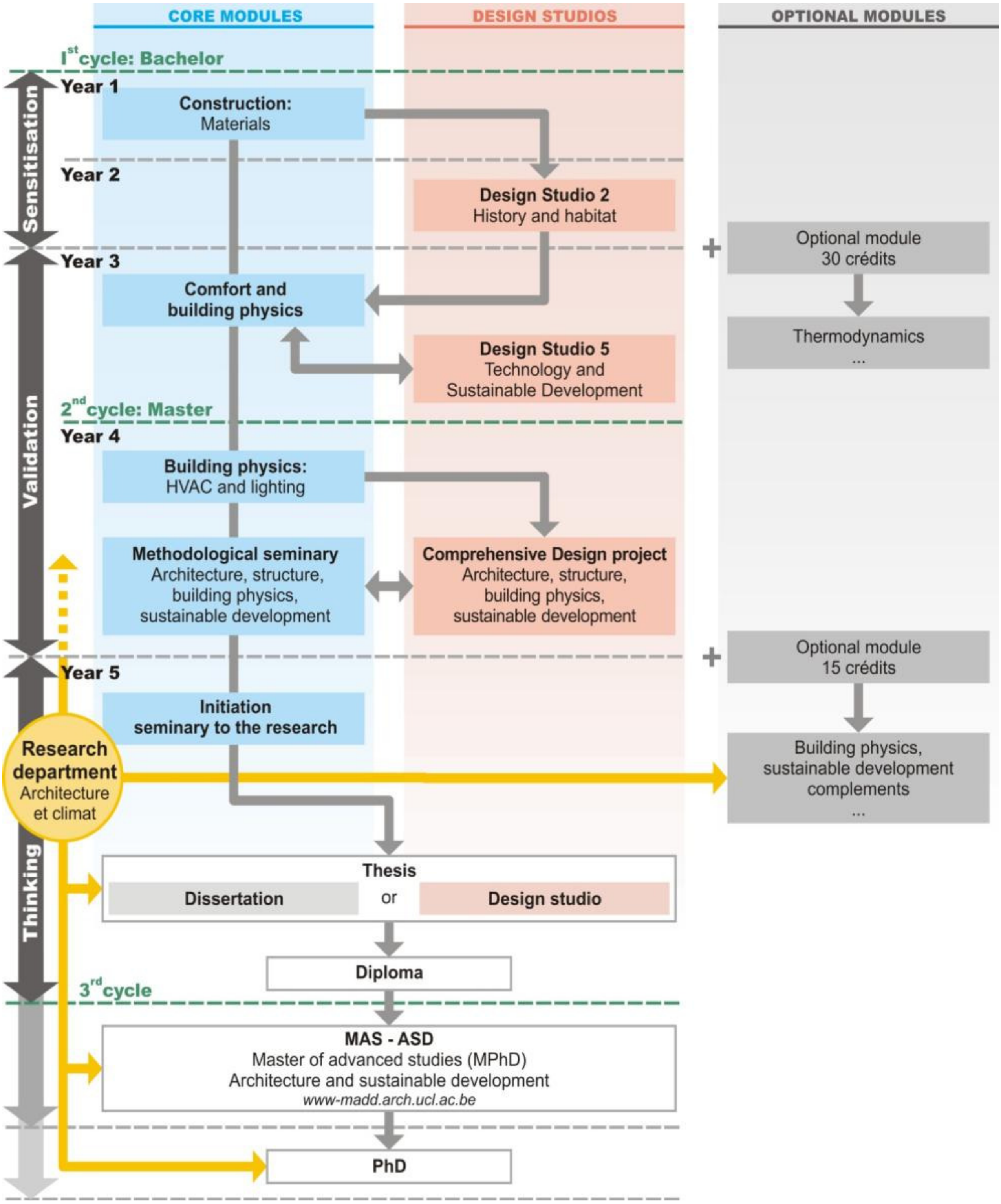
Code	*Title*	*Credits*	*Taught*
AUCE2930	Territorial processes and models of development	3	Autumn
AUCE2940	Urban morphology and analysis of the landscapes	4	Autumn
AUCE2960	Mobility, town planning and territorial development	3	Autumn
AUCE2965	Introduction to the urban and territorial development laws	2	Autumn
AUCE2975	Interdisciplinary seminary of town planning and territorial development	5	Autumn
AUCE3011	Actors, territories and contexts of development	5	Autumn
K1DARM	Architectural Research Methods	15	Autumn
K14AD1	Architectural Design 1	30	Autumn
K14DS1	Architectural Design seminaries 1	15	Autumn
AUCE2950	Systems of decision in town planning and territorial development	4	Spring

Group 3 Elective modules in construction

Code	*Title*	*Credits*	*Taught*
AUCE2103	Organization of the works in civil engineering	2	Autumn
AUCE2104	Seminaries relative to works of engineering	3	Autumn
AUCE2192	Technological choices management	3	Autumn
MECA2120	Introduction to the methods of finished elements	5	Autumn
AUCE2101	Project elements in civil engineering	2	Autumn
AUCE2032	Prestressed concrete	3	Spring
AUCE2102	Project elements in civil engineering 2	3	Spring
AUCE2183	Conception of wood structures	2	Spring
MECA2520	Elasticity complements: calculation of flat structures	5	Spring
Credit Total	**60**		

Learning Outcomes: The programme of the Bachelor and Master of Engineering Science: Architectural Engineering provides opportunities for students to develop an appropriate knowledge at different levels during the curriculum specifically focusing on Sensitisation, Validation and Thinking.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum



STEP I: SENSITISATION. During the first two years, some courses are conceived to increase gradually the student awareness of sustainable design. The first course partially related to sustainable design is **Construction: materials**. It gives to the students a first presentation of bioclimatic architecture and its relatives concepts. This is the occasion to give a first definition of sustainable architecture.

Concerning the **Design Studios**, the particular design process approach at UCL considers the *context* as an important parameter. These considerations, shared by all the academic faculty members, are a first step to the introduction of climatic environment. Moreover, the adequacy to the program allows the introduction of the notion of comfort for the occupants very early in the curriculum. However, the concepts of bioclimatic architecture and sustainable architecture are really studied in depth during the second year in the **Design Studio 2: History and habitat**. In this studio, students have to integrate in their design process the stakes of sustainability at a specific scale: the house(s).

STEP II: VALIDATION. During the third year, the course **Comfort and building physics (thermal principles, acoustics and lighting)** presents the physical basic concepts which allow the control of the environment and the comfort (thermal, acoustic, air quality, etc.). It concretizes the already present reasoning of the previous design studios. The teachers, members of the research team “Architecture et climat”, are experts in these domains.

During the fourth year, the theoretical course **Building physics: HVAC and lighting** focuses on equipment connected to energy demands (heating / ventilation / electricity, etc.). The course gives the students the necessary knowledge and tools to conceive and calculate the technical installations in adequacy with the building and its functions. These systems are scientifically described and studied (thermodynamics).

The optional course **Building physics: complements** concerns special questions about sustainable design. It invites a more detailed understanding of the physical concepts on the basis of advanced systems, and offers a critical analysis of architecture within the framework of sustainable development through study of published papers and analysis of built structures.

The third year studio, **Studio 5: Structures, Technology and Sustainable development,** strengthens the questioning concerning the integration in the environment (orientation/winds, bioclimatics, etc.) and is particularly attached to the study of natural light. It takes place on the basis of a program and a simplified site, which allows studying more in depth the design of natural lighting. The students are able to validate their approach by direct field measurements at the " Belgian Building Research Institute (BBRI) " under an artificial sun and artificial sky. This gives the opportunity to the students to lead a real research on the relation between the conception of the design and natural lighting.

The design studio of the fourth year, **Comprehensive Design project and methodological seminary**, concerns a subject directly connected to sustainable and environmental design. This project, on a larger scale, leads to the conception of a sustainable district. It comes along with a theoretical seminary (e.g., study of 12 sustainable districts in Europe). Through this project of synthesis, the students have to prove their knowledge and their experience concerning sustainable and environmental design. At this step, theory and research are connected to each other. The “research” part is thus amplified.

STEP III: THINKING. During the last year of the curriculum, the students are invited to follow the **Initiation seminary to research**. A part of this seminar - given by the research team “Architecture et climat" - presents the current stakes in the research concerning sustainable design in architecture.

At this last step, students have to realize a **Thesis**. According to the subject chosen by the student, the thesis can be supervised by members of the research either in design studio or in a theoretical subject. In this case, students have access to the necessary tools provided by the research team (e.g., computer simulation programs, databases, publications, results of research, etc.).

MASTER OF ADVANCED STUDIES. The research unit “Architecture et climat” participates actively in the postgraduate **European Master of Advanced Studies in Architecture and Sustainable Development (MAS-ASD)** developed in partnership with the School of Architecture of Toulouse (France) and the EPFL Polytechnic of Lausanne (Switzerland) (http://www-madd.arch.ucl.ac.be) This advanced programme allows the deep investigation of theories and practices in architecture, climate, energy, environment and economy with respect to sustainable development. It brings the necessary knowledge and tools for the conception of buildings by taking into account these imperatives. The cycle is addressed first and foremost to the professional architects, (architects of the state, regional and local authorities or private) as well as the teachers in architecture.

PhD. The research unit “Architecture et climat” has already produced 17 doctorates since its creation and 8 doctoral thesis are currently in preparation. The PhD program consists of two compulsory elements: a 60-credit doctoral training course and the research work for the PhD thesis (120 credits). “Architecture et climat” participates in the thematic doctoral school (Sustainability in architecture and town planning group).

Integration of Environmental Design - Bachelor of Engineering Science: Architectural Engineering

Year 1

Construction: structure
3 Credits

Construction: materials
3 Credits

Cross-disciplinary approaches: Anthropology
2 Credits

History of architecture: Antiquity
2 Credits

Theory of architecture 1: Introduction
2 Credits

Art and Civilisation: the middle ages, architecture
2 Credits

Mathematics 1, 2
15 Credits

Physics 1, 2
12 Credits

Critical History of Science and Technology
2 Credits

English: reading comprehension
2 Credits

Studio Modules

Drawing 1
City and territory
4 Credits

Drawing 2
Places
4 Credits

Drawing 3
Composition and compositional techniques
3 credits

Design Studio I
Landscape and edifice
4 Credits

Year 2

Mathematical structures for spaces
4 Credits

Advanced Statics
2 Credits

Physics 3
3 Credits

Numerical methods
5 Credits

Chemistry
5 Credits

Construction
3 Credits

Cross-disciplinary approaches: Philosophy
2 Credits

History of architecture: contemporary
2 Credits

Theory of Architecture 2: Theories
2 Credits

English: Listening Comprehension
2 Credits

Studio Modules

Drawing 4
Presentation and presentation techniques
3 Credits

Design Studio 2
History and habitat
4 Credits

Design Studio 3
Institution and edifice
4 Credits

Design Studio 4
City and edifice
4 Credits

Geology and mineralogy
3 Credits

Art and Civilization: modern times
2 Credits

Elective
30 Credits (2nd and 3rd year)
Thermodynamics

Year 3

Deformable solid mechanics
5 Credits

Soil mechanics
4 Credits

Continuum mechanics
5 Credits

Comfort and building physics
2 Credits

Cross-disciplinary approaches: aesthetics
2 Credits

Architecture and city
3 Credits

English communication skills for Engineers
2 Credits

Theory of architecture 3: composition
2 Credits

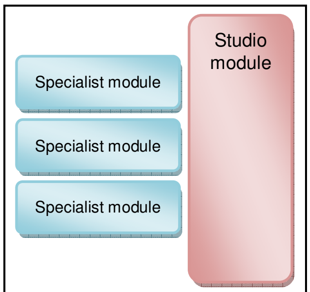
Elective
30 Credits (2nd and 3rd year)
Thermodynamics

Studio Modules

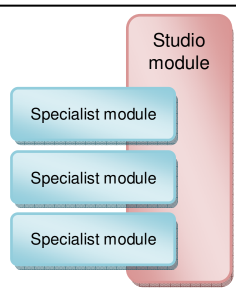
Design Studio 5
Architecture, Technology and Sustainable Development
4 Credits

Design Studio 6
Architecture, city and landscape
4 Credits

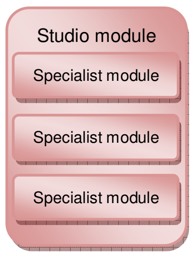
Design Studio 7
Synthesis
7 Credits



Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).

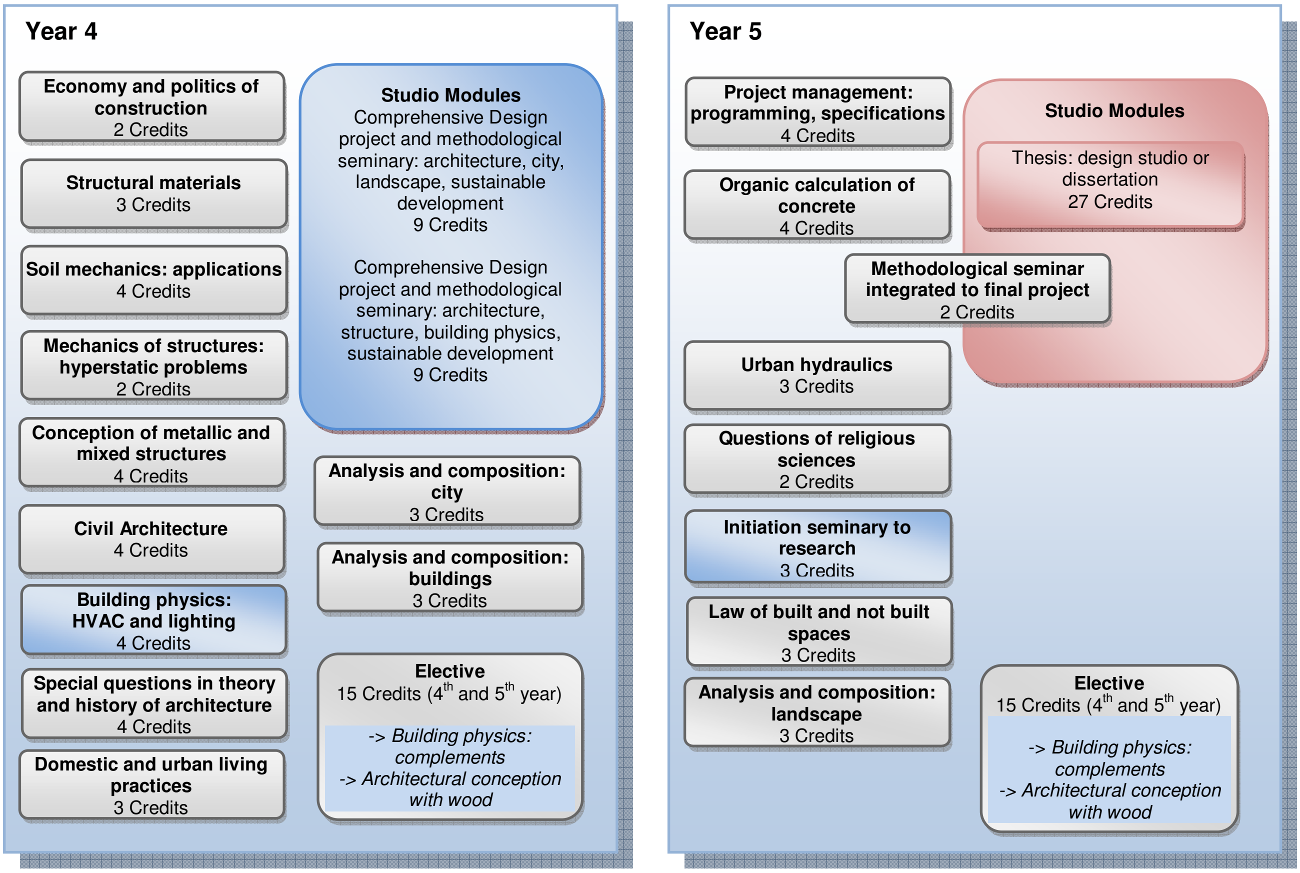


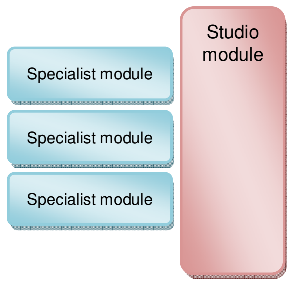
Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



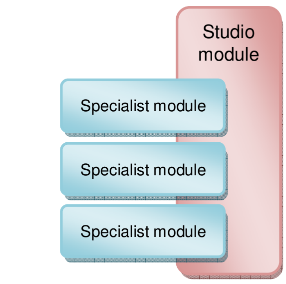
Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

Integration of Environmental Design - Master of Engineering Science: Architectural Engineering

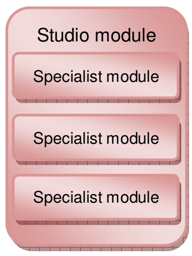




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Strengths:

- A shared vision: the contextual vision is recurring in the approach of the studios and this aspect is shared by all the teaching corps. Every Design studio offers a detailed analysis of the context, the place (city and landscape) during the first steps of the design process;
- The dynamics given by the research team: the courses relative to the sustainable development and to building physics are given by persons of the research team, experts in each specific domain;
- The access to the tools: the students have access to techniques that are used by the research team (laboratory, simulation programs, etc.) to develop their personal work (design studio, thesis, etc.).

Opportunities:

- Strengthen the intervention of the research team in different levels of the curricula.

SOURCES AND REFERENCES

Faculty of Architecture and Building website: www.uclouvain.be/aiau.html
Academic Surveys and Feedback

INSTITUT SUPERIEUR D'ARCHITECTURE SAINT-LUC DE BRUXELLES

Bachelor of Architecture + Master of Architecture (5 years)

Level: Undergraduate (Bachelor of Architecture, 3 years) + Graduate (Diploma/Master, 2 years)

Accrediting Body: CNOA Conseil National de l'Ordre des Architectes de Belgique

Educational Aims: The first aim of the education at the Institut Supérieur d'Architecture Saint-Luc de Bruxelles is to train skilled architects. This training must integrate all the dimensions and implications of architecture. Moreover, the ambition is to convey the contemporary stakes of architecture and its multiple aspects. The existence of large fields of expertise makes it possible to deal with new problems and emerging themes. Students enrolled in the course become conscious, responsible and creative architects.

Outline Description of Course: The Bachelor is the first phase of the architecture curriculum. The three years of course lead the students to gain the basic knowledge and methodology in the architectural field. For that purpose, the curriculum is based on the idea of progression. The first three years deal with the intrinsic complexity of architecture and develop a pedagogy which discovers gradually the various complex issues involved. The program spreads out the complexity and the multidisciplinary aspects of the given problems. This slow progression leads to a deep consciousness of the basics of architecture and to an increasing control of the architectural solutions. After the three years of the Bachelor, centred on the initiation, the exploration and the acquisition of foundations and long-lasting values of architectural design, the Master degree (two years) gives an important accent to personal study and further investigations. It is based on the knowledge gained during the Bachelor, such as the capacity to conceive buildings basing on the combination of a global approach and a synthetic vision during the elaboration of the projects. The specific organization of the Master is clearly different from the Bachelor, but still adheres to the basic principles which prevail at the Institute, which are: Progressiveness of the pedagogy; Personalized assistance; Context, creativity but also technical skills; Architectural design as a way to synthesize knowledge; Team work, etc. In addition to these principles, the teaching approach is anchored on the research for a sustainable world and remains centred on a human purpose which makes Architecture a major art targeting dignity and quality of life.

Course Structure: The Bachelor of Architecture has duration of 3 years and requires 180 credits. The Bachelor is followed by a Master of Architecture lasting 2 years and needing additional 120 credit points.

<u>Bachelor of Architecture (3 years)</u>

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
B.1.1.1	Projet d'architecture (Design studio)	24	Full year
B1.2.1	Histoire de l'architecture (History of architecture)	2	Spring
B1.4.1	Sciences du milieu (géologie et écologie) (Geology and ecology)	3	Full year
B1.6.1	Géométrie descriptive (Geometry)	5	Full year
B1.6.2	Etude des formes (Study of forms)	4	Full year
B1.7.1	Mathématique et applications (Maths and applications)	5	Full year
B1.7.2	Mécanique appliqué (Applied mechanics)	5	Full year
B1.7.3	Physique et chimie du bâtiment (Physics and chemistry of buildings)	4	Full year
B1.8.1	Technologie de la construction (Building technology)	4	Full year
B1.12.1	Dessin (Drawing)	4	Full year
Credit Total	**60**		

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
B2.1.1	Projet d'architecture (Design studio)	24	Full year
B2.2.1	Histoire de l'architecture (History of architecture)	4	Full year
B2.2.2	Théorie de l'architecture (Theory of architecture)	2	Spring
B2.5.1	Lecture de la ville (Reading the city)	3	Full year
B2.7.4	Physique du bâtiment (Building physics)	2	Full year
B2.7.5	Résistance des matériaux (Strength of materials)	5	Full year
B2.8.1	Technologie de la construction (Building technology)	4	Full year
B2.8.2	Technologie des matériaux (Technology of materials)	4	Full year
B2.10.1	Bureautique et DAO (Software and CAD)	4	Full year
B2.12.1	Dessin (Drawing)	3	Full year
Credit Total	**60**		

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
B3.1.1	Projet d'architecture (Design studio)	24	Full year

B3.2.1	Histoire de l'architecture (History of architecture)	2	Autumn
B3.2.2	Théorie de l'architecture (Theory of architecture)	2	Full year
B3.2.3	Identification du patrimoine (Identification of heritage)	2	Spring
B3.3.1	Sociologie (Sociology)	2	Spring
B3.3.2	Philosophie (Philosophy)	3	Full year
B3.3.3	Perceptions et pratiques (Perceptions & practice of built environment)	2	Autumn
B3.5.2	Aménagement du territoire (Territorial management)	2	Autumn
B3.5.3	Végétal et architecture (Plants and architecture)	2	Spring
B3.7.5	Résistance des matériaux (Strength of materials)	4	Full year
B3.8.1	Technologie de la construction (Building technology)	3	Full year
B3.8.3	Equipements du bâtiment (Building systems)	3	Full year
B3.8.4	Conception architectonique (Architectural design)	2	Spring
B3.10.2	Conception et simulation (Design and simulation)	2	Autumn
B3.12.1	Dessin (Drawing)	3	Full year
STB	Stage du bachelier (Practical experience)	2	
Credit Total	**60**		

<u>Master of Architecture (2 years)</u>

Year 4 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
M.1.1.1	Projet d'architecture (Design studio)	24	Full year
M.1.2.1	Histoire de l'architecture (History of architecture)	2	Autumn
M.1.2.2	Théorie de l'architecture (Theory of architecture)	2	Autumn
M.1.5.4	Composition urbaine (Urban design)	2	Spring
M.1.8.1	Technologie de la construction (Building technology)	4	Autumn
M.1.8.3	Equipements du bâtiment (Building systems)	4	Full year
M.1.8.5	Stabilité et conception des structures (Structural design)	4	Full year
M.1.9.1	Economie appliquée (Applied economics)	2	Autumn
Group 1 Elective Modules: ARCHITECTONIQUE (Architectural)			
M.1.8.6	Conception environnementale (Environmental design)	2	Spring
Group 2 Elective Modules: PATRIMOINE (Heritage)			
M.1.2.4	Histoire de l'urbanisme (History of urbanism)	2	Spring
Group 3 Elective Modules: TERRITOIRE (Territorial)			
M.1.2.4	Histoire de l'urbanisme (History of urbanism)	2	Spring
(*Optional Modules*):			
O.B1	Pathologie et thérapie (Pathology and therapy)	4	Full year
O.B2	Essais et normalisation I (Tests and standardisation)	2	Spring
O.E1	Lumière et environnement construit (Light and built environment)	2	Full year
O.E2	Architecture durable (Sustainable architecture)	2	Autumn
O.S1	Expression (Expression)	2	Autumn
O.S2	Atelier design (Design atelier)	4	Full year
O.S3	Critique architecturale (Architectural critics)	2	Spring
M.1.13.1	Travail de fin d'études (Final thesis)	8	Full year
Credit Total	**60**		

Year 5 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
M.2.1.1	Projet d'architecture (Design studio)	24	Full year
M.2.5.5	Projet urbain (Urban design)	2	Autumn
M.2.8.3	Equipements du bâtiment (Building systems)	2	Full year
M.2.8.5	Stabilité et conception des structures (Structural design)	3	Spring
M.2.9.2	Déontologie et pratique professionnelle (Professional practice)	2	Full year
M.2.9.3	Droit immobilier et droit de l'urbanisme (Urban legislation)	3	Full year
Group 1 Elective Modules: ARCHITECTONIQUE (Architectural)			
M.2.8.7	Efficacité énergétique (Energy efficiency)	2	Autumn
M.2.8.8	Gestion du projet (Project management)	2	Spring
Group 2 Elective Modules: PATRIMOINE (Heritage)			
M.2.2.5	Théorie de la restauration (Theory of restoration)	2	Spring

M.2.8.9	Méthodologie du projet de restauration (Methodology of restoration)	2	Autumn
Group 3 Elective Modules: TERRITOIRE (Territory)			
M.2.5.6	Paysage (Landscape)	2	Autumn
M.2.5.7	Enjeux contemporains en urbanisme (Current issues in urbanism)	2	Spring
(*Optional Modules*):			
O.B3	Expertise (Expertise)	4	Full year
O.B4	Essais et normalisation II (Tests and standardisation)	2	Autumn
O.B5	Droit immobilier (Building legislation)	2	Spring
O.D2	Histoire des jardins (History of gardens)	2	Spring
O.E3	Couleur et environnement construit (Colour and built environment)	2	Full year
STM	Stage de Master (Practical experience)	2	
M.2.13.1	Travail de fin d'études (Final thesis)	12	Full year
Credit Total	**60**		

Learning Outcomes: The specific modules related to environmental and sustainable design follow the general teaching framework. The progressive difficulty and the increasing complexity of the problems treated bring to the students a deep knowledge of the bases of architecture and an appropriate control of the solutions. During the first three years (Bachelor of Architecture) of the programme, the environmental and sustainable design courses belong to the base of the training. During the following years (Master of Architecture), the educational process leads the students to a deeper knowledge of certain disciplines and themes amongst the three possible orientations: “Territoire” (Territory), “Patrimoine” (Heritage) and “Architectonique” (Architectural). Moreover, during the Master course, students can choose some optional modules that can reinforce their knowledge base.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

According to the teaching method of the Institute, the notions related to environmental design and sustainability in architecture are introduced progressively. This approach is present in a variety of courses within the architectural curriculum. Amongst them, in the field of “Sciences de l’environnement” (Environmental Sciences) the second part of the course “Science du milieu (geologie et écologie): notions d’écologie” (**Geology and Ecology**) introduces the close relationship between man and environment. This course is therefore a first introduction to the general theme of sustainability.

In the domain of “Connaissance du territoire, urbanisme et paysage” (Territory, urbanism and landscape), the module “Aménagement du territoire” (**Territorial planning**) is offered at the third year of the Bachelor and is structured around the specificity of the spatial dimension and of the economical and social development of the territory. This course falls within the prospect of the conception of a sustainable world. In parallel, the course “Végétal et architecture” (**Plants and architecture**) leads the students to realize the importance of nature. The module suggests the respect for the correct integration of architecture in nature, in harmony with the different components of the landscape. During the last two years of the programme (Master of Architecture), the course “Composition urbaine” (**Urban design**), organized in the form of a seminar-workshop, allows to acquire cognitive and sensitive abilities required for town-planning.

The orientation “Territoire” (Territory), which can be chosen during the last year, offers “Paysage” (**Landscape**) and “Enjeux contemporains en urbanisme” (**Current issues in urbanism**). Students are invited to understand and analyse the relationship between architecture and landscape taking into account scale, environment and urban planning, inter-culture, urban growth and sustainability. The course “Projet urbain” (**Urban design**) is a compulsory module which is organized in close relation with a Master design studio. The course finalises the general training initiated during the Bachelor with a project focused on integration and application of the knowledge acquired. The site is in an urban area and is highly complex. The project deals with the global nature of the environment, socially, culturally, economically and politically.

In terms of disciplines focusing on technology and construction, during the first year of the Bachelor, “Physique et chimie du bâtiment” (**Buildings physics and chemistry**) gives the necessary scientific basis for the comprehension of physical phenomena such as: energy, power, soundproofing, heat transfer and wall steam transfer. During the second year, “Physique du bâtiment” (**Building physics**) deals with a more detailed analysis of the thermal performance of a building, according to its architectural and bioclimatic characteristics. The course “Technologie de la construction” (**Building technology**), at both Bachelor and Master level, investigates various building components, in particular dealing with long-term economy, sustainability and respect for the environment. The module “Equipements du bâtiment” (**Building services**) is offered during the last three years. In the third year of the Bachelor, the course develops discourse on the technological systems, principles of performance and realisation of technical installations. At first year of the Master course, it develops principles of integration and of pre-dimensioning of the systems. During the last year, students integrate these principles into their last architectural project. Concurrently, the students follow the course “Efficacité énergétique des équipements du bâtiment” (**Energy efficiency of building systems**). The aim of the course is to develop a strategy to reduce energy consumption through an adequate conception and a suitable choice of systems. The module “Conception environnementale des bâtiments tertiaires” (**Environmental design of non residential buildings**), related to the orientation “Architectonique” (Architectural), aims the comprehension and the application of the low energy strategies in the design of tertiary buildings. In addition to direct economical aspects, the module “Economie appliqué” (**Applied economy**), in the first year of the Master, approaches the concepts of growth and urban management, the policies of the city and their socio-economic impacts. During the final year, the module “Droit immobilier et droit de l’urbanisme” (**Urban legislation**) deals with land-planning and environmental protection.

In the “Projet d’architecture” (**Design studio**) modules, the first year of the Bachelor introduces the relation form-environment, while the design studio of the second year deals with sustainable architecture, integrating the energy aspects analysed in building physics courses. Sensitivity and creativity are here confronted to the stakes of today and tomorrow. During the third year, the design studio is more particularly related to the context, with a thorough study of the site and an analysis of the landscape, as part of the architectural and structural choices. During the first year of the Master, students continue to develop their formation in architecture (knowledge), in architectural projects-design studios (know-how) and their professional training (technical know-how). The last design studio is a synthesis project during which the students have to show the architectural capacities acquired during their studies. The course “Architecture durable” (**Sustainable architecture**) in the first year of the Master tries to establish relations between the Bachelor course and issues related to sustainable design. This course is not compulsory. Students are invited to think about the specific role of the architect with regards to sustainable development. The “Travail de fin d’études” (**Final thesis**) can be carried out within the framework of sustainable design.

Integration of Environmental Design with Studio – Bachelor of Architecture

Year 1

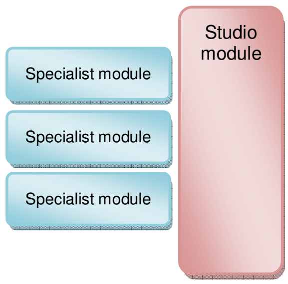
- **Histoire de l'architecture** – 2 Credits
- **Sciences du milieu** (géologie et écologie) – 3 Credits
- **Géométrie descriptive** – 5 Credits
- **Etude des formes** – 4 Credits
- **Mathématique et applications** – 5 Credits
- **Mécanique appliquée** – 5 Credits
- **Physique et chimie du bâtiment** – 4 Credits
- **Technologie de la construction** – 4 Credits
- **Dessin** – 4 Credits
- **Studio Modules** – Projet d'architecture – 24 Credits

Year 2

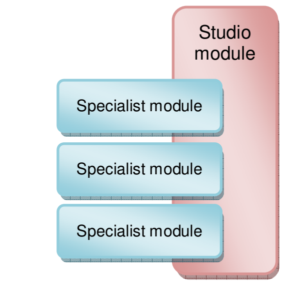
- **Histoire de l'architecture** – 4 Credits
- **Physique du bâtiment** – 2 Credits
- **Lecture de la ville** – 2 Credits
- **Géométrie descriptive** – 3 Credits
- **Topographie** – 3 Credits
- **Technologie de la construction** – 4 Credits
- **Résistance des matériaux** – 5 Credits
- **Théorie de l'architecture** – 2 Credits
- **Technologie des matériaux** – 4 Credits
- **Studio Modules** – Projet d'architecture – 24 Credits
- **Dessin** – 3 Credits
- **Bureautique et DAO** – 4 Credits

Year 3

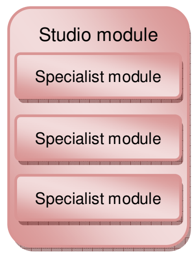
- **Histoire de l'architecture** – 2 Credits
- **Théorie de l'architecture** – 2 Credits
- **Identification du patrimoine** – 2 Credits
- **Sociologie** – 2 Credits
- **Philosophie** – 3 Credits
- **Perceptions et pratiques de l'environnement construit** – 2 Credits
- **Végétal et architecture** – 2 Credits
- **Résistance des matériaux** – 4 Credits
- **Dessin** – 3 Credits
- **Studio Modules** – Projet d'architecture – 24 Credits
- **Conception et simulation** – 2 Credits
- **Technologie de la construction** – 3 Credits
- **Equipements du bâtiment** – 3 Credits
- **Conception architectonique** – 2 Credits
- **Aménagement du territoire** – 2 Credits
- **Stage du bachelier** – 2 credits



Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).

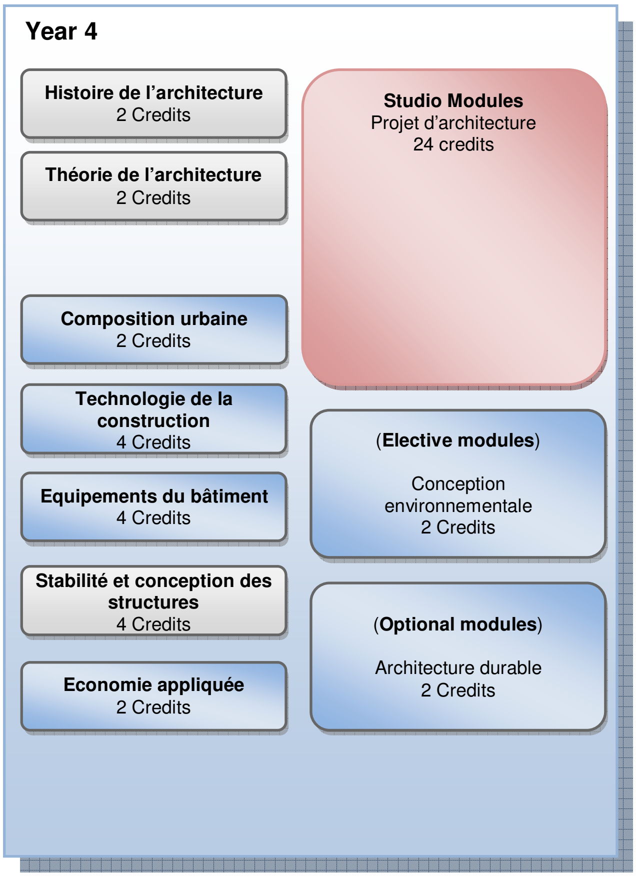


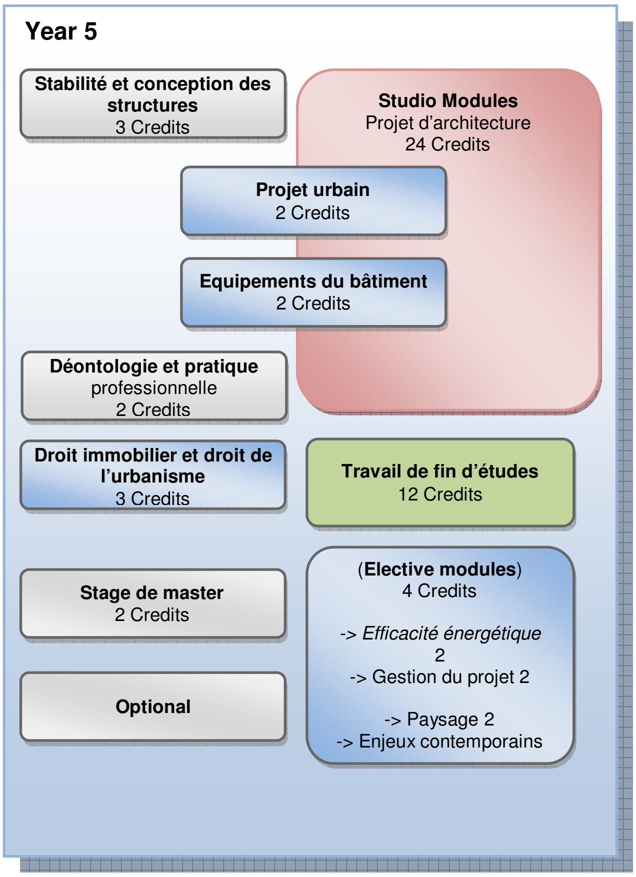
Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.

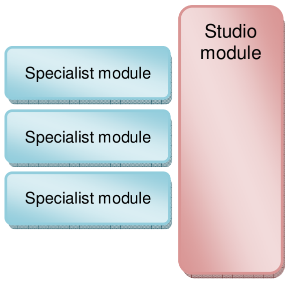


Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

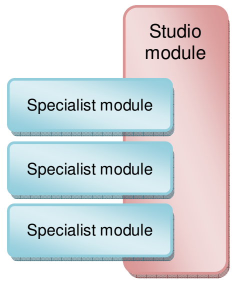
Integration of Environmental Design with Studio – Master of Architecture



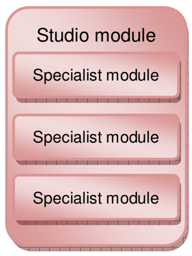




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Strengths:

- Sustainable Environmental Design has had and has a strong impact on the development of the curriculum. Design studio tutors and staff responsible of technical teaching (e.g. environmental design, constructions, building physics) collaborate continuously.. There is a strong articulation between our technical teaching and our design studios. Sustainable Environmental Design strategies are perceived by studio tutors as supporting the overall quality of space and imagery, and considered as part of the creative input of design.
- The curriculum is supported by a research centre, which is involved in various researches in the field (www.ceraa.be)

SOURCES AND REFERENCES

Institut Saint-Luc website: www.st-luc-brussels-archi.be
Academic Surveys and Feedback

UNIVERSITÉ LIBRE DE BRUXELLES
FACULTÉ DES SCIENCES APPLIQUÉES

Bachelor and Diploma/Master of Engineering Science: Architectural Engineering

Level: Undergraduate (Bachelor, 3 years) + Graduate (Diploma/Master, 2 years)

Accrediting Body: CNOA, Conseil National de l'Ordre des Architectes de Belgique

Educational Aims: The specificity of the formation of the Civil Engineer - Architect at the Université Libre de Bruxelles is represented mainly by the articulation of the teaching of architecture around the building process. The learning approach of a builder, capable of controlling the complexity of the construction work, represents the initial part of the curriculum. The suggested work/pedagogical method is similar to that of the architect, but by particularizing it in order to be able to capture the problems of realization which usually require the contribution of an engineer. The formation also provides the skills to conceive, coordinate and realize projects of large scale within a multidisciplinary approach and basing on a detailed technical and scientific knowledge. The programme of study ultimately develops the necessary management capacity in the private and public domains, fostering the acquisition of the methods required to facilitate the dialogue between all the actors in the construction and town planning process.

Outline Description of Course: The curriculum is articulated around architectural workshops in order to develop the capacities of creation and the methodology of architectural project design. The programme benefits of a close cooperation with the Institute of Architecture "Victor Horta". Many courses oriented towards construction issues are also taught together with the civil engineers. The main target of the programme is to confront the different approaches following the example of the current functioning of multidisciplinary teams managing large scale architectural projects. The curriculum comprises courses of architecture as well as courses of engineering and building technology. Specific topics are devoted to building services, construction management, structural design as well as the aspects of architectural engineering concerned with the heritage, which students can choose as their specialisation. The programme of study is concluded by the presentation of a final thesis.

Course structure: During the three years of undergraduate studies, the program contains a thorough formation about architecture - architectural design (16 credits per year), history of architecture, theory of architecture – in parallel to a basic training in the scientific disciplines, such as mathematics or the mechanics of materials and structures. During the two years of the Master course, the time devoted to design studio is about 24% of the whole programme. The architectural project constitutes the heart of the program making possible to activate the acquired knowledge by the way of creation of architectural spaces.

Bachelor of Engineering Science: Architectural Engineering (3 years)

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*
ARCH-H-100	Projet d'architecture (Design studio)	16
LANG-H-100	Anglais I (English)	2
ARCH-H-101	Histoire de l'architecture: le 20ème siècle (History of architecture)	2
HORT-B1-121	Moyens d'expression graphique (Tools for graphic expression)	4
MATH-H-103	Eléments d'analyse (Elements of analysis)	6
TRAN-H-100	Connaissances fondamentales (Basic knowledge)	8
MATH-H-102	Géométrie (Geometry)	3
MATH-H-101	Algèbre linéaire (Linear algebra)	6
PHYS-H-100-A	Physique générale (General physics)	7
MECA-H-100	Mécanique rationnelle I (Rational mechanics)	6
Credit Total	**60**	

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*
ARCH-H-200	Projet d'architecture II (Design studio)	16
HORT-B1-220	Théorie de l'architecture I (Architectural theory)	2
HORT-B2-121	Moyens d'expression graphique (pro parte) (Tools for graphic expression)	6
HORT-B1-820	Technologie de la construction (Building technology)	4
ARCH-H-201	Histoire de l'architecture II (History of architecture)	3
HAAR-B-111-A	Notions d'histoire de l'art et d'archéologie: arts du XXe siècle (History of art)	2
CHIM-H-201	Aspects chimiques des matériaux (Chemical aspects of materials)	6
GEOG-F-414-A	Analyse des espaces urbains I: les villes des pays développés (Analysis of cities)	2
TRAN-H-303	Projet de conception assistée par ordinateur (CAD design)	2
CNST-H-200	Mécanique des solides et des fluides (Mechanics of solids and fluids)	4

MATH-H-204	Calcul des probabilités et statistiques (Statistics and probability)	4
INFO-H-100	Informatique (Informatics)	5
GEST-H-200	Economie politique et sociale (Political and social economy)	2
LANG-H-200	Anglais II (English)	2
Credit Total	**60**	

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*
Module 310 (Architecture I)		
ARCH-H-300	Projet d'architecture (Design studio)	16
Module 311 (Construction et architecture I)		
CNST-H-300	Mécanique des structures et résistance des matériaux (Structural mechanics)	4
ARCH-H-302	Projet d'informatique appliquée à l'architecture (Applied CAD)	3
LANG-H-300	Anglais III (English)	4
CNST-H-306	Introduction à l'énergétique du bâtiment (Introduction to energy in buildings)	4
Module 321 (Construction I)		
CNST-H-302	Mécanique des sols (Soil mechanics)	6
CNST-H-303	Analyse des structures et élements de conception (Structures and elements)	6
CNST-H-307	Organisation des entreprises et des projets de construction (Building management)	6
PROJ-H-305	Projet de conception des structures (Design of structures)	5
CNST-H-311	Eléments de dimensionnement des structures (Elements of structures calculation)	6
Credit Total	**60**	

Master of Engineering Science: Architectural Engineering (2 years)

Year 4 (*Compulsory Modules*)

Code	*Title*	*Credits*
Module 410 (Architecture II)		
ARCH-H-400	Projet d'architecture (Design studio)	16
ARCH-H-401	Théorie de l'architecture II (Theory of architecture)	2
Module 411 (Conception des structures)		
IR-ARCH-8199	Vorm-actieve constructies I (Form-active constructions)	4
CNST-H-418	Modélisation non linéaire des structures et des matériaux (Non-linear modelisation)	6
CNST-H-403	Méthode des éléments finis (structures) (Finite elements method)	6
Module 413 (Construction et architecture II)		
CNST-H-407	Techniques spéciales du bâtiment (Special techniques of buildings)	4
ARCH-H-402	Droit de la construction (Building law)	2
CNST-H-404	Technologie des ouvrages en béton, acier et mixtes (Steel and concrete technologies)	4
Module 422 (Géo-matériaux I) (Geo-materials)		
CNST-H-406	Fondations et ouvrages en terre (Foundations and earth structures)	6
CNST-H-401-A	Calcul des ouvrages en béton, acier et mixtes (Calculus of steel and concrete)	6
CNST-H-417	Géologie de l'ingénieur (Geological engineering)	4
Credit Total	**60**	

Year 5 (*Compulsory Modules*)

Code	*Title*	*Credits*
MEMO-H-507	Mémoire de fin d'études en Architecture (Final Thesis)	29
(Elective modules) Conception architecturale		
Module 511 (Conception architecturale) (Architectural design)		
ARCH-H-502	Théorie de l'architecture III (Theory of architecture)	2
CNST-H-502	Pathologies, rénovation et réhabilitation des structures (Pathologies and renovations)	3
CNST-H-409	Fiabilité des structures et des matériaux (Structures and materials)	4
CNST-H-503	Gestion des chantiers et des projets de construction (Building site management)	5
PROJ-H-502	Concours de projet 1 (Design competition)	2
(Elective modules) Rénovation et restauration		
Module 512 (Rénovation et restauration)		
ARCH-H-500	Projet d'architecture V (Design studio)	6
IR-ARCH-11581	Technieken specifiek voor renovatie en reconversie (Techniques for conversion)	3
IR-ARCH-7212	Pathologie van constructies (Building pathologies)	3
IR-ARCH-6078	Berekening van houtconstructies (Calculation of timber structures)	4

(Optional modules) -15 ECTS to choose amongst the following courses:

Module 513 (Equipement des bâtiments et environnement) (Building services and environment)

ISAB138	Acoustique (Acoustics)	2
ELEC-H-500	Eclairage (Lighting)	3
HORT-B3-511	Eléments urbains (Urban elements)	1
ISAB216	Organisation et gestion des opérations de rénovation (Management of renovations)	2
MECA-H-502	Vibro-acoustique et acoustique architecturale (Architectural acoustics)	4
CNST-H-524	Conception et gestion des infrastructures de transport (Management of infrastructures)	4
CNST-H-513	Constructions souterraines (Subterranean constructions)	4
CNST-H-511	Conception parasismique (Seismic design)	2
ELEC-H-303	Applications industrielles de l'électricité (Industrial applications of electricity)	4
CNST-H-523	Hydraulique fluviale et ouvrages d'art hydrauliques (Hydraulics)	6

Module 514 (Stages)

ARCH-H-503	Stages en architecture (Architectural practice period)	15

Elective modules

Students can choose among the courses existing in the programs offered throughout the entire Faculty. It is possible to also take one or more course from another Faculty. The ECTS value of each course is considered according to its allocation by its managing Faculty. The amount of modules taken from a different Faculty cannot exceed 6 ECTS, except where this has been agreed with the Teaching Commission. The written agreement of the module convenor must be obtained. The only limitation within the choice of the courses consists in prerequisites.

Credit Total 60

Learning Outcomes: Graduates of the Bachelor and Master of Engineering Science at the ULB gain knowledge and skills in various areas related to architecture, production processes, processing, construction, transportation, communication and information. The course enables students to become operational in various aspects of architecture and engineering in order to create, develop, produce and optimize buildings and urban spaces with scientific rigor and practical capacities. Ultimately, the programme also introduces research in applied sciences such as: construction, chemistry, materials science, physics, electricity, mechanics, information technology and biomedical sciences.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

At the moment, the curriculum offers two courses and one workshop in relation to sustainable architecture. A fourth course is in preparation and should be given starting from the academic year 2011-2012. The first course is entitled “Introduction à l’énergétique du bâtiment (**Introduction to energy in buildings**) and is given during the third year of the Bachelor. It is a course composed by 2 ECTS of theory and 2 ECTS of exercise/application offered in the second semester. The theory is given during the first part of the year and the exercises during the second part. The theory covers 6 teaching units (modules). Contemporary energy issues are considered firstly in the general context of the world climatic and socio-political problems and then with regard to the profession of the architect, in their urban, spatial and technical implications. The first module finishes with the presentation of examples of living spaces with low energy consumption in order to show how the energy debate can influence architectural design as well as structural questions. The teaching also focuses on how energy issues offer the occasion and the potential to reconsider contemporary architectural design, which is currently driven more by fashionable composition rather than paying attention to the issues of our contemporary society. Basic principles of low energy design introduced are: bioclimatic town planning and architecture, and building life cycle. The basic principles of energy flows and parameters of comfort which are analysed comprise heat exchange (within the envelope and the entire building) and energy performance of constructions. In the exercises, students are asked to make a critical analysis of a building regarding energy issues. This analysis is done by simulation of consumptions in order to highlight strengths and weaknesses of the urban, spatial and technical design as well as its realization.

The second course is given during the first year of the Master programme and is entitled “Techniques spéciales du bâtiment” (**Special techniques of buildings**). The objective of this course is to give an outline of the concepts of comfort as well as the design and dimensioning associated with the various technical systems of a building. The techniques considered are: heating, ventilation, air-conditioning, lighting, electricity distribution, elevators, technical plumbing, and the services ensuring the safety of goods, people and data transmission. This course will change from the academic year 2010-2011. The contents will probably be worked over again to integrate the study of special techniques related to energy efficiency, such as double flow ventilation, heat pumps, solar and photovoltaic panels, etc.

The third course is a design studio/workshop entitled “Architecture et Urbanité” (**Architecture and Urbanism**) which is given during the first year of the Master programme one day per week all year long. The project integrates three main objectives:

1. *Architecture as “Composition” of a Complex Organism*. The large size and complex programs of buildings contain functions which appear intrinsically disparate and from which a coherent space organization should be created. It is a question of qualifying spaces, of making them exist together, of organizing the sequences, of articulating the volumes between them, of interacting with the environment and of making choices guided by the imperatives of sustainable development.
2. *Contextual Study with “Composition” of Urban Spaces*. The nature of the program induces questions about the regeneration of the urban centre of Brussels, the installation of a network of public spaces, the handing-over of the pedestrian routes continuity which is broken by the automobile flows, the recombining of a heterogeneous place whilst safeguarding its living and housing spaces and its functional diversity.
3. *Techniques in favour of Comfort, Energy-Savings, Economy of the Materials and Sustainability of the Building*. The complex and multifunctional program of contemporary buildings allows analysis of the complementarities of the means of production, diffusion and conservation of energy according to the rates and periods of building occupation. Strategies for energy saving and use of renewable resources are also fundamental choices of the structures, façades and the design solution within the urban environment.

The workshop is divided into two complementary parts. During the first semester, the purpose of the work is concentrated on the development of a master plan which takes position within the chosen site in relation to the general issues of sustainable development. An analysis on the potentials and limits of the place is done within a team. The master plan is worked individually and helps to delimit a zone of particular intervention which will be the centre of the work during the second semester. During the second semester, the continuation of the project is related to the requalification of the public space as construction or rehabilitation of a specific building. In the case of work on a public space, students are required to analyze the relations of the public space in its general urban context. It is also asked to students to explore the public space in relation with the built context of the site as proposed in the master plan. In any cases, the project must go until the definition of the choice of materials and systems with consideration of issues of sustainable development. The objectives of the workshop are:

- To interrogate and to form an opinion about the many issues involved in a building program through a master plan in the context of sustainable development and with respect to a specific place;
- To think about the “composition” of a complex organism made of disparate functions and from which it is necessary to create a coherent spatial organization in relation to the general urban context where it is located;
- To investigate the existing structures not only in relation to their potentials but also in their capacities to support and develop a more general project by recombining and increasing the density of the place within the general framework of sustainable development and the implications which these can have on the various scales of the architectural project (at the scale of the city and the district, and at the level of materials and systems);
- To implement various concepts of town planning and bioclimatic architecture;
- To question and implement various materials and techniques limiting the use of perishable natural resources (energy, water, grounds, materials, biodiversity, etc.) in the specific context of the developed project by studying the relations that design choices can have on the spaces created at the scale of the architectural project and at the scale of the master plan.

A fourth course (3 ECTS) entitled **Sustainable Design** is in preparation. It should be offered starting from the academic year 2011-2012 in English within the framework of a joint Master programme. The structure of the course is not yet defined but should primarily focus on the meaning of sustainable development and the concepts, principles and controversies implied for the professions of architect and town planner. The course will investigate the several issues of sustainable environmental design in the context of contemporary architecture as well as on a technical, spatial and urban scale. Finally, the course will give information and knowledge on tools for decision-making, criteria to assist the design, methodologies for sustainable architectural design steps and the principles which make possible to define the basis of a sustainable architectural practice.

A number of optional modules (also from other Faculties) focusing on techniques of environmental design are also available to students.

Integration of Environmental Design with Studio – Bachelor of Engineering Science

Year 1

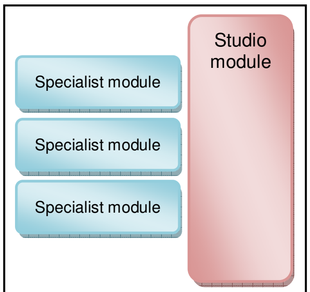
- **Mécanique rationnelle I** – 6 Credits
- **Histoire de l'architecture** : le 20ème siècle – 2 Credits
- **Moyens d'expression graphique** – 4 Credits
- **Eléments d'analyse** – 6 Credits
- **Connaissances fondamentales** – 8 Credits
- **Géométrie** – 3 Credits
- **Algèbre linéaire** – 6 Credits
- **Physique générale** – 7 Credits
- **Studio Module** – Projet d'architecture – 16 Credits
- **Anglais I** – 2 Credits

Year 2

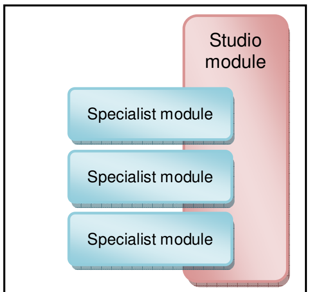
- **Histoire de l'architecture** – 4 Credits
- **Théorie de l'architecture I** – 2 Credits
- **Moyens d'expression graphique** – 2 Credits
- **Histoire de l'architecture II** – 3 Credits
- **Notions d'histoire de l'art et d'archéologie** – 2 Credits
- **Aspects chimiques des matériaux** – 6 Credits
- **Analyse des espaces urbains I** – 2 Credits
- **Projet de conception assistée par ordinateur** – 2 Credits
- **Studio Module** – Projet d'architecture II – 16 Credits
- **Mécanique des solides et des fluides** – 4 Credits
- **Calcul des probabilités et statistiques** – 4 Credits
- **Technologie de la construction** – 4 Credits
- **Economie politique et sociale** – 2 Credits
- **Informatique** – 5 Credits
- **Anglais II** – 2 Credits

Year 3

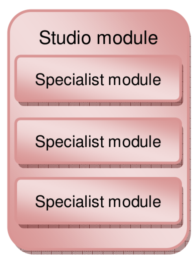
- **Mécanique des structures et résistance des matériaux** – 4 Credits
- **Projet d'informatique appliquée à l'architecture** – 3 Credits
- **Analyse des structures et éléments de conception** – 6 Credits
- **Organisation des entreprises et des projets** – 6 Credits
- **Projet de conception des structures** – 5 Credits
- **Introduction à l'énergétique du bâtiment** – 4 Credits
- **Mécanique des sols** – 6 Credits
- **Eléments de dimensionnement** – 6 Credits
- **Studio Module** – Projet d'architecture – 16 Credits
- **Anglais III** – 4 Credits



Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).

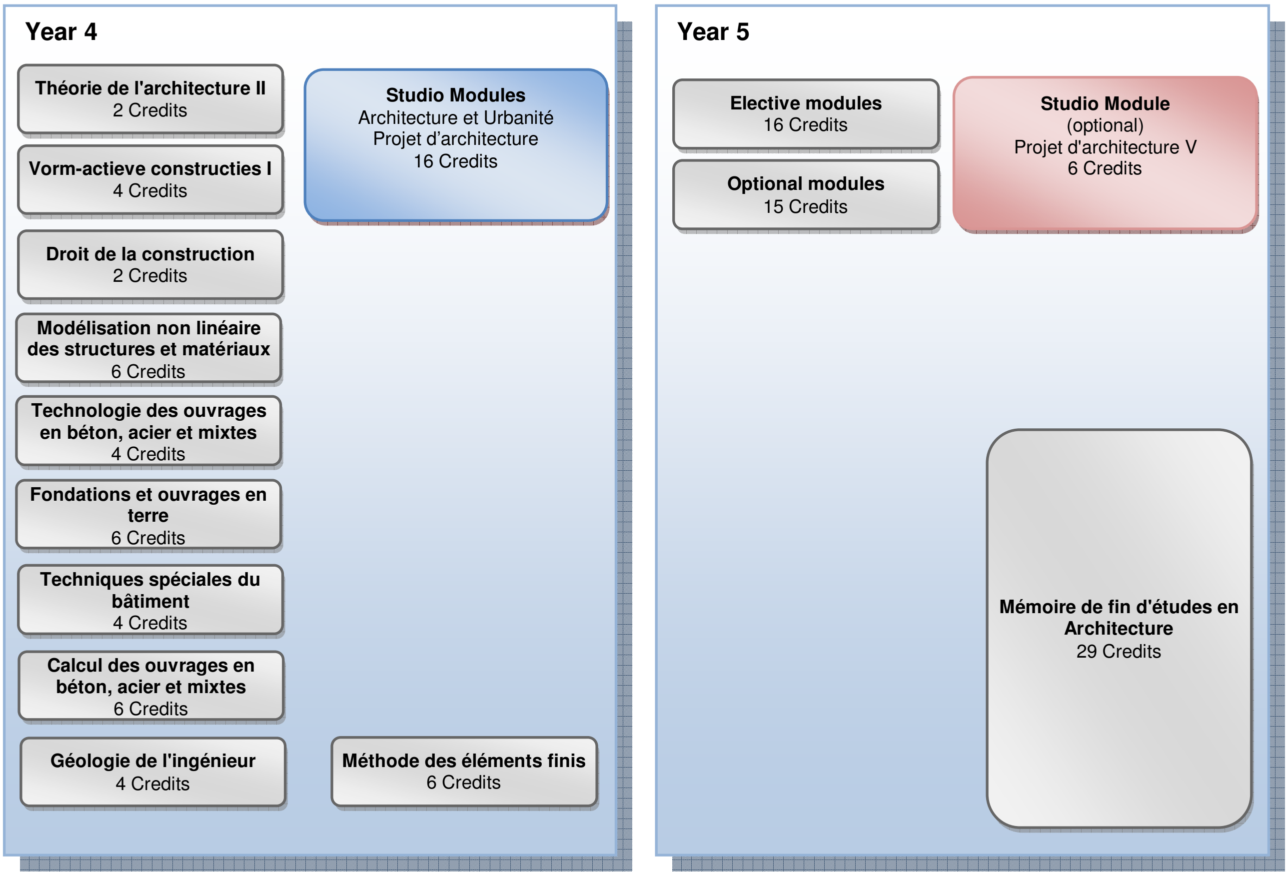


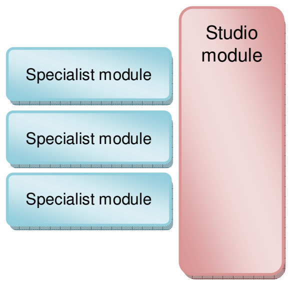
Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



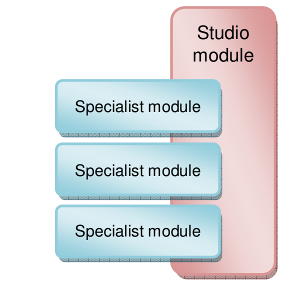
Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

Integration of Environmental Design with Studio – Master of Engineering Science

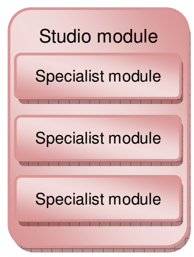




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Strengths:

- The learning of the concepts related to sustainable development and their implications in the architectural practice is done by the design project with preliminary theoretical support. The related questions concerning sustainable development are indeed in the centre of the workshop of the first year of Master. It is one of the largest workshops of the entire programme, which occurs in the curriculum at a moment where the students have gained sufficient maturity with respect to architectural design so as to try to answer through their projects the complex stakes of sustainable development. At this moment, the students have already had a course giving them the basic knowledge in terms of energy and special techniques. Thus, the students can very quickly integrate their theoretical knowledge in their design project;
- A new course will approach the issues of environmental design in the broad sense, and not only with respect to the energy question. The major goal of this course will be to consider the environmental, social, economic problems and policies not like constraints but like opportunities able to generate architecture. The questions considered will concern the relation between man and his natural environment (energy, water, ground and air), the modes of articulation between the individual and the collective spaces and the questions of wealth management;
- The new platform “Architecture et Développement Durable” ensures the integration of the related questions concerning sustainable environmental design in the whole curriculum. The function of this platform is to develop research on the subject within the Faculty. Some thesis subjects will be based on questions related to research activities;
- The theme of “Structures and Sustainable development” is present at the juries of the design studio of each year, and as far as possible, also with each critic in order to ensure that the stakes of sustainability are well integrated into each design studio, from the first to the fifth year and not only at the end of the curriculum.

SOURCES AND REFERENCES

Faculté des Sciences Appliqués website: www.ulb.ac.be/facs/polytech/index.html
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

CNOA Conseil National de l'Ordre des Architectes

The CNOA Conseil National de l'Ordre des Architectes (National Council of Chambers of Architects) is composed by 20 members, of whom ten are the delegates of provincial chambers, eight are nominated directly by the king, and one is a juridical consultant. They are elected for a period of four years. Every two years, the CNOA elects a president, a vice-president, a treasurer, a secretary, and a pro-secretary which, together with the juridical consultant, constitute the *Bureau du Conseil National* (CNOA Board). The CNOA also elects a vice-president representing the French section and one representing the Flemish section.

The mission of the CNOA is as follows:

- Representing the order of architects;
- Establish the deontological rules for the profession of architect;
- Establish the rules for the 2 years of professional training (*stage*);
- Monitor the application of the deontological rules for the *stage*;
- Propose to the public authorities legislative measures or rules related to the profession, and give advice on questions related to professional practice;
- Control the activities of the provincial chambers and consolidate their decisions in order to synthesise them;
- Assess, from an administrative point of view, the applications from foreign professionals;
- Provide for any measure necessary to the attainment of the objectives of the CNOA.

Conditions for Qualifications

In Belgium, holding a Diploma (Architect / Engineer Architect) gives access to the profession. However, a “professional training” (*stage*) of minimum two years is obligatory. This professional training is a period of complementary formation. From the inscription to the “Ordre des Architectes” (Chamber of Architects), the trainee has the right to exercise the profession under observation of one "training mentor". The training mentor (*maitre de stage*) has to be a member of the chamber of architects since at least 10 years. There is no examination which certifies this practice but only some level of control so as to verify the good process of the professional training.

As for all the architects, the CNOA has the right to verify if the trainee has the capacities - in terms of skills but also availability of time - to exercise his missions. At the end of the professional training, the Architect is registered on the board of the Ordre des Architectes.

In Belgium, there is no formal validation system for Schools of Architecture, although every five years there is an evaluation which is done by an international commission focused on teaching and research.

SOURCES AND REFERENCES

CNOA website: www.architectes.org/accueils/cnoa

Bulgaria

UNIVERSITY OF ARCHITECTURE, CIVIL ENGINEERING AND GEODESY OF SOFIA
FACULTY OF ARCHITECTURE

Master Degree in Architecture (11 semesters)

Level: Graduate (Master of Architecture, 5 years + Thesis)

Accrediting Body: NEAA (National Evaluation and Accreditation Agency) and FEANI (European Federation of National Engineering Associations)

Educational Aims: The main objectives of UACEG are to provide high-quality higher education in Architecture and Civil Engineering, to offer a rich choice of post graduate educational qualifications and to realize thorough scientific research and effective co-operation with national and international public and private institutions in the following fields: overall regional and urban planning, planning of complexes and functional zones, design of residential, public, industrial and rural buildings; calculation of stress and strain state in buildings and structures at various static and dynamic impacts as well as soil properties; design and dimensioning of bearing systems, performed in different building materials; implementing efficient building technology solutions as well as construction management techniques; design, construction and operation of hydropower systems and structures, dams, hydropower plants, reservoirs, irrigation and drainage, water-supply and sewerage systems, waste water treatment plants and landfills; carrying out geodetic, gravimetric, astronomic and photogrammetric measurements, vertical levelling, town plans, regional plans, cadastre plans, and all kinds of maps, atlases, and geographical globes; design, construction and maintenance of roads, railways, road and railway structures, bridges, tunnels, stations, airports, harbour and geotechnical structures; planning, organization and management of urban and interurban traffic. Alongside with the technical aspects of the education, one of the aims of UACEG is to develop the skills of future architects, civil engineers and surveyors to cope with large-scale construction projects in compliance with ecological requirements and provide non-conflicting development of built and natural environment.

Outline Description of Course: The University of Architecture, Civil Engineering and Geodesy of Sofia is a state institution offering a Master Degree for architects, civil engineers and surveyors, Bachelor's and Master Degrees in Urbanism and a Bachelor's Degree in a Land and Real Estate Planning and Management – a new programme for Bulgaria. The duration of study for the architecture programme, including the time for preparation and defence of diploma thesis, is 11 semesters. The programme is based on a modular structure, adopting the European Credit Transfer System and Quality Control System.

Course Structure: According to the ECTS credit system, 60 credits represent the workload of one year of study and usually 30 credits are given for a semester. Each module has a credit value. 10 credits are designed to require around 100 hours of student work, including taught and contact time, assessment work and 'student-centred learning'. The Master Degree in Architecture requires 330 credits for completion.

Master Degree in Architecture (11 semesters)

Year 1 (*Compulsory Modules*)
Semester 1

Code	*Title*	*Credits*
BMTbCBA	Building Materials	3
HARTbCBA	History of Arts	6
FADLbCBA	Fundamentals of Architectural Design	3
FADEbCBA	Fundamentals of Architectural Design - exercises	3
FADbCPA	Fundamentals of Architectural Design - practical training	1
MATHbCBA	Mathematics	6
DRW1bCBA	Drawing - Part I	2
DRWbCPA	Drawing - Practical Training	0
MOD1bCBA	Modelling - Part I	2
FL_bCBA	Foreign language	3
SPObCBA	Physical Education	1
Credit Total	**30**	

Semester 2

Code	*Title*	*Credits*
BCONLbCBA	Building Construction	2
BPHLbCBA	Building Physics	3
BPHEbCBA	Building Physics - exercises	1
DEGLbCBA	Descriptive Geometry	3
DEGEbCBA	Descriptive Geometry - exercises	2

VISbCBA	Fine Arts Techniques	4
HA1bCBA	History of Ancient and Medieval Architecture	1
DRW1bCBA	Drawing - Part I	2
DRWbCPA	Drawing - Practical Training	1
MOD1bCBA	Modelling - Part I	2
SUbCBA	Surveying	3
PH_bCBA	Philosophy	2
FL_bCBA	Foreign language	3
SPObCBA	Physical Education	1
Credit Total	**30**	

<u>Year 2</u> (*Compulsory Modules*)
Semester 3

Code	*Title*	*Credits*
BIEbCBA	Building Installations and Equipment	2
FADP1bCBA	Fundamentals of Architectural Design - Project I	3
HA1bCBA	History of Ancient and Medieval Architecture	3
BCONP1bCBA	Housing Construction - Project I	3
INF1bCBA	Informatics in Architecture - Part I	2
SM1bCBA	Structural Mechanics I	3
BCONLbCBA	Building Construction	2
BCONPbCPA	Building Construction - practical training	0
DRW2bCBA	Drawing - Part II	2
HAbCPA	History of Architecture - practical training	0
MOD2bCBA	Modelling - Part II	2
PBLDLbCBA	Public Buildings	2
RBLDLbCBA	Residential Buildings	2
FL_bCBA	Foreign language	3
SPObCBA	Physical Education	1
Credit Total	**30**	

Semester 4

Code	*Title*	*Credits*
AGBLbCBA	Rural Buildings	2
FADP2bCBA	Fundamentals of Architectural Design - Project II	2
HA2bCBA	History of Architecture - XV - XVIII Centuries	2
BCONP2bCBA	Housing Construction - Project II	3
INF2bCBA	Informatics in Architecture - Part II	2
SM2bCBA	Structural Mechanics II	3
BCONPbCPA	Building Construction - practical training	1
DRW2bCBA	Drawing - Part II	2
HAbCPA	History of Architecture - practical training	1
MOD2bCBA	Modelling - Part II	2
PBLDLbCBA	Public Buildings	2
RBLDLbCBA	Residential Buildings	2
URBLbCBA	Urban Planning	3
BCONLbCBA	Building Construction	2
SPObCBA	Physical Education	1
Credit Total	**30**	

<u>Year 3</u> (*Compulsory Modules*)
Semester 5

Code	*Title*	*Credits*
ASP1bCBA	Architectural Structures - Project I	4
HBGAbCBA	History of Bulgarian Architecture	3
IBLDLbCBA	Industrial Buildings	2
PLNDLbCBA	Park and Landscape Architecture	2
PBLDP1bCBA	Public Buildings - Project I	4 / 2
RCSSbCBA	Reinforced Concrete Structures	2
RCSSPbCBA	Reinforced Concrete Structures - Project Assignment	2
RBLDP1bCBA	Residential Buildings - Project I	4 / 2
URBLbCBA	Urban Planning	2
URBP1bCBA	Urban Planning - Project I	4
ASLbCBA	Architectural Structures	2
AGBPbCBA	Rural Buildings - Project	3
Credit Total	**30**	

Semester 6

Code	*Title*	*Credits*
ASLbCBA	Architectural Structures	2
ASP2bCBA	Architectural Structures - Project II	4
ECONbCBA	Economics	2
IBLDP1bCBA	Industrial Buildings - Project I	4
DALbCBA	Industrial Design for Architects	2
MNGbEBA	Management	2
PLNDPbCBA	Park and Landscape Architecture - Project	3
PAHbCBA	Preservation of Architectural Heritage	3
PBLDP1bCBA	Public Buildings - Project I	4 / 2
RBLDP1bCBA	Residential Buildings - Project I	4 / 2
SITSbCBA	Steel and Timber Structures	2
SITSPbCBA	Steel and Timber Structures - Project Assignment	2
Credit Total	**30**	

Year 4 (*Compulsory Modules*)
Semester 7

Code	*Title*	*Credits*
HMAbCBA	History of Modern Architecture	3
IBLDP2bCBA	Industrial Buildings - Project II	6 / 2
DAPbCBA	Industrial Design for Architects - Project	5
INTLbCBA	Interior	2
MUPAbCBA	Management in Urban Planning and Architecture	2
OCbCBA	Organization of Construction	2
PBLDP2bCBA	Public Buildings - Project II	6 / 2
RBLDP2bCBA	Residential Buildings - Project II	6 / 2
TISbCBA	Technical Installations and Systems	2
URBP2bCBA	Urban Planning - Project II	6 / 2
DRW3bEBA	Drawing - Part III	2
Credit Total	**30**	

Semester 8

Code	*Title*	*Credits*
AESbCBA	Aesthetics	2
COTELSbCBA	Construction Technology and Labour Safety	2
DRW3bEBA	Drawing - Part III	2
ECONAbCBA	Economics of Construction and Architecture	2
IBLDP2bCBA	Industrial Buildings - Project II	6 / 2
INTPbCBA	Interior - Project	6
PBLDP2bCBA	Public Buildings - Project II	6 / 2
REGPLbCBA	Regional Planning	2
RBLDP2bCBA	Residential Buildings - Project II	6 / 2
SOCAbCBA	Sociology of Architecture	2
URBP2bCBA	Urban Planning - Project II	6 / 2
Credit Total	**30**	

Year 5 (*Specialization*)
The possibilities of specialization, at the beginning of the 9th semester, are:

- Residential buildings;
- Public buildings;
- Industrial (rural) buildings;
- Urban planning, regional and landscape planning;
- Interior and architectural design;
- Preservation of architectural heritage;
- Architectural structures and details;

Semester 9 (*Compulsory Modules – specialization in residential buildings*)

Code	*Title*	*Credits*
RBLKP1bCSA	Residential Buildings - Pre - Diploma Project I	12
RBLKSLbCSA	Residential Buildings - Special Course	6

(*Optional Modules*) - Students must take 12 credits from this group:

AIT1bESA	Advanced Information Technologies - 3D Studio	4
AIT2bESA	Advanced Information Technologies - ArchiCAD	4
AECbESA	Architecture of Engineering Constructions	4
NN1bESA	Civil Protection in Emergency Situations	4

CANbESA	Cultural Anthropology	4
EEFAbESA	Energy Efficient Architecture	4
ARLbESA	Lighting in Architecture	4
PAHbESA	Preservation of Architectural Heritage	4
ECOUPbESA	Regional and Urban Planning and Architecture Ecology	4
TARbESA	Theory of Architecture	4
URBSbESA	Urban Synthesis and Architecture	4
Credit Total	**30**	

Semester 10 (*Compulsory Modules – specialization in residential buildings*)

Code	*Title*	*Credits*
RBLKP3bCSA	Residential Building - Detail Project	8
RBLKP2bCSA	Residential Building - Pre - Diploma Project II	8
RBLKP3bCSA	Residential Building -Detail Project	8

(*Optional Modules*) - Students must take 4 credits from this group

AIT1bESA	Advanced Information Technologies - 3D Studio	4
AIT2bESA	Advanced Information Technologies - ArchiCAD	4
ASTRbESA	Architectural Structures II	4
AANbESA	Architectural Anthropology	4
COLAbESA	Colour in Architecture	4
CARRbESA	Contemporary Architecture	4
EEFAbESA	Energy Efficient Architecture	4
EPSDbESA	Environmental Protection Policy & Sustainable Development	4
HHRBbESA	History of High Rise Buildings	4
PRPAbESA	Practicing the Architectural Profession	4
URBSbESA	Urban Synthesis and Architecture	4

Practical work Modules

PDPRbCPA	Pre Diploma Field Practice	2
Credit Total	**30**	

<u>Year 6</u>

Semester 11 (*Compulsory Modules*)

Code	*Title*	*Credits*
DPLEbCBA	Diploma Thesis - presentation	10
DPLbCBA	Diploma Thesis - project	20
Credit Total	**30**	

Credit Total **330 Programme Credits**

Learning Outcomes: According to the guidelines of the RTPI, AESOP (planning institutes) and ECTP (European Construction Technology Platform), planning education should induce knowledge of: planning nature, aims, theory and methodology; history of planning as institution and job; cultural differences in planning within European and global context; development of natural and cultural values and resources, the impacts of human intervention in the environment and the principles of sustainable development; the institutional, political and legislative framework of planning practice; mechanisms for implementation of planning policies; the relation of planning with the other sectors of economics.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Students are introduced for the first time to issues of environmental sustainability and energy efficiency during the 2nd semester of the first year by the module **Building Physics**, offered by the Department of Physics (Faculty of Hydrotechniques). Within the course, topics introduced include: architectural and building aerodynamics, thermodynamics, acoustics and lighting-techniques, physical phenomena and processes in the interaction between buildings and the environment, their model investigation, the main physical quantities and objective laws characterizing them, and general normative requirements. An approach relating theory to the specific architectural and engineering applications is used. Emphasis is given to the modern trends for energy-efficient and ecological construction, and for use of non-conventional sources of energy.

The applied part of the Building Physics course, **Building Physics – exercises**, gives to students familiarity with the main regulations on heat preservation, energy saving in buildings and noise protection. Theoretical knowledge is applied in practice for calculation of the necessary thermal insulation of several types of multi-layer cladding structures. The suggested thermal insulation of the structure analysed is assessed in order to meet the requirements of noise protection as well. The coursework develops skills for working out real projects in conformity with the current regulations. These principles are then further explored within the 2nd year module **Building Installations and Equipment**.

An elective of the 9th semester (within the specialization to be chosen during the fifth year) is the module **Energy Efficient Architecture**, which is offered by the Department of Industrial and Agricultural Buildings. Within 15 lectures and 15 seminars, students get introduced to the norms, techniques and methods of energy efficient investigation, assessment, design and renovation of architectural and building objects. The course covers problems of influence of space organization, planning characteristics and properties of building materials and products on human health in the occupation sphere.

Another elective of the 10th semester is the module **Environmental Protection Policy and Sustainable Development**, offered by the Department of Urban Planning. The aim of this course is to present the dynamic development of environmental problems and the sustainable development of the modern world as well as their impact on the theory and practice of spatial planning. The EU policies on environmental protection and sustainable development and their application under the Bulgarian conditions are analyzed. The expected results of the training include obtaining knowledge of the principles set at the root of the sustainable development idea, acquiring skills for definition and critical assessment of strategies for environmental protection and sustainable development in particular spatial, social and cultural conditions.

All of the courses above have typical duration of a single semester and are structured in lectures and, in some cases, case studies and local (often computer-aided) practice. Successful completion of all subjects includes the passing of a final examination.

STRENGTHS AND OPPORTUNITIES

Strengths:

- Cooperation between the Departments and the Faculties.
- Theoretical knowledge is applied in practice for calculation of the necessary thermal and noise insulation.

Opportunities:

- Sustainable architecture is an important subject matter introducing real life solutions that in turn allow students to utilize these techniques in reality.

SOURCES AND REFERENCES

UACEG Faculty of Architecture website: www.uacg.bg/UACEG_site/index-en.html

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

The Chamber of Architects of Bulgaria (KAB)

The Chamber of Architects of Bulgaria has about 4,000 members, including architects, urban planners, interior designers and landscape architects and coordinates the activities of 29 Regional Chambers of Architects. It defends the national and international interests of professionals, taking into account the requirements of contemporary society.

The Bulgarian Chamber of Architects and Engineers (BIAK) was initially established on the strength of Regulations - Law of the Chamber of Architects and Engineers, ratified with decree 247/25 of September 1937, published in the Official Gazette, No 221/07 of October 1937. Its headquarters was established in the city of Sofia. On March 27-28, 1949 a Constituent congress of the Scientific-Technical Union took place, in which the Chamber of Architects and Engineers together with other branches participated as cofounders.

During the 8th extraordinary Congress of the "Union of Architects in Bulgaria", which took place in 1991 in Varna, it was taken the decision to create the current status of Chamber of Architects (KAB). In 1991, at the complex of St. Kirik and Julita, the Constituent Assembly of KAB was held. During this meeting, the statute and the leadership of KAB was accepted. In article 1 of the Statute, it is stated that KAB is the inheritor, continuer, and successor of the Bulgarian Chamber of Architects and Engineers (BIAK). The Statute and the leadership of KAB are registered under the terms of the Law of persons and families, as an association with non economical objective. A new statute and governing body of KAB was decided at the National Constituent Assembly held in Sofia in 2003.

The main aim of the Chamber of Architects of Bulgaria is to regulate the activities of architects, designers, and to ensure free choice of the designer in terms of fair competition. Specifically, KAB has the following objectives:

- To protect the public prestige of the architect-designer;
- To represent its members and to defend their professional rights and interests in the interests of society;
- to regulate the principles of professional activities in architectural design in terms of specific professional ethics;
- To prevent monopolies, unfair competition and unequal status in the selection of the designer;
- To protect intellectual property and copyright of the architect;
- To maintain a high level of qualifications of its members and the quality of the design and consultancy services.

Conditions for Professional Qualifications

In order to practice the profession of independent architect and use the title of “Architect” in Bulgaria, the following requirements apply:

- Finalized Master education (5 1/2 years, 11 semesters) on Architecture and award of Certificate/Diploma,
- Membership at the Chamber of Architects of Bulgaria;
- Registration in the Register of Bulgarian Architects;
- 2 years period of professional practice for architects employed at design office on contract;
- 4 years period of professional practice for self-employed architects.

SOURCES AND REFERENCES

Chamber of Architects of Bulgaria website: www.kab.bg

Cyprus

FREDERICK UNIVERSITY

SCHOOL OF ARCHITECTURE, FINE AND APPLIED ARTS

Bachelor of Architecture + Diploma in Architecture (5 Years)

Level: Undergraduate (Bachelor of Design, 4 years) + Graduate (Diploma in Architecture, 1 year)

Accrediting Body: Conditionally approved by the Evaluation Committee of Private Universities (ECPU)

Educational Aims: Studies in architecture at Frederick University are based upon the conception that architecture is primarily driven by values, principles, ethics and objectives directing the creative manipulation of mass, space, volumes, materials, textures, light and pragmatic elements such as cost, construction techniques, environmental issues and technology. The programme does not seek to impose any single design philosophy, but to encourage the development of individual approaches to design. It views architecture as a culture, a commitment and a lifelong path to discovery. It invites students to investigate the domain of architectural knowledge and experience in order to construct their own architectural language. It aspires to equip students with the practical and intellectual tools necessary to invent and implement new forms of architectural expression for the future.

Outline Description of Course: The five-year programme is organised in ten semesters and is structured around six thematic units: Architectural Design; Technology and Environment; Architecture, City and Civilization; Expression and Representation; Professional Practice; Elective Courses.

Course Structure: Students must complete a total of 300 ECTS (credits) for the five-year Diploma in Architecture or can take the option of a four-year Bachelor of Architecture with the completion of 240 ECTS.

Bachelor + Diploma in Architecture (5 years)

Module Group	**ECTS**
Architectural Design Studio Courses	126
Technology and Environment	48
Architecture, City, Civilisation	57
Expression and Representation	34
Professional Practices	10
Free Electives	25
TOTAL	**300**

Semester 1

Code	*Title*	*Credits*	*Hours/Week*
BAARCH01	Discovering architecture	12	12
BATECH01	Matter and materials	5	4
BATECH03	Structures and architecture	3	2
BACULT01	Ideas and precedents of contemporary architecture	3	2
BACOM01	Observation and sketching	3	4
BACULT02	History of art and architecture: 20th century	2	2
BACOM02	Architectural representations and geometry	2	4

Semester 2

Code	*Title*	*Credits*	*Hours/Week*
BAARCH02	Experimenting with space and forms	12	12
BATECH02	Materials and construction methods I	5	4
BATECH05	Concrete structures	3	2
BACOM03	Observation, representation and creation of volumes	3	4
BACULT03	The human, the architecture and the city	3	2
BACOM04	Digital representation tools I	2	4
BACULT05	History of art and architecture: antiquity	2	2

Semester 3

Code	*Title*	*Credits*	*Hours/Week*
BAARCH03	Architectural design and construction	12	12
BATECH04	Materials and construction methods II	5	4
BATECH08	Wooden and metallic structures	3	2
BATECH06	Building physics - technology of the building skin	3	2
BACULT04	Architecture and society	3	2
BACULT18	History of art and architecture: 15th-18th centuries	2	2
BACOM05	Digital representation tools II	2	4

Semester 4

Code	*Title*	*Credits*	*Hours/Week*
BAARCH04	Architectural design and restoration of historic buildings	12	12
BATECH07	Materials and construction methods III	5	4
BATECH10	New construction materials and architectural experimentations	3	2
BACULT06	The architecture of Cyprus	3	2
BACOM06	Digital tools for measuring and representation	3	3
BATECH09	Electrical and mechanical installations	2	2
BACULT07	History of art and architecture: 19th century	2	2

Semester 5

Code	*Title*	*Credits*	*Hours/Week*
BAARCH05	Architectural design and architecture of the city	12	12
BACULT11	Urban planning and sustainable development	5	4
BACULT10	Theories and doctrines of urban planning	3	2
BACULT09	Architecture and urban analysis and criticism	3	2
BACOM07	Visual arts in public space	3	2
BACULT08	The history of the city	2	2
BACOM08	Digital tools for the creation of architectural forms - maths	2	4

Semester 6

Code	*Title*	*Credits*	*Hours/Week*
BAARCH06	Architectural design and cultural landscapes	12	12
BATECH13	Materials and construction methods IV	5	4
BATECH12	Environment and climate in architectural design	3	2
BATECH11	Special environmental studies: living ambiences	3	2
BACULT12	Special studies in philosophy and human sciences	3	2
BACULT13	Theories and doctrines of architectural and urban design	2	2
BACOM09	Research methodology and writing scientific dissertations	2	2

Semester 7

Code	*Title*	*Credits*	*Hours/Week*
BAARCH07	Integrated design studio 1: designing materiality to live in	12	12
BAPROF01	Professional environments: organisation of design projects	3	2
BACULT14	Investigation and critical analysis of contemporary paradigms	5	4
BACULT15	Special studies: urban planning intervention in urban space	3	4
BACOM10	Digital tools for simulation and testing	3	2
BAELE 1	Free elective module	2	2
BAELE 2	Free elective module	2	2

Semester 8

Code	*Title*	*Credits*	*Hours/Week*
BAARCH08	Integrated design studio 2: design plus	12	12
BACOM12	Advanced digital representation multimedia	5	4
BAPROF02	Professional environments: organisation of the practice	3	2
BACOM11	Paper writing on the theme of design studio plus	2	2
BAELE 3	Free elective module	2	2
BAELE 4	Free elective module	2	2
BAELE 5	Free elective module	2	2
BAELE 6	Free elective module	2	2

Semester 9

Code	*Title*	*Credits*	*Hours/Week*
BAARCH09	Elective Master Studio	12	12
	Subject area A: Experimenting with Architecture (Studio 1)		
	Subject area B: Architecture, Place and Civilisation (Studio 2)		
	Subject area C: Architecture, Environment, Technology (Studio 3)		
MAELE 01.1	Deeper exploration of studio 1 thematology	5	4
MAELE 01.2	Deeper exploration of studio 2 thematology		
MAELE 01.3	Deeper exploration of studio 3 thematology		
MACUL 1	Supporting seminars for the dissertation projects	3	2
BAPROF03	Professional environments: organisation and management	2	4
BAELE 7	Free elective module	2	2
BAELE 8	Free elective module	2	2
BAELE 9	Free elective module	2	2
BAELE 10	Free elective module	2	2

Semester 10

Code	*Title*	*Credits*	*Hours/Week*
BAARCH10	Diploma Project Subject area A: Experimenting with Architecture Subject area B: Architecture, Place and Civilisation Subject area C: Architecture, Environment, Technology	18	2

Learning Outcomes: On completion of their studies, graduates are expected to have acquired:

- Capability to deal with all levels of design activity from urban space to product design
- Critical thinking and ethical commitment.
- Ability to cope creatively and operationally with the challenges of our era and adapt to change.
- Sensitivity to local culture and awareness of new trends in international architectural production.
- Passion for inventing the future.
- Sensitivity to environmental issues and ability to design sustainable environments.
- Ability to operate within the constraints of the construction industry, the project budget and the brief.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

The 3rd semester course **Building Physics - Technology of the Building's Skin** deals with the interactions between buildings and natural phenomena, as well as examining the effects of phenomena of anthropogenic origin, such as fire and environmental pollution. The aim is to put forward proposals for building designs, the choice of suitable materials and application of suitable techniques to ensure conditions of comfort and health. The educational objective of the course is to stress that environmental factors influence greatly the operation of buildings and should be considered in the design process.

The 6th semester course **Environment and Climate in Architectural Design** attempts a theoretical approach to concepts relating to the effects on architectural design of energy conservation and the utilization of alternative energy sources in order to limit environmental pollution and the uncontrolled abuse of natural resources. Concurrently, the **Special Environmental Studies: Living Ambiences** module focuses on the interaction between the building, its microenvironment and the wider environment. Ecological and recyclable or recycled materials and constructional methods are examined.

The 9th semester options include **Architecture, Environment, Technology** as one of the studios (Studio 3) that can be selected for the final design thesis over the final two semesters of study for the Diploma.

STRENGTHS AND OPPORTUNITIES

Strengths:

- There is an attempt to introduce environmental design in most of the studio courses;
- Students can elect to focus on environmental issues for their final studio in the 9th semester.

Opportunities:

- Introducing environmental design as a source of technical innovation and architectural expression from earlier years.

SOURCES AND REFERENCES

Architecture Department website: www.frederick.ac.cy/DA/index.php
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Scientific Technical Chamber of Cyprus (ETEK)

The Scientific Technical Chamber of Cyprus (ETEK) is the body responsible for the accreditation and qualification of Architects in Cyprus. Graduates with a diploma or degree in architecture are entitled to enrol as members of ETEK as long as the following conditions apply:

- The degree has been obtained after a minimum of 4 years of full-time study at a university or similar educational institution. The relevant law (article 7(1A) of 224/90) includes an Appendix describing the knowledge that the architect is expected to have and another Appendix with a list of degrees that are recognised. Degrees not included on this list follow the procedure concerning the '*General System of Recognition for Professional Qualifications*' according to laws from 2002 and 2003.
- Applicants must have at least one year of practical experience in architecture after obtaining their degree.
- Applicants with degrees from the UK must have met the requirements of RIBA Part 2.
- Concerning degrees from other countries, as long as the Diploma is validated in the country of study for practising architecture without any constraints or conditions, and as long as the applicant has followed the basic cycle of study (12 semester-long modules or 6 year long modules) in the area of architecture and the study for obtaining the Diploma was full-time and at least 4-years in length at university level, then there is high probability that the degree will be validated from the Technical Chamber of Cyprus.

The knowledge and skills that applicants are expected to have are:

a) Ability to think and design architectural creations that fulfil aesthetical and technical requirements at the same time;

b) Proper knowledge of the history and the theory of architecture and other similar arts, technologies and human sciences;

c) Proper knowledge of the fine arts as means that can influence the quality of architectural concepts;

d) Proper knowledge of urban design and techniques of urban planning;

e) Ability to understand the relation and interaction between people and architectural creations on the one hand and between architectural creations and their environment as well as understanding the need for harmonic combination or architecture and space according to the human scale and requirements;

f) Ability to understand the architects profession and his/her role in the society especially through processing concepts and designs that take into consideration social factors;

g) Knowledge of the methods for documentation and preparation of the building permit;

h) Knowledge of the problems of structural design, construction technology and tasks of civil engineers which are relevant to building design;

i) Proper knowledge of the problems relevant to the physical characteristics of the buildings and the technologies as well as the constructions, so that the architect can provide thermal comfort and climatic protection in buildings;

j) Technical ability to invent constructions that meet the requirements of the occupants respecting the financial constraints and the building regulations;

k) Proper knowledge of the industry, organisations, regulations and procedures that are relevant to the implementation of building studies and their incorporation in the general planning.

SOURCES AND REFERENCES

Scientific Technical Chamber of Cyprus web site: www.etek.org.cy

Croatia

UNIVERSITY OF SPLIT

FACULTY OF CIVIL ENGINEERING AND ARCHITECTURE

Bachelor of Architecture + Master of Architecture (5 years)

Level: Undergraduate (BArch, 3 years) + Graduate (MArch, 2 years)

Accrediting Body: Croatian Chamber of Architects

Educational Aims: Undergraduate study of architecture at the Faculty of Civil Engineering and Architecture, University of Split, lasts three academic years (six semesters). Upon completion of undergraduate studies, students acquire the academic title Bachelor / Engineer of architecture and urbanism. Graduate study of architecture lasts two academic years (four semesters). Upon completion of the graduate programme, students acquire the academic title Master / Engineer of architecture and urbanism. Master engineers of architecture and urbanism are trained for all tasks in the field of architectural services in accordance with the Croatian legislation and the Law on Croatian Chamber of Architects and Architectural Engineers (the competences which, under the existing laws, correspond to engineer of architecture).

Outline Description of Course: The curriculum consists of compulsory and elective modules and is based on a balance of lectures and studios. The program complies with the European Credit Transfer System (ECTS); each year of study obtains 60 ECTS. The compulsory modules at the undergraduate level are organized in 8 thematic units / modular sequences: Architectural design (APR); Urban planning (URB); Architecture, Structures and Technology (AKT); Drawing, Modelling and Presentation (COP); History and Theory of Architecture (PTA); Typology and Form in Architecture (TIP); Special skills (PZ); and Elective courses (IZB). The modules of the graduate study are grouped into 6 thematic units / modular sequences: Architectural design (APR); Urban planning (URB); History and Theory of Architecture (PTA); Protection and restoration of architectural heritage (ZGN); Project management (UP); and Elective courses (IZB).

Course Structure: Each year of study consists of 60 credits, normally 30 in each semester, for a total of 180 credits for the undergraduate program and 120 for the graduate program. Each module has a credit value. Undergraduate and Graduate programmes comprise obligatory and elective subjects. In addition to mandatory content, students have the right to chose optional subjects, content and activities - a total of 30 hours per semester. The duration of one hour of teaching at the University of Split is 45 minutes. One ECTS point represents 30 total hours of student work.

<u>Bachelor of Architecture (3 years)</u>

Year 1 (*Compulsory Modules*)

Modules	*Thematic Units*	*Modular courses*	*ECTS*	*Taught*
APR – M1B	Architectural design	Introduction to architectural design 1	6	Autumn
TIP – M1B	Typology and form in architecture			
		Typology and form in architecture 1	2	Autumn
COP – M1B	Drawing, Modelling and Presentation		10 (Total)	
		Principles of projections 1	5	Autumn
		Drawing 1	3	Autumn
		Computer-aided architectural design 1	2	Autumn
AKT– M1B	Architecture, Structures and Technology		10 (Total)	
		Elements of buildings 1	4	Autumn
		Basics of structures	6	Autumn
PZ – M1B	Special skills	Mathematics 1	2	Autumn
APR - M2B	Architectural design	Introduction to architectural design 1	6	Spring
TIP - M2B	Typology and form in architecture			
		Typology and form in architecture 2	2	Spring
COP – M2B	Drawing, Modelling and Presentation		10 (Total)	
		Drawing 2	5	Spring
		Principles of projections 1	3	Spring
		Computer-aided architectural design 2	2	Spring
AKT– M2B	Architecture, Structures and Technology		10 (Total)	
		Elements of buildings 2	4	Spring
		Basics of structures 2	6	Spring
PZ – M2B	Special skills	Mathematics 2	2	Spring
Credit Total	**60**			

Year 2 (*Compulsory Modules*)

Modules	*Thematic Units*	*Modular courses*	*ECTS*	*Taught*
APR – M3B	Architectural design	Architectural design workshop 1	10	Autumn

PTA – M1B	History and Theory of Architecture			
		History of architecture and art 1	4	Autumn
TIP – M3B	Typology and form in architecture			
		Typology and form in architecture 3	2	Autumn
COP – M3B	Drawing, Modelling and Presentation		4 (Total)	
		Modelling	2	Autumn
		Architectural presentation	2	Autumn
AKT – M3B	Architecture, Structures and Technology		10 (Total)	
		Elements of buildings 3	4	Autumn
		Structural systems 1	6	Autumn
APR – M4B	Architectural design	Architectural design workshop 2	10	Spring
PTA – M2B	History and Theory of Architecture			
		History of architecture and art 2	4	Spring
TIP – M4B	Typology and form in architecture			
		Typology and form in architecture 4	2	Spring
URB– M1B	Urban planning		5 (Total)	
		Introduction to urban planning	2	Spring
		History of urban form	3	Spring
AKT – M4B	Architecture, Structures and Technology		10 (Total)	
		Elements of buildings 4	4	Spring
		Structural systems 2	6	Spring
Credit Total	**60**			

Year 3 (*Compulsory Modules*)

Modules	*Thematic Units*	*Modular courses*	*ECTS*	*Taught*
APR – M5B	Architectural design	Architectural design workshop 3	10	Autumn
PTA – M3B	History and Theory of Architecture		4 (Total)	
		History of architecture and art 3	2	Autumn
		Contemporary architecture 1	2	Autumn
URB– M2B	Urban planning	Urban planning workshop 1	6	Autumn
AKT – M5B	Architecture, Structures and Technology		10 (Total)	
		Building installations	4	Autumn
		Building physics	2	Autumn
		Construction planning and management	2	Autumn
		Urban traffic areas and facilities	2	Autumn
APR – M6B	Architectural design	Architectural design workshop 4	10	Spring
		Final design		
PTA – M4B	History and Theory of Architecture		4 (Total)	
		History of architecture and art 4	2	Spring
		Contemporary architecture 2	2	Spring
URB– M3B	Urban planning	Urban planning workshop 2	6	Spring
IZB – M1B	*Elective courses*	Social urban research	2	Spring
Credit Total	**60**			

<u>Master of Architecture (2 years)</u>

Year 1 (*Compulsory Modules*)

Modules	*Thematic Units*	*Modular courses*	*ECTS*	*Taught*
APR – M1M	Architectural design	Master's studio 1	15	Autumn
PTA – M1M	History and Theory of Architecture			
		Contemporary architecture 3	2	Autumn
ZGN - M1M	Protection and restoration of architectural heritage			
		Protection and restoration	5	Autumn
URB– M1M	Urban planning	Survey of urban planning	5	Autumn
UP - M1M	Project management	Project management	3	Autumn
APR – M2M	Architectural design	Master's studio 2	15	Spring
PTA – M2M	History and Theory of Architecture			
		Contemporary architecture 4	2	Spring
ZGN – M2M	Protection and restoration of architectural heritage			
		Protection and restoration 2	5	Spring
URB– M2M	Urban planning		5 (Total)	
		Research and analytical methods	2.5	Spring
		Marine structure and ports	2.5	Spring
UP – M2M	Project management	Construction investments planning	3	Spring
Credit Total	**60**			

Year 2 (*Compulsory Modules*)

Modules	*Thematic Units*	*Modular courses*	*ECTS*	*Taught*
APR – M3M	Architectural design	Interior design	5	Autumn
APR – M4M	Architectural design	Master's studio 3	15	Autumn
PTA – M3M	History and Theory of Architecture			
		Theory and architecture	2	Autumn
URB– M3M	Urban planning		4 (Total)	
		Urban economics	2	Autumn
		Integrated environmental protection	2	Autumn
IZB – M1M	*Elective courses*		4 (Total)	
		History and theory of design	2	Autumn
		Electives from Arts Academy in Split	2	Autumn
IZB – M2M	*Elective courses*		4 (Total)	
		Protection and restoration 3	2	Autumn
APR – M5M	Architectural design	Master's thesis	30	Spring
Credit Total	**60**			

Learning Outcomes: The programme provides opportunities for students to develop appropriate knowledge and understanding, intellectual and cognitive skills, professional and practical competences, which include: making architectural design and jobs associated with the chief designer; drawing documents concerning space planning and design; drawing project documentation concerning protection and restoration of architectural heritage; jobs associated with consulting and engineering in architecture (project management, programming, project and programme studies, investment studies, expert management of construction, managing construction sites and construction organization); jobs in expert services of local and national administration; other jobs.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

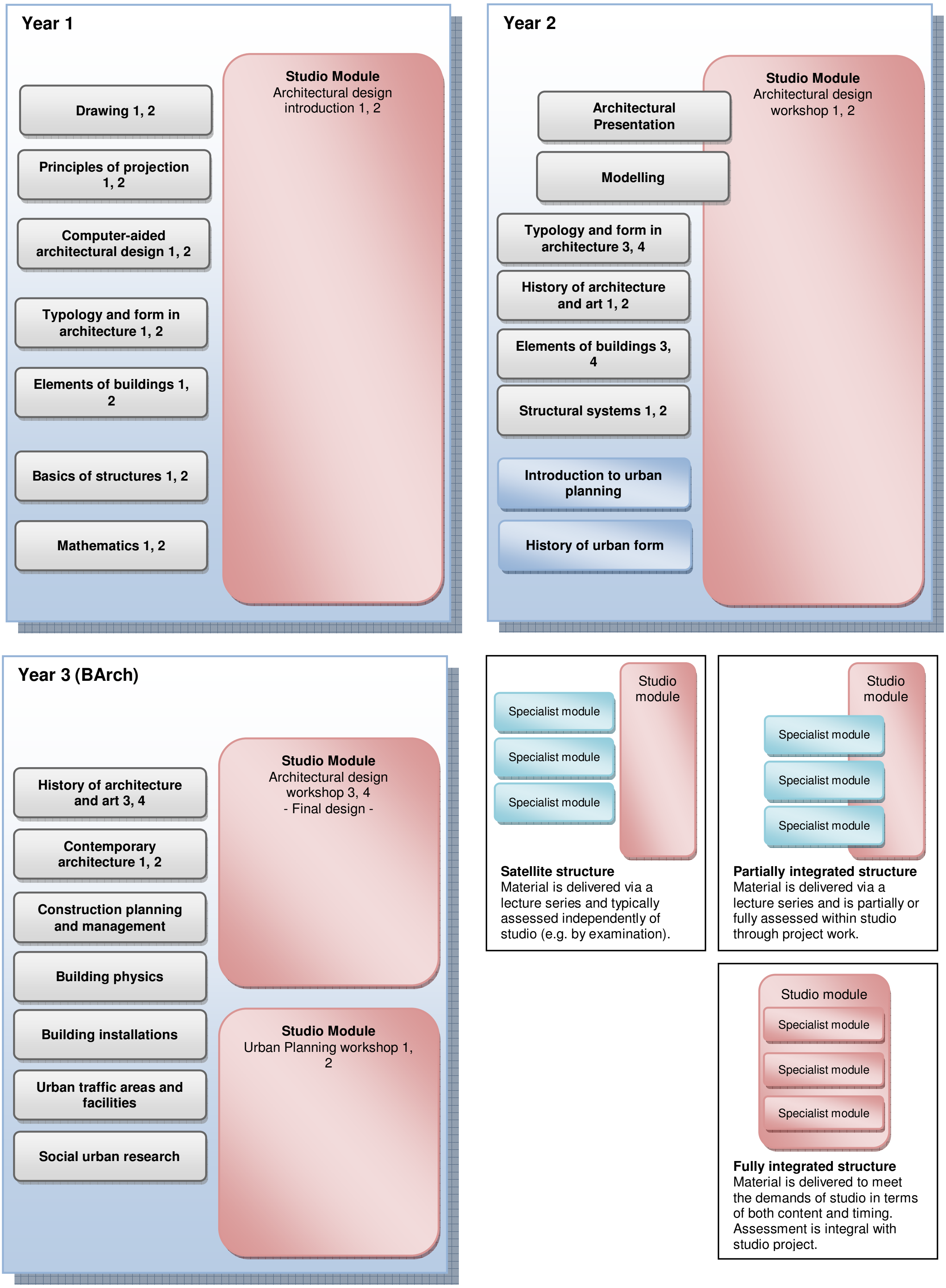
At second year of the **BArch**, **Introduction to urban planning** and **History of urban form** are two courses of the same compulsory module **Urban Planning**, which lasts one semester and has 5 ECTS. The module is based primarily on lectures regarding sustainable development of cities and regions, providing basic information on urban design, infrastructure and green areas planning, urban legislation, urban renewal, sustainable use of natural resources, etc.

In the first year of MArch, **Master's studio 1** is a compulsory module of 15 credits based on 30 hours of lectures and 60 hours of practice. Part of the module is dedicated to integrated lectures on urban planning.

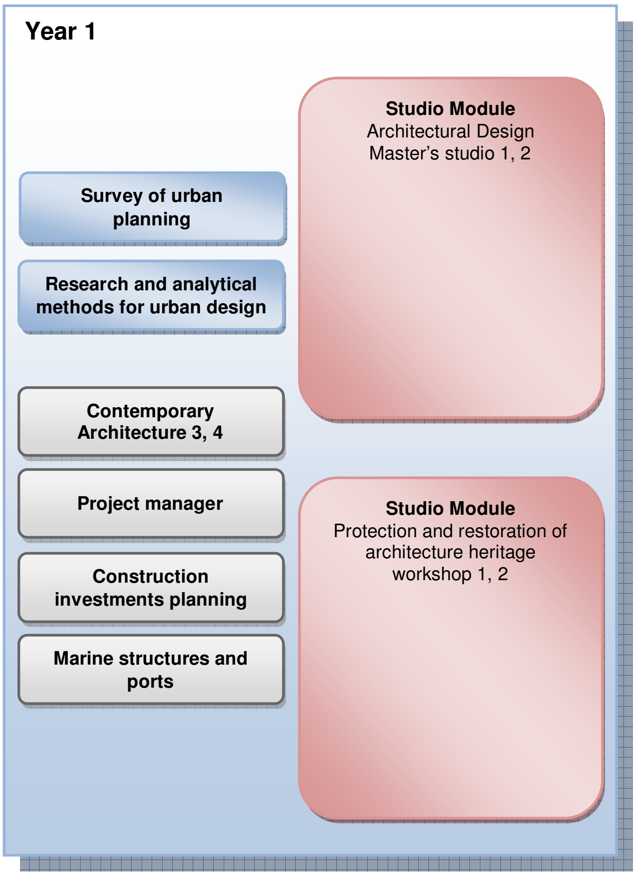
Also courses of **Survey of urban planning**, **Research and analytical methods for urban design** and **Marine structures and ports** are three subjects of 10 credits in the first year of MArch that explores in detail topics mentioned below, as an integral base for urban and architecture development of students' projects on Master's studio 1. The contents of the exercises (4 hours per week) include the following themes: The foundations of regional planning; Sustainable development of cities and regions; Urban regeneration; Urban renewal; Social structure of the city; Urban Systems and Traffic Systems; Sustainable use of natural resources. The contents of the urban seminars (2 hours per week) focus on theoretical approaches to designing the urban space. Also the modules include exploration of Geographic Information Systems, with definition, elements and methods of use in urban planning, and explore means of communicating with the public and methods for preparation of reports

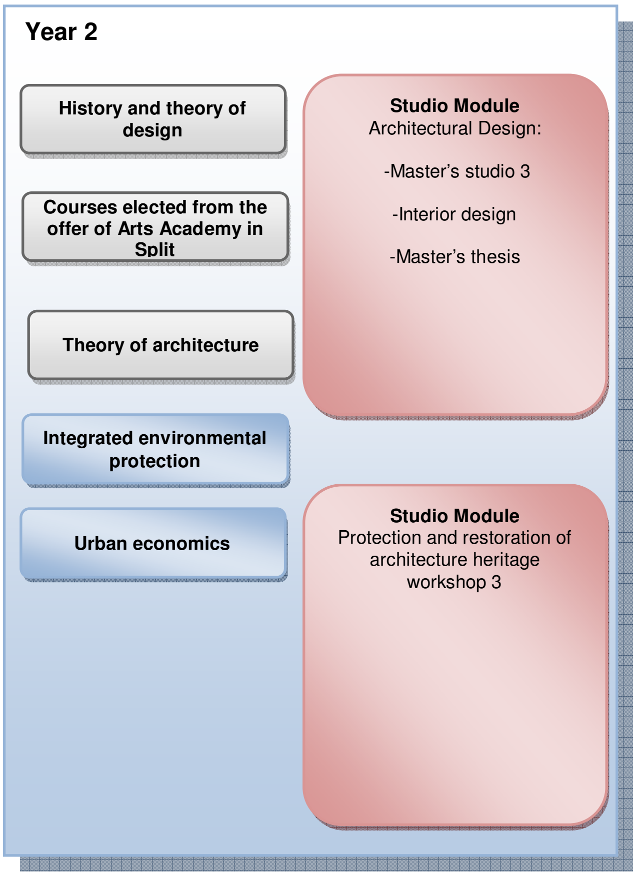
In the second year of the MArch, **Integrated environmental protection** and **Urban economics** are two courses of the same compulsory module, **Urban Planning,** of 4 ECTS based on 30 hours lectures. It analyses themes of: Urbanization and the environment; Sustainable development of cities; Fundamental ecological principles; Circulation of water and substances in the environment; Urbanization as a starter of pressure on the environment; Types and features of pressure; Consequences and impact of pressure on the environment, society and economy; Principles and criteria of environmental management; Integral concepts of environmental protection; Basic management framework; Objectives and methods; Strategies and principles; Control mechanisms; Basic principles of environmental planning; Control of the influence of built spaces on ecosystems, atmosphere, water and soil; Control point and scattered sources of pollutionSolid waste; Basic elements for making plans and studies on the impacts on the environment

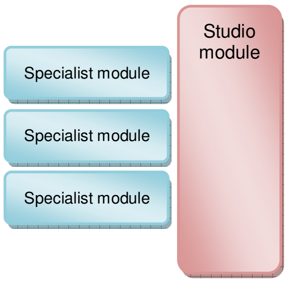
Integration of Environmental Design with Studio - Bachelor of Architecture:



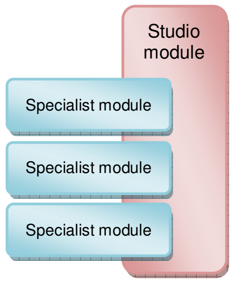
Integration of Environmental Design with Studio - Master of Architecture:



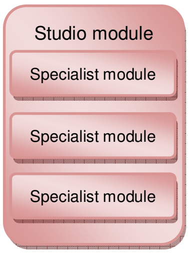




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Amongst the major strengths and opportunities within the Bachelor of Architecture and Master of Architecture (5 years) programmes at the Faculty of Civil Engineering and Architecture of Split are the following:

Strengths:

- The architectural study at the University of Split, Faculty of Civil Engineering and Architecture, was established in 2003 strongly based on the idea of sustainable environmental design;
- Enthusiasm shown on many occasions during the last six years by most of the students in discovering that environmentally-sensitive buildings can be beautiful and inspiring, specifically in terms of use of the environmental characters of a coastal Mediterranean area as a driver for design.

Opportunities:

- Sustainable environmental design should be considered as a compulsory requirement for the curriculum as well as a requirement for accreditation of the course.

SOURCES AND REFERENCES:

Faculty of Civil Engineering and Architecture of Split website: www.gradst.hr/
Academic Surveys and Feedback

UNIVERSITY OF ZAGREB
FACULTY OF ARCHITECTURE

Undergraduate Study Programme in Architecture (5 years)

Level: Graduate (DipArch, 5 years)

Accrediting Body: Croatian Chamber of Architects

Educational Aims: The Faculty of Architecture at the University of Zagreb is the only institution of higher education in Croatia combining instruction and research in the fields of architecture and urban design. The undergraduate program normally takes nine semesters to complete and is followed by a graduation thesis. It is based on a balance of lectures and studios. Lectures, offering theoretical insights, consist of required core courses as well as a selection of electives. The latter are continually modified to reflect the trends in architecture and changes in the architectural profession. Guest lectures by both Croatian and foreign professionals are an important addition to the regular lectures. The undergraduate program is enriched and complemented by site surveying and visits to town in Istria as well as architectural summer schools in Motovun, Bol and Unije. Field trips are a particular form of instruction in the first four years of study. Students, guided by their teachers, visit Croatian regions and are acquainted with historical and contemporary urban design and architectural achievements.

Outline Description of Course: The core aspect of the undergraduate program is the studio work related to architectural design and urban planning. Students are required to integrate and apply the acquired skills and knowledge in their projects, as well as to approach various architectural and urban-planning issues in a creative and innovative way.

Course Structure: The curriculum consists of 77 regular and 29 optional courses, each one organized in lectures and studios. At the first year, there are 13 regular and 4 optional courses; at the second level, there are 16 regular and 9 optional courses; at the third year, there are 14 regular and 8 optional courses; at the fourth year, there are 21 regular courses and 9 optional courses; at the fifth year there are 9 regular and 8 optional courses. The evaluation for each course is based on a final written and/or oral exam. The fifth year is concluded by the graduation thesis.

Undergraduate Study Programme in Architecture (5 years)

*( )-( ) hours per week of lectures and studio

Year 1 (*Compulsory Modules*)

Title	*1st sem*	*2nd sem*
History of art and architecture I, II	2-0*	2-0
Introduction to architectural design	1-0	1-0
Architectural design I, II	0-2	0-2
Architectural structures and Building Physics I, II	2-3	2-3
Materials in architecture	1-0	1-0
Drawing	2-2	2-2
Descriptive geometry and perspective I, II	2-3	2-3
Technical mechanics I	3-2	3-2
Technical mechanics II	-	2-2
Foreign Language	1-1	1-1
Physical Training	0-2	0-2
Croatian region and architecture - Zagreb	2 days	

(*Optional Modules*) – Students are required to take one elective course during second semester

Geodesy	-	1-0
Drawing and architectural graphics	-	1-0
Introduction to computer - aided architectural design	-	0-1
History of architectural forms I	-	0-1

Year 2 (*Compulsory Modules*)

Title	*1st sem*	*2nd sem*
History of art and architecture III, IV	3-0	2-0
Residential buildings I	2-0	0-0
Residential buildings II	-	2-0
Architectural design III, IV	0-4	0-4
Drawing II	0-3	0-3
Modelling plastics	0-2	0-2
Architectural structures and building physics III, IV	2-3	2-3

Introduction to urban planning	1-1	0-0
Urban planning	0-0	2-0
Landscape architecture	0-0	1-1
Structural systems I	2-0	1-2
Environmental sociology	1-0	1-0
Computer – aided architectural design	1-1	0-1
Foreign Language II (English or German)	1-1	1-1
Physical Training II	0-2	0-2
Croatian regions and architecture - Slavonia	4 day	

(*Optional Modules*) Students are required to take one elective course per semester during the academic year

Geometry in architecture	1-0	-
Vernacular architecture	1-0	-
Visual communication in architecture	1-0	-
History of architectural forms II	0-1	-
Methodology of architectural design	-	1-0
Japanese spatial concept	-	1-0
Environmental design and protection	-	1-0
Historical forms	-	1-0
Computer simulation of structural systems	-	1-0

Year 3 (*Compulsory Modules*)

Title	*1st sem*	*2nd sem*
Residential buildings III	2-0	0-0
Building for educational purposes	0-0	2-0
Architectural design V	0-6	0-0
Architectural design VI	0-0	0-8
Contemporary world architecture	2-0	2-0
Urban planning II (history of urban planning)	2-0	0-0
Urban planning III	0-0	2-0
Urban planning I, II	0-4	0-4
Architectural structures V	2-3	0-0
Structural system II	2-2	0-0
Structural system III	0-0	2-2
Building technology I	0-0	2-1
Building installations	2-1	2-1
Croatian regions and architecture - Istria	5 days	

(*Optional Modules*) Students are required to take one elective course per semester during the academic year

Energy and ecology in architecture	1-0	0-0
Computer aided urban and physical planning	1-0	0-0
Build heritage I- field work	0-2	0-0
Historical development of structural systems	0-0	1-0
Virtuality in residential building architecture	0-0	1-0
Modern steel and timber structural systems	0-0	1-0
Public welfare buildings	0-0	1-0
Urban composition	0-0	1-0

Year 4 (*Compulsory Modules*)

Title	*1st sem*	*2nd sem*
Sport and recreation facilities	1-0	0-0
Health care facilities	1-0	0-0
Building for cultural purposes	0-0	1-0
Office and commercial buildings	0-0	2-0
Tourist facilities	1-0	0-0
Theory of architecture	2-0	2-0
Architectural design VII	0-8	0-0
Architectural design VIII	0-0	0-8
Contemporary Croatian architecture	2-0	2-0
Urban planning V	2-0	0-0
Urban planning III, IV	0-4	0-4
Physical planning and landscape design	0-0	2-0
Engineering structures	1-0	0-0
Building technology II	2-2	0-0
Final works	0-0	1-0
Scope of the works with estimated costs I, II	1-2	1-2

Planning and project management	0-0	1-1
Preservation and restoration of the build heritage	0-0	1-0
Restoration method for historical structures	0-0	1-0
Professional practice	4 weeks	
Croatian region and architecture - Dalmatia	6 days	

(*Optional Modules*) Students are required to take one elective course per semester during the academic year

Complex installation systems in buildings	1-0	0-0
Secondary and higher education in buildings	1-0	0-0
Landscape design	1-0	0-0
Building heritage II- field work	0-2	0-0
Landscape design (studio)	0-0	0-1
Thermo-technical installations and building forms	0-0	1-0
Industrial archaeology	0-0	1-0
Building for special purposes	0-0	1-0
Critical evaluation in architecture	0-0	1-0

Year 5 (*Compulsory Modules*)

Title	*1st sem*	*2nd sem*
Building for tourist and leisure facilities	2-0	-
Theory of architecture	2-0	-
Contemporary world architecture	2-0	-
Contemporary Croatian architecture	2-0	-
Interior design	2-0	-
Interior design (studio)	0-4	-
Restoration methods for historical structures	1-0	-
Architectural l and urban planning workshop - seminar	0-4	-
Architectural and urban planning workshop - studio	0-8	-

(*Optional Modules*) Students are required to take one elective course

Managing the investment	1-0	-
Mathematical structures	1-0	-
Materials and equipment in interior design	1-0	-
Urban sociology	1-0	-
Tradition and creativity – summer school in Motovun	0-2	-
Tradition and modernity- summer school in Bol	0-2	-
Architecture and sustainable development		
Summer school in Unije	0-2	-
Urban recognition of coastal settlements		
Summer school in Orebic	0-2	-

Learning Outcomes: The programme provides opportunities for students to develop and demonstrate appropriate knowledge and understanding, intellectual and cognitive skills and professional and practical competence.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

At second year of the programme, **Environmental sociology** is a year-long module that introduces students to the sociology in general as well as specific sociological issues relevant for architecture and urban planning.

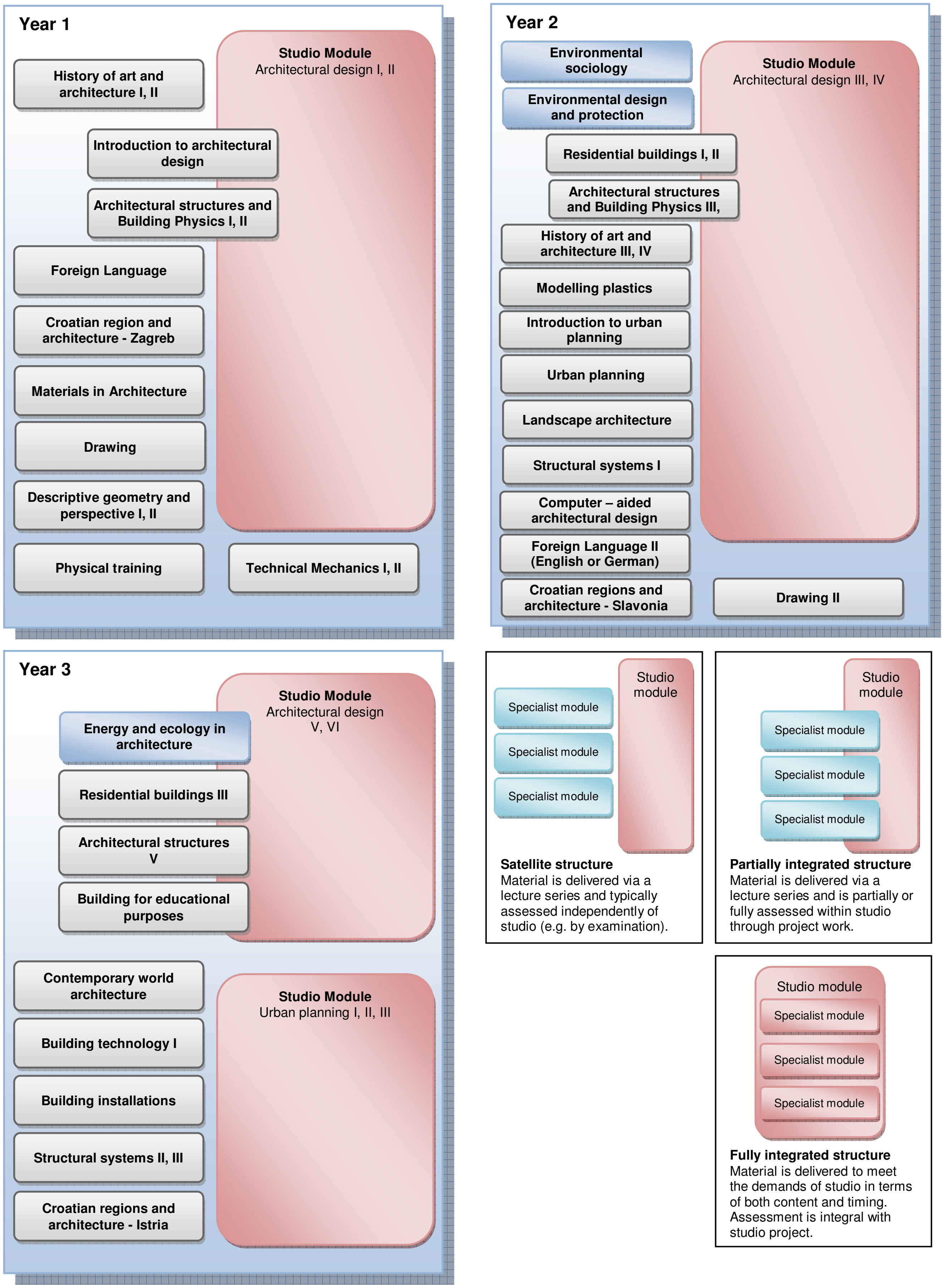
Environmental design and protection is an elective module that lasts one semester and introduces students to planning and designing communal buildings, maintaining and developing urban spaces and environmental protection in the field or urban planning.

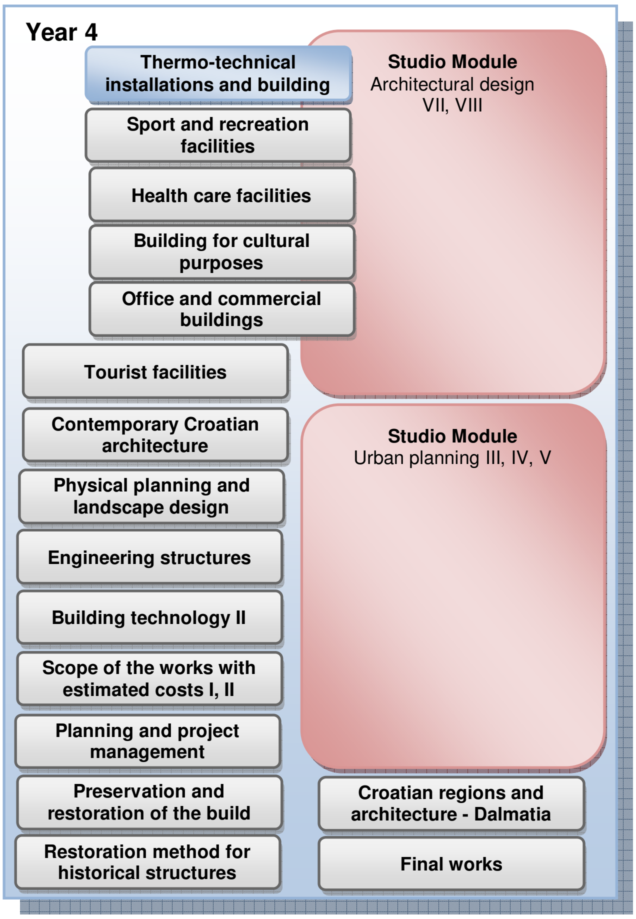
At the third year, **Energy and ecology in architecture** is an optional module that lasts one semester and introduces students to basic concepts and principles of energy efficiency and ecological approach to architecture, as well as their application into architectural design with a survey and analysis of recent projects and achievements both in Croatia and worldwide.

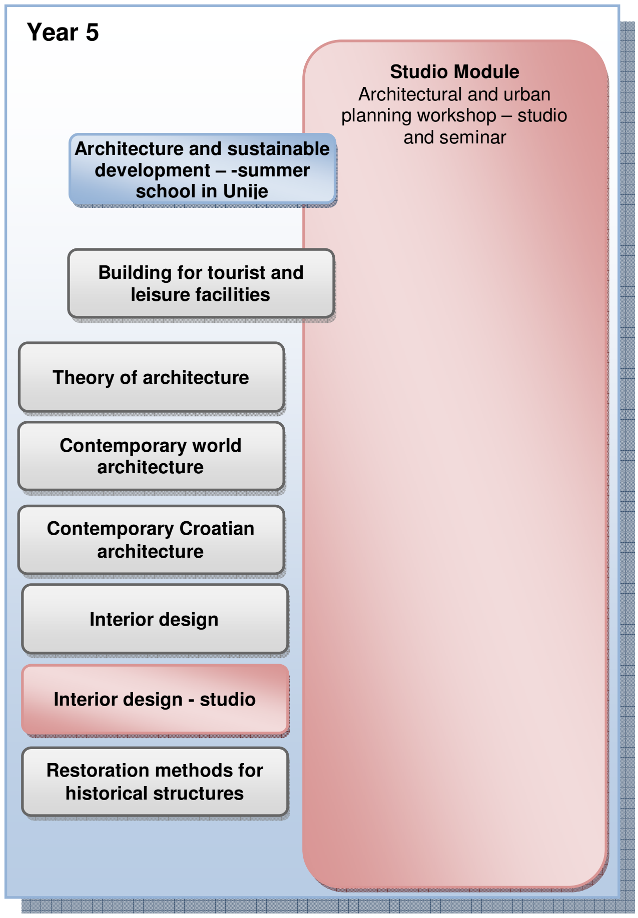
At the fourth year, **Thermo- technical installations and building forms** is an elective course that lasts one semester and introduces a methodology of thermodynamic calculation of outdoor climatic impacts on microclimatic condition in the building depending on the position of the building, facade components and its orientation, choice of the materials and protection throughout the year. The impact of the form of the building on energy consumption as well as the approximate determination (by means of a diagram) of technical storage areas for particular pieces of equipment (such as the air-conditioning engine-room, cooling systems, thermal systems, etc.) and their optimal position in the building are also explored.

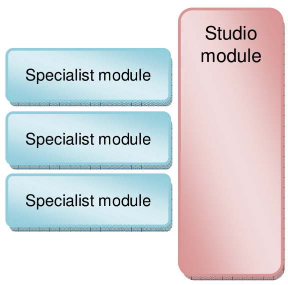
At the fifth year, **Architecture and sustainable development – summer school in Unije** is a workshop based on theory and practice of architecture within the ecological context of the Mediterranean and local islands. Basic guidelines of the program are concerned with the following research: study of the morphology of the place and types of houses in Unije; criteria for the tourist industry; the existing communal infrastructure of the place; qualitative and quantitative analysis of the built environment of the island. The theoretical workshop, with its lectures and discussions involving eminent experts, focuses on the investigation of similarities and differences of the artistic expression in a given space and time as well as ecological, economic, ethical and ethnical issues. The results achieved in the summer school of architecture are available to all potential users, particularly government institutions and local authorities, research institutions and individuals.

Integration of Environmental Design with Studio – Undergraduate Study Programme in Architecture

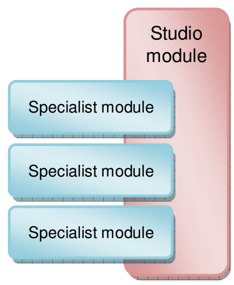




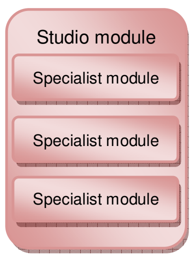




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Amongst the major strengths and opportunities of the Undergraduate study programme in Architecture at the University of Zagreb are the following:

Strengths:

- Students are encouraged to explore themes of sustainable design throughout the curriculum, starting from the second and third year with a theoretical approach to environmental issues, up to (with stronger emphasis) the following stages of education, where they face these topics in a more practical way, mainly through design workshops and technical knowledge concerning energy consumption in buildings, occupant comfort and well-being, passive design, etc.

Opportunities:

- Sustainable environmental design should be considered as a compulsory requirement for the curriculum as well as a requirement for accreditation of the course;
- Exploration and analysis of heritage and application of sustainable environmental design in practice could bring the academic curriculum closer to the reality of professional practice.

SOURCES AND REFERENCES:

Faculty of Architecture of Zagreb website: www.arhitekt.hr/_af/_en/faculty/
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Croatian Chamber of Architects

The Croatian Chamber of Architects is an independent organisation aiming at preserving the reputation, honour and the rights of certificated architects and graduated civil engineers, seeing that the certificated architects and certificated engineers duly accomplish their tasks in conformity with the law.

The Chamber promotes, represents and harmonises their common interests towards the state and other institutions in the country and abroad. According to the *Act on the Croatian Chamber of Architects and Civil Engineers*, an architect is a person holding a degree from an appropriate technical faculty in the Republic of Croatia, with the title of graduate architect/engineer. Membership in the Chamber is obligatory for architects and certified civil engineers performing jobs in physical planning, designing, professional supervision and design supervision in conformity with specific regulations and in order to represent and harmonise their common interests, to protect the public interest as well as the interests of the third parties. The right to use the professional title of 'Certified Architect' and 'Certified Engineer' is acquired by entering the Register of certified architects and the Register of certified engineers.

Conditions for Professional Qualification

To enter the Register of certified architects and engineers candidates shall meet the following requirements:

1. Croatian citizenship;
2. Competence for the job;
3. Physical fitness for the job;
4. A degree from an appropriate technical faculty of the Republic of Croatia with the title of graduate architect/engineer (in architecture, civil engineering, surveying, mechanical engineering or electrical engineering);
5. At least three years of working experience after graduation, under the supervision of a certified architect or certified engineer;
6. A certification examination for jobs in the construction sector, or any other relevant certification examination;
7. That there are no court proceedings against the candidate;
8. That the candidate is worthy of performing jobs in the architecture and civil engineering sector;
9. That the candidate does not perform jobs that are incompatible with the profession.

If the candidate applying to enter the Register has graduated from a foreign university or a relevant foreign institution, he is deemed to have met requirements from point 4 with the obligation to validate his certificate in compliance with national regulations. The entry into the Register of certified architects or certified engineers can be granted to architects or engineers who are foreign citizens when such candidates are members of the Chamber of architects or engineers in their country under the conditions of reciprocity.

A person is deemed unworthy of performing jobs in the architecture or civil engineering sector if sentenced for crime against the Republic of Croatia, for crime against his profession, a crime committed for financial gain, which, according to the Code of conduct, qualifies him as morally unworthy to perform jobs in the architecture and civil engineering sector.

Environmental awareness

Code of Ethics (extract from the "Act on the Croatian Chamber of Architects and Civil Engineers")

Authorized architects and civil engineers shall strictly comply with the principles of environment protection in their work by:

- using their abilities and dedication to achieve the best possible technical solutions in creating a healthy and pleasant environment, in open and closed space;
- trying to reach their goal with minimum consumption of natural resources and energy, the least possible waste or any other kind of pollution;
- thorough consideration of the direct, indirect, immediate or long-term consequences that a suggestion or action might have on the health of the population, the social justice and the local system of values;
- thorough studies of the environment they influence with their projects and by studies of the effects they might have on the condition, dynamics and the aesthetic values of the ecological system, urbanized or natural, as well as on the socio-economic systems, and by selecting the optimal way for a proper and sustainable ecological development.

Certified architects and civil engineers shall promote the public comprehension of actions towards decreasing environmental damages and, wherever possible, repair existing damages and shall refuse any engagement which could possibly harm the public hygiene, health and environment. They must avoid environmental damage caused by construction and find the best possible architectural, technical and social solutions. In planning, they have to comply with the principle that space, landscape, the architectural, cultural and natural heritage are limited values with limited renewal possibilities.

Certified architects and civil engineers shall, in all situations, represent and defend the principles of mutual dependence, mutual harmony of the eco-system, sustainability of diversity and sustainable usage of the resources, as a basis of the existence which has a threshold of endurance that can not to be crossed.

SOURCES AND REFERENCES

Croatian Chamber of Architects website: www.arhitekti-hkaig.com/ENkodeks.aspx

Czech Republic

CZECH TECHNICAL UNIVERSITY IN PRAGUE
FACULTY OF ARCHITECTURE

Bachelor (3 years) + Master of Architecture and Urbanism (2 years)

Level: Undergraduate (Bachelor of Architecture, 3 years) + Graduate (Master of Architecture, 2 years)

Accrediting Body: Czech Chamber of Architects

Educational Aims: Architectural education at the Czech Technical University is based on a long tradition. Its foundations were laid in 1707 when the School of Engineering was established, while architectural education was initiated in the 1st half of the 18th century. It was related to the civil engineering science and conceived as a synthesis of art, science and technology. At the end of the 18th century, the original School of Engineering was transformed into the Prague Polytechnic, whose task was to educate experts for domestic industry, civil engineering and architecture. In 1920, two years after the foundation of the independent Czech-Slovak Republic the school was renamed to the Czech Technical University. The College of Architecture and Civil Engineering was one of the seven colleges (faculties) of CTU. After the war, the education continued at the College of Architecture and Civil Engineering until 1960, when a new faculty – the Faculty of Civil Engineering came into being by merger of several faculties. In 1976, the independent Faculty of Architecture was established. The civil engineering education remained at the Faculty of Civil Engineering. After 1989, both the structure and the organization of study at the Faculty had to undergo considerable changes, predominantly relating to the implementation of democratic principles in coherence with the Law on Universities 1990. In the period just after the "velvet revolution", under the influence of newly established organizations, the Civic Forum of Architects and the later established Society of Czech Architects, the "new regime" exponents started to penetrate into the faculty and initiate a reform of the rigid institution. The faculty has been gradually involving the young architectural generation belonging to the same intellectual stream. The instruction system was transformed from the classical system of departments, divided according to typology, towards a more liberal system, based on studio work under the leadership of creative architects from practice. Recent years (after 2000) are first of all marked by the entry of the Czech Republic into the European Union. This step has brought a series of structural transformations, which are gradually being absorbed and introduced into the every-day routine. The system change was initiated by the European Union and after the approval of the Bologna Declaration adopted by all European schools of Architecture. As a consequence, the Faculty of Architecture at CTU is step by step adapting to the newly arising system of European architectural education. The Czech Technical University currently offers a Bachelor and Master courses in Architecture and Urbanism. The study programme is fully accredited in the EU in accordance with Guideline 2005/36/ES.

Outline Description of Course: Since the academic year 2002/2003, the Faculty of Architecture has adopted a 3-year undergraduate courses culminating in a state final exam, which consists of examinations in selected subjects and the defence of a thesis. Graduates are awarded the degree of Bachelor in Architecture and Urbanism. Graduates of the Bachelor degree may, when conditions are met within the admission procedure, continue their studies in the Master programme, which has duration of two years. The Master degree culminates in a state final exam, which consists of an examination of the two blocks of subjects and the defence of a thesis. Graduates are awarded the title of Architect, Engineer (Ing.Arch.). Since the academic year 2008/2009, the previous Master degree program (six year) has been replaced by the current 3+2 structure (the last prospective students were admitted in the academic year 2001/2002). The basic feature of the curriculum at CTU is centred on developing creative abilities, enabling the search for new roads or paths to specialization in any field. The purpose of the Bachelor and Master degree programs at the CTU Faculty of Architecture is to provide students with basic technical knowledge in the field of architecture and urbanism in all its breadth together with the interdisciplinary links, skill and awareness that match the current requirements of the work of the architect and can be fully applied in professional activities. One of the fundamental principles of the academic programs at the Faculty of Architecture is a balanced share of mandatory and compulsory optional subjects which include humanities, theoretical, technical and artistic issues. The structure of the study program has been recognized in the EU since it fulfils the requirements of the education of architects as defined by the Council Directive 85/384/EEC and 2005/36/EC. Graduates can apply for registration in other EU countries, and thus work abroad, without having to demonstrate the content of studies and their knowledge in the field of architecture.

Course Structure: The CTU offers a Bachelor of Architecture and Urbanism which has three years of duration followed by a graduate Master of Architecture programme of 2 years of duration. The Master is also offered in English language and is intended for international students with a Bachelor of Architecture degree (or with a completed bachelor degree programme in related study branches). Within the Master degree study in English, the student must obtain 70 credits for requisite courses and 22 credits for elective courses, pass two state examinations - in Architecture and Urbanism and in Building Management - elaborate and successfully submit the diploma work/project for 28 credits. The number of credits necessary for the award of the degree is 120. A student having obtained 90 credits for the completion of requisite and elective courses is allowed to enrol on the diploma work/project. The state exams in Architecture and Urbanism and in Building`Management shall be passed before the diploma work/project submission procedure.

Master Degree Study of Architecture and Urbanism in English Language (2 years)

Semester 1

Title	*Compulsory/Elective*	*Credits/Lessons per week*
Architectural Design I	C	12
Visual Design I	E	2
History of Architecture I	C	2
History of Modern Architecture	C	2
Country Planning and Architecture	C	3
Urban Planning I	C	3
Technical Infrastructure	C	3
Building Physics	E	2
Building Technology	C	3
Building Economics and Management	C	4
Computer Aided Design I	E	2
Total requested		**30**

Semester 2

Title	*Compulsory/Elective*	*Credits/Lessons per week*
Architectural Design II	C	13
Visual Design II	E	2
Architectural Design and Technology	C	10
History of Architecture II	C	2
Contemporary Architecture I-II	C	2
Monument Preservation	C	3
Urban Planning II	E	2
History and Theory of Urbanism	C	3
Building Construction	E	2
Building Structures	E	2
Computer Aided Design II	E	2
Total requested		**30**

Semester 3

Title	*Compulsory/Elective*	*Credits/Lessons per week*
Visual Design III	E	2
Urban Design	C	10
Diploma Seminar	E	2
History of Theatre	E	2
Landscape Architecture	C	3
Building Law	C	2
Total requested		**30**

Semester 4

Title	*Compulsory/Elective*	*Credits*
Architectural Design and Technology	C	8
Visual Design IV	E	2
Diploma Project	C	28
Total requested		**30**

Learning Outcomes: The content of the curriculum involves knowledge of the fundamental aspects of architecture. Depending on the chosen profile of modules, students can gain knowledge on environmental design related issues in the area of urban design (Department of Spatial Planning) construction (Department of Building Construction) and building design (Department of Architectural Design).

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Throughout the Bachelor of Architecture and Urbanism, the programme is structured in parallel satellite modules which include the teaching of environmental-related issues. Over recent years, there has been a process of continuous changes to existing courses incorporating current topics of design and sustainability. Additionally, there have been courses added to the curriculum such as social ecology and renewable energy resources that broaden the subject of sustainable environmental design and support the modifications to existing courses. The faculty has 42 studios with some level of freedom in choosing projects and teaching methods. There are some basic requirements for the studio topics, but there can be different emphasis in the tutors' approach. Some of the studios focus more on social sustainability, some on environmental; some prefer to focus on issues other than sustainability. As a consequence, students get a choice of topics where sustainability can be one of the options. Therefore, at Bachelor level, the subject is not specifically defined as a core part of the curriculum and, through the freedom of choice, students can also get around it.

The study plan of the Master Degree implies the recommended succession of courses throughout the programme. In the course Visual Design I-IV the student can choose any of the currently offered courses, but maximum 2 per the whole study. Studios are enrolled under a code with an assigned thematic focus: AT SS Building structures; ATU Urban planning and design; AT VZ Free assignment studio; AT RN Implementation studio. There is no specific studio focusing on environmental design, although these issues are implemented within seminars and specific lectures. The AT SS studio requires elaborating a solution to a complex or ensemble of civic, industrial, and/or agricultural buildings with a complicated disposition plan. The free assignment studio allows a wider choice of assignments, such as the conceptual studio, furniture design studio or exhibition design studio, implementation studio, etc. The implementation studio (AT RN) can be also completed with the elaboration of a comprehensive urban design assignment.

STRENGTHS AND OPPORTUNITIES

Amongst the major strengths and opportunities of the curriculum:

Strengths:

- Issues of sustainability and environmental design are integrated in specific modules and are introduced in the architectural education;
- An increasing attention is paid to these issues. Sustainable and environmental design represents a part of the curriculum but more on an indirect approach.

Opportunities:

- There is an ongoing opportunity to tune the curriculum for the benefit of the student's preparation to their future career;
- There are several opportunities for the staff and the students to innovate and adapt their methodologies. Sustainable design can add depth to the subject of professional environmental and social ethics.

SOURCES AND REFERENCES

Faculty of Architecture website: www.fa.cvut.cz/en
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR PROFESSIONAL QUALIFICATION

Recognition of professional qualifications in the Czech Republic is regulated by Act No. 18/2004 Coll., on the *Recognition of Professional Qualification and Other Eligibility of Citizens of Member States of the European Union and Some Citizens of Other States and on the Amendment of Certain Acts* (Act on Recognition of Professional Qualifications), which was amended by Act No. 189/2008 Coll. in connection with the need to implement into the Czech legal system the Directive 2005/36/EC of 7 September 2005 on the recognition of professional qualifications.

Certification Code of the Czech Chamber of Architects

Selected Excerpts:

“Type, fields and specializations of certification and their designations:

(1) Certification is granted in accordance with the provisions of Section 4 of the Act, for

a) the type of certification of “architect“ (with general competence), with the numerical designation A.0 and authorization to use the designation protected by the Act (hereinafter referred to as the “protected title“) of “certified architect“ or the alternative designation “certified architect with general competence”),

b) the fields of certification of:

1. Architecture, with the numerical designation A.1 and authorization to use the protected title of “certified architect“,

2. Land-use planning, with the numerical designation A.2 and authorization to use the protected title of “certified architect – land-use planning“ or the alternative title of “certified urban planner”,

3. Landscape architecture, with the numerical designation A.3 and authorization to use the protected title of “certified architect – landscape architecture“, or the alternative title of “certified landscape architect“

Educational requirements for the field of Architecture

A course of study with a primary orientation towards architecture, urban and land-use planning and conceived of as multidisciplinary education throughout the whole period of study, and with a due proportional balance of technical and arts disciplines and theoretical and practical subjects, by which a graduate has attained the following capabilities, skills and knowledge, shall be considered as the recognized professional education necessary for certification in the field of “Architecture”:

a) The ability and skill to create architectural designs complying with artistic, aesthetic and technical requirements;

b) A knowledge of architectural history and theory and related arts, humanities and technologies;

c) A knowledge of culture, particularly the fine arts, as one of the significant factors influencing the quality of an architectural work;

d) A knowledge of urban and land-use planning, and the abilities and skills related to the planning and designing process;

e) An ability to understand the relationships between people and architectural works, between architectural works and their urban environment, and the need to relate architectural works and the spaces between them with human needs and scales;

f) An ability to understand the profession of an architect and his role in society, especially when preparing designs which consider social factors;

g) A corresponding knowledge of survey and analytical methods and the ability to prepare design briefs;

h) A knowledge of the whole process of building design and the ability and skill to solve structural and technical problems related to building design;

i) A knowledge of physical laws, building technologies and functions of buildings suitable to provide high-quality practical and technical standard and protection against the effects of the weather;

j) The ability and skill to design in a manner satisfying the requirements of building’s users within the limits set by economic factors and legal and technical regulations.

k) A knowledge of the industrial branches, technologies, standards and processes relating to the integration of partial special designs into an aggregate design, and to the organization of such aggregate designs.

Requirements for supervised professional practice and proof thereof for certification purposes

Supervised professional practice necessary for the purposes of certification means professional practice under the supervision of a certified person undertaken in an employment relationship or on the basis of a contractual relationship following on immediately from completed prescribed education and including to a commensurate degree all of the activities corresponding to the practice of the profession pursuant to the Act.

In the case of Master or Bachelor degrees, the subsequent supervised professional practice shall last at least three and five years respectively. Any continuous professional practice performed between a duly completed four-year Bachelors' degree and the beginning of a Master degree shall also be included in the total duration of supervised professional practice unless the Act sets forth for individual field otherwise.

In the event of a concurrence of professional practice performed between a completed Bachelor degree and the beginning of a Master degree or after a Master degree, the requirement for practice duration is commensurately reduced on the basis of the mutual relationship of their minimal durations. The period between the application for certification and the contributed time of supervised professional practice must not be longer than five years".

Summary of Criteria

Applicants for accreditation with a degree of "Bachelor of Architecture and Urbanism" have to have five years of supervised professional practice. Applicants for accreditation with a degree of "Master of Architecture and Urbanism" have to have 3 years of supervised professional practice. An exam has to be passed in order to be qualified.

Issues of environmental design are not part of accreditation criteria neither of the exam. Although the Certification Code points out certain abilities and knowledge of architects in a general manner, a fundamental understanding of the issues of sustainability or energy efficiency is not specifically mentioned.

SOURCES AND REFERENCES

Czech Chamber of Architects website: www.cka.cc/en

Denmark

ARKITEKTSKOLEN AARHUS

Bachelor of Architecture + Master Degree of Architecture (5 years)

Level: Bachelor of Architecture (3 years) + Master Degree of Architecture (2 years)

Accrediting Body: Danish Ministry of Culture

Educational Aims: The mission of the Aarhus School of Architecture is: to offer academic, profession-oriented education at the highest level within the field of architecture, plus PhDs within architectural fields; to offer profession-oriented supplementary and further education within architectural fields up to and including Master level; to perform research and artistic development work at the highest level directed at continuously qualifying the education, the practice of the profession, and the inter-disciplinary integration of architecture.

Outline Description of Course: The degree consists of 300 European credits (ECTS), which are distributed in 5 years that compose both educational cycles (Bachelor/Master). The first degree (Bachelor of Arts in Architecture) of the two-cycle program consists of three years and it aims to teach the student - in a rather theoretical way - the basic skills related to the construction, functionality and economy of the architectural project. It provides some background of the theories and architectural methods that will be developed in the following years but it also gives access to certain working functions. The first year is an initial training course in which the students' skills will be evaluated in order to decide whether they should continue or not with the training in architecture. In the second year, the student will go on with the basic training and both semesters will focus on a different architectural topic: architectural planning in the first one and architectural design in the second. In the third year, the student begins to specialize in one of four departments in which the Master Degree is divided. The following two years are necessary to complete the degree (which can be studied either in Aarhus or in Copenhagen) and involve four specialized departments, among which the students can choose to develop their professional specialization: Department of Architecture; Department of Landscape and Urban Planning; Department of Architectural Heritage; Department of Design. The four departments form the framework of the research and development efforts, and they plan and provide the teaching and training of the student. The curriculum also considers the possibility of dedicating some credits to external non-obligatory professional training to be validated as elective modules. Students at the Aarhus School of Architecture can gain practical experience through the practical training arrangement, which gives the students the possibility of integrating practical training in their course of study as a study element that (with regards to assessment) is an integral part equal to the other academic activities.

Outline Description of Course: The degree consists of 300 European credits (ECTS) which are distributed in 5 years of 60 credits each. Every year is divided into 2 semesters of 30 credits.

<u>Bachelor of Architecture (3 years)</u>

Year 1

In the first year, an architectural knowledge base is generated by theoretical concepts. This basic knowledge allows students to choose the tools with which they want to work. They handle concepts and ideas such as form, space, functionality, construction and context. At the same time, students have the option to attend different seminars along the year and will have to present written works.

Modules	*Credits*	*Taught*
Basic Module	6	Autumn
Tasks	20	Autumn
Written work	2	Autumn
History of Architecture	2	Autumn
Basic Module	6	Spring
Tasks	20	Spring
Written work	2	Spring
History of Architecture	2	Spring
Credit Total	**60**	

Year 2

In the second year, semesters are more differentiated and students work on a specific topic (Architectural Planning / Architectural Design) while they continue with their basic training, and also take some free choice modules and seminars.

Modules	*Credits*	*Taught*
Basic Module	4	Autumn
Architectural Design/Planning	13/15	Autumn
Elective Module	3	Autumn
Written work	2/4	Autumn

Individual study activity	3	Autumn
History and Theory of Architecture	3	Autumn
Basic Module	4	Spring
Architectural Design/Planning	13/15	Spring
Elective Module	3	Spring
Written work	2/4	Spring
Individual study activity	3	Spring
History and Theory of Architecture	3	Spring
Credit Total	**60**	

Year 3
In the third year, students distribute again their workload in two projects, one by each semester, while they continue with their basic training. During this year, the student begins his specialization by choosing one amongst the 4 existing departments with their own character, themes, aims and architectural projects to realise.

Modules	*Credits*	*Taught*
Basic Module	5	Autumn
Architectural Design	22	Autumn
History and Theory of Architecture	3	Autumn
Basic Module (Bachelor Project)	5	Spring
Architectural Design (Bachelor Project)	22	Spring
History and Theory of Architecture	3	Spring
Credit Total	**60**	

Master Degree of Architecture (2 years)

In the next two years, per each semester (semesters 7 to 9) the work of the student will go around a semester-long architectural project worth 30 credits. The project will be guided by the Department in which the student is specializing. Departments have different themes each semester with a program, a process of study, and a series of practical tasks (individual, group, study, etc.). During the last semester (semester 10), the students will embark on their final project.

Learning Outcomes: During the first two years, the school's programme endows the student with the basic knowledge of architectural training and from the third year onwards, it specializes the student according to four proposed lines: Architecture; Landscape and Urban Planning; Architectural Heritage; Department of Design. The student training will depend on the program of every Department.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

At the Aarhus School, the environmental training depends directly on the programs of the departments.

The **Department of Architecture** is a new department resulting from the unification of the "Department of Architecture and Aesthetics" and the "Department of Architectural Design", which will totally take place starting from the academic year 2010/2011, when there will be a complete joint syllabus for the previously existing departments. The Department of Architecture is responsible for formulating and pursuing strategies for developing building and design processes and concepts for the various applications seen in the light of internationalization, technological development and environmental demands and considerations. On this background, the department carries out research, innovation work and training within the fields of conceptual, technological, functional and environmental issues regarding housing buildings, industrial and commercial buildings and institutions. In the Master's curriculum of the "Department of Architectural Design", it is pointed out that students must have insight into the current conditions, including knowledge of environmentally problematic areas, and they must examine and challenge the profession. Every semester has a technological focus, which is studied in a project assignment. The focus is always examined in relation to the three areas of responsibility that the department has chosen to put attention to in the process of designing architecture: aesthetical responsibility, sustainable responsibility and social responsibility.

The **Department of Landscape and Urban Planning** is responsible for pursuing strategies for planning politics and spatiality for the development of cities, urban areas, public spaces, landscapes and infrastructural installations in relation to societal processes of change. Furthermore, the department attends to the accumulation and communication of knowledge within the field of social sciences. The department conducts research and development within the field of urban development, both nationally and internationally, in relation to both the cultural and the natural basis for residence and localisation of economic, technical and educational infrastructure. The perspective of the work is both strategic/urban political and administrative, and approaches are sociological, environmental, historical, aesthetic, and from the vantage point of planning theory.

STRENGTHS AND OPPORTUNITIES

The integration of environmental design in the curriculum does not depend as much on the School as on the Departments. Each one of the four departments has its own syllabus in which it indicates the strategic and academic areas of responsibility, profile of profession and where the main objectives are specified. This structure reveals a number of strengths and opportunities, namely:

Strengths:

- The overall purpose of studying is to develop designing skills in an integrated process;
- The studies are an integrated process for achieving knowledge and developing a project, where knowledge and competences are activated during the development of a project;
- It is a key point that it is the architecture and urban planning departments that have an environmental approach, as opposed to the design and heritage departments;
- The approach of the architect's environmental training as a transverse topic of architectural design to develop by the students in the Architecture Department is an example to follow;
- The learning around a design project allows the student to have a complete and coherent vision of all the components of the design process and their interrelations. The questions related to sustainability and their relations to other considerations (e.g., design, installations, energy efficiency, etc.) are especially important;
- The environmental training of the architect within the workshop does not depend on free choice modules;
- The Department of Architecture approaches environmental design not only as a technical training, but also as an ethical question on the part of the architect, conferring to these issues a value that goes beyond the strictly legal one.

Opportunities:

- The proposal of the Architecture Department is a good example for the integration of environmental design in university curricula and architectural training in Europe;
- Students are highly conscious and claim an environmental integrated training;
- The teaching methodology shows that a 'learning by doing' approach can bring tangible results and successfully link objective physical measures with inspiring design.

SOURCES AND REFERENCES

Aarhus School of Architecture website: http://aarch.dk

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

The Architects' Association of Denmark (AA)

The AA is an independent professional association established in 1879 with the prime duty to advance and promote architectural quality by influencing the planning and design of the physical environment in the widest possible context. The AA works to promote excellence in the profession and to improve the conditions for the provision of architectural services for the benefit both of the members of the association (the MAAs) and for everybody who uses towns, cities, buildings and products. The 7,000 members of AA have the sole right to the title Architect MAA, Member of the Architects' Association of Denmark, the name of the original association. AA is organized in 7 local divisions who elect the members of the Federation's Council of Representatives as well as the members of the Federation's Standing Committees with special competence in design, architecture and planning. The publishing house within the Association, *Arkitektens Forlag*, publishes magazines dealing with all aspects of professional interest to the members of AA. AA is represented in a large number of national and international organizations and is a member of the Architects Council of Europe (ACE) and the International Union of Architects (UIA).

The Federation of Danish Architects/Academic Association of Architects (DAL/AA) was formed in 1951 by the merger of the Academic Association of Architects and the Federation of Danish Architects.

Danish Association of Architectural Firms (DANSKE ARK)

DANSKE ARK is a Danish business association of private firms of consulting architects. DANSKE ARK represents almost all architectural firms in Denmark. DANSKE ARK works to promote the interests of member firms vis-à-vis other parts of the building and construction industries, government and the general public. DANSKE ARK negotiates general agreements on salaries and working conditions with the relevant trade unions. DANSKE ARK has more than 730 members in Denmark. In total the firms employ around 4,800 graduate architects, constructing architects and other technical and administrative employees and account for almost the entire aggregate building contract sums in Denmark. The size of the member firms ranges from one man firms to Denmark's largest architectural firms with more than 250 employees in Denmark and abroad. The member firms had in 2008 a total turnover of 449 EUR million. The Danish architects experienced in 2008 a small increase in foreign projects. From 2007 to 2008, the foreign turnover increased by almost 2 per cent to 63 EUR million. As in 2007, 14 per cent of the total turnover derives from projects abroad. Of the foreign turnover of 63 EUR million, exports accounts for 75 per cent and the rest is from foreign subsidiaries, departments and partners. As per architectural facts in Denmark:

- There are approximately 7,200 architects in Denmark, graduates of the country's schools of architecture;
- There are 675 registered architectural firms in Denmark, 27% one-man and about 33% two-man operations;
- About 80% of total contract costs is payable to registered firms of architecture.

Accreditation of academic curricula

Since 1999, EVA (Danish Evaluation Institute) has systematically assessed programmes and institutions within higher education. EVA has been responsible for external quality assurance of short, medium and long cycle programmes. In 2007, an Act of Parliament introduced systematic accreditation of all higher education programmes in Denmark (ex ante and ex post) as mandatory external quality assurance. In addition to this, the act introduced a new accreditation agency for long cycle programmes, ACE DENMARK, responsible for accrediting university programmes, with EVA being responsible for accrediting short and medium cycle programmes. Within accreditation, EVA tasks are:

- Initial accreditation assessment of short and medium cycle programmes;
- Clustered accreditation assessment of short and medium cycle programmes;
- Initial accreditation and accreditation of other existing higher education programmes (excluding university programmes), e.g. maritime education programmes and programmes in design and architecture amongst others under the Ministry of Cultural Affairs;

Other tasks include:

- System-wide analysis within the field of higher education;
- Revenue-generating activities within the field of higher education (including the university sector), e.g. evaluations of programmes or research or knowledge centres or policy studies;
- Presentations, seminars and conferences on quality issues within higher education.

By law, EVA is entitled to engage in revenue-generating activities, and about half of EVA's activities are commissioned tasks, e.g. on behalf of ministries, higher education institutions or non-governmental organisations. The ENQA Board re-confirmed the Full membership of EVA in ENQA (European Association for Quality Assurance in Higher Education) in September 2006 on the basis of the external review of the Agency conducted in 2005 and of the supplementary review that looked at EVA's compliance with the ESG, which was completed in 2006.

Conditions for Professional Qualification

Minimum length of study for professional qualification in Denmark is five years. Danish architecture education programmes at the two national schools of architecture are governed by Directive 2005/36/EC of the European Parliament and of the Council on the recognition of professional qualifications (the Professional Qualifications Directive). The AA Secretariat has a list of other architecture programmes recognised under the Directive in other EU member states, EEA countries and Switzerland. Rules 2(2) and 2(3) of the Rules of the Architects' Association of Denmark (AA) state that architects not covered by the Professional Qualifications Directive may apply for admission by the *AA Qualification and Admission Board*. Similarly, architects may have their qualifications assessed with a view to being recognised as architects under the Professional Qualifications Directive (see the Order on Recognition of Diplomas in the Field of Architecture issued in an EU Member State, in an EEA country or in Switzerland and the Order on Construction Designers Graduated Before 31 December 1998), as may people who have completed an educational programme in a third country but obtained their professional qualifications in another EU or EEA Member State. AA must check that the conditions set out in Article 13 of the Professional Qualifications Directive are met. Articles 11 and 12 of the Directive must be applied in the consideration of an application. The Board will not take any position on the seniority of successful applicants. Applicants who apply for AA membership or for assessment must submit the information and material listed in items A and B below. The Board normally meets four times a year: in January, April, August and November.

Evidence of the applicant's professional qualifications must be provided in a written application accompanied by examples of professional production resulting from professional activities carried out in recent years after completion of a theoretical training and education programme. The material to be assessed must be sent to the AA Qualification and Admission Board and must comprise the following:

A. Personal data

- Evidence of the applicant's educational background, formal education, vocational and professional training, any skills and experience from a trade, and any programmes of further education completed;
- Evidence of enrolment in programmes and examinations passed at schools of architecture in other countries;
- Evidence of enrolment at a school of architecture recognised by the EU, if applicable, and the reason why the applicant did not complete his or her studies;
- Information about employment in architectural practices or other employment as an architect. Documentary evidence may be enclosed, but references will not be taken into account in the Board's assessment of the applicant;
- Non-Danish applicants must provide information on any employment in Denmark.

B. Examples of the applicant's professional production

The material submitted to the Board must document the applicant's professional qualifications within the architectural area(s) in which he or she has worked. The following requirements apply:

- Work carried out for or in collaboration with others may be included in the assessment material, provided that the specific contribution of the applicant is documented;
- The material submitted must show evidence of the applicant's own qualifications and competencies. Submission of general material relative to a specific building project is not sufficient;
- The material may include both realised and unrealised projects. This means that competition entries may be submitted, for example;
- At least three projects must be presented, preferably also including sketches, publications, animations, photos and similar material, if possible;
- The applicant must explain why the projects submitted have been selected to present the applicant's professional production;
- Application material that does not mainly consist of drawings - for example books, reports or descriptions of professionally relevant administrative work or teaching - must be submitted in a form that makes it possible to assess the material.

The Board will base its assessment on the eleven points listed below, which are identical with the points listed in Article 46 of the Professional Qualifications Directive that set out the training requirements applying to architects in Europe (Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications). The training must maintain a balance between theoretical and practical aspects of architectural training and guarantee the acquisition of the following knowledge and skills:

1. Ability to create architectural designs that satisfy both aesthetic and technical requirements.
2. Adequate knowledge of the history and theories of architecture and the related arts, technologies and human sciences.
3. Knowledge of the fine arts as an influence on the quality of architectural design.
4. Adequate knowledge of urban design, planning and the skills involved in the planning process.
5. Understanding of the relationship between people and buildings, and between buildings and their environment, and of the need to relate buildings and the spaces between them to human needs and scale.
6. Understanding of the profession of architecture and the role of the architect in society, in particular in preparing briefs that take account of social factors.
7. Understanding of the methods of investigation and preparation of the brief for a design project.
8. Understanding of the structural design, constructional and engineering problems associated with building design.
9. Adequate knowledge of physical problems and technologies and of the function of buildings so as to provide them with internal conditions of comfort and protection against the climate.
10. The necessary design skills to meet building users' requirements within the constraints imposed by cost factors and building regulations.
11. Adequate knowledge of the industries, organisations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning.

The profession of architect covers a wide range of activities, but for all of them architectural competencies such as the ability to provide an accurate formulation of the basic concepts of the project and mastering design are important prerequisites for the achievement of the title of architect and for becoming a member of the Architects' Association of Denmark and using the abbreviation MAA after the title.

Even applicants who have pursued a line of specialisation or whose professional activities have generally been of a theoretical nature must submit material that enables the Board to make an overall assessment of whether the applicant's academic and professional qualifications should result in a favourable decision and possibly admission as a member of the Architects' Association of Denmark. In other words, the applicant must state in his or her application how the eleven points of the Directive quoted above relate specifically to his or her qualifications.

Applicants who wish to become members of the Architects' Association of Denmark (AA) and applicants who request assessment with a view to obtaining the title of architect must pay a fee before the assessment is made. If the outcome of the assessment of an application is negative, a new application may not be submitted for three years after the application was rejected.

SOURCES AND REFERENCES

DANSKE ARK Website: www.danskeark.org
AA Website: www.arkitektforeningen.dk

France

ECOLE NATIONALE SUPERIEURE D'ARCHITECTURE DE GRENOBLE

Bachelor of Architecture (3 years) + Diploma in Architecture (2 years)

Level: Undergraduate (BArch, 3 years) + Graduate (DipArch, 2 years)

Accrediting Body: Conseil National de l'Ordre des Architectes

Educational Aims: The ENSAG trains mainly practitioners who intend to exercise the liberal profession of architect. Architecture education is made in "studios". The strategic place of the studio is strengthened by a better coherence between all the teaching units, by an interaction with the common courses and by a harmonization of the level of requirements (contents and objectives of the formation). The architectural and urban design studio sits at the heart of the curriculum and of the formation. It is a question of not dividing the education of architecture into two constituents, which would separate the theoretical courses from the practical know-how. The studio is the place of learning of architectural design and town planning. In this context, it remains a place opened to other disciplines and to all the diverse teaching members (including professors and assistants not from the studios). The presence of teaching members which are not exclusively practicing architects ensures the link between the professional world and education. The courses are the natural place for the bases of Architecture: the courses constitute the common core of the curriculum bringing the fundamental knowledge. They are often followed by exercises. Besides, there are several other subjects which are offered as electives modules. Sustainable development is an important element of the educational culture of the school. It marks the curriculum in several places within the program, being considered as one of the priorities and an important aspect of any architectural project and not as a special stream of education. ENSAG also includes an internship and practical training within its study programme.

Outline Description of Course: The first 3 years (Bachelor) of the programme lead to the Diploma of Studies in Architecture (DEEA), conferring the rank of Bachelor's degree (licence) and allowing the student to acquire the bases concerning: architectural culture; understanding and practice of the architectural design by knowledge and experimentation of concepts, methods and fundamentals; design processes. The second cycle of 2 years leads to the State Architect Diploma, conferring the rank of Master/Diploma degree.

Course Structure: The Bachelor is organized in 6 independent semesters (180 ECTS) and corresponds to 4.200 hours of students' work, of which 2.200 hours are supervised by professors. It contains two periods of internship or practical training that allow the students to experience the "multi professional" aspect of architectural practice. Within the Diploma degree program, the ENSAG proposes six themes, which balance projects and seminars. In every semester, the students can, if they wish, change their choice: 1. Architecture as a discipline; 2. Architecture between uses and urban landscapes; 3. Architecture and constructive cultures; 4. Construction-large territories-cities; 5. Architectures and sensitive cultures of the environment; 6. Sustainability, city, mountains (6a. Architecture, landscape, mountain; and 6b. Sustainability and placed Architecture, City). The Diploma is organized in 4 semesters (120 ECTS). The program contains 2.600 hours of students' work, of which 1.200 hours are directly supervised. The Diploma integrates a practical training course of 2 months minimum, an initiation to the research, the preparation of a thesis and a final studio (PFE). This work consists of an architectural or town planning studio accompanied by a presentation report. It amounts to approximately 200 hours of personal work per semester.

<u>Bachelor of Architecture (3 years)</u>

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
L1A1	Projet (Design studio)	6	Autumn
L1A2	Dessin (Drawing)	3	Autumn
L1C1	Langage des formes (Language of forms)	6	Autumn
L1C2	Matières et matériaux (Textures and materials)	3	Autumn
L1C3	Descriptive (Description)	2	Autumn
L1H1	Penser l'architecture à partir de l'étonnement (Architecture and surprise)	2	Autumn
L1H2	Pensée architecturale à différentes échelles (Architecture and scale)	2	Autumn
L1H3	Historique de l'architecture et de la construction (History of architecture)	2	Autumn
L1H4	Architecture et Art Moderne (Architecture and modern art)	1	Autumn
L1L1	Informatique (Informatics)	2	Autumn
L1L2	Langues (Languages)	1	Autumn
L2A1	Projet (Design studio)	6	Spring
L2A2	Dessin (Drawing)	3	Spring
L2C1	Micro-architecture (Micro-architecture)	6	Spring
L2C2	Statique, équilibre et structure (Statics, equilibrium and structure)	3	Spring
L2C3	Sciences appliquées à la construction (Science applied to construction)	2	Spring
L2H1	Introduction au débat contemporain (Introduction to contemporary debate)	1	Spring

L2H2	Architecture et art contemporain (Architecture and contemporary art)	1	Spring
L2H3	Lecture de la ville à partir de la ville de Pienza (Reading the city, Pienza case study)	2	Spring
L2S1	Introduction à la sociologie urbaine (Introduction to urban sociology)	2	Spring
L2S2	Cultures de l'habiter (Cultures and inhabitation)	1	Spring
L2S3	Projet, art et architecture (Design, art and architecture)	2	Spring

Credit Total 60

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
L3A1	Projet (Design studio)	10	Autumn
L3A2	Cours théorique d'architecture (Theoretical course of architecture)	2	Autumn
L3C1	Systèmes constructifs (Construction systems)	4	Autumn
L3C2	Ambiances (Atmospheres)	1	Autumn
L3C3	Mécanique des structures (Mechanics of structures)	2	Autumn
L3L1	informatique (Informatics)	2	Autumn
L3L2	Langues (Languages)	1	Autumn
L3V1	Aménagement et politiques de développement local (Politics of local development)	2	Autumn
L3V2	Le logement et l'habiter en questions (Housing and inhabiting in questions)	2	Autumn
L3V3	Analyse des formes urbaines (Analysis of urban forms)	2	Autumn
	Stage ouvriers (Probationary practice)	2	Autumn
L4A1	Projet (Design studio)	10	Spring
L4A2	Cours théorique d'architecture (Theoretical course of architecture)	2	Spring
L4C1	Cultures et logiques constructives (Cultures and constructive logics)	6	Spring
L4C2	Construction et environnement (Construction and environment)	2	Spring
L4H1	La multiplicité des langages modernes de l'architecture (Multiple modern languages)	2	Spring
L4H2	Cultures et architecture contemporaines (Cultures and contemporary architecture)	2	Spring
L4L1	Dessin (Drawing)	3	Spring
L4L2	Informatique (traitement d'image) (Informatics – image processing)	2	Spring
L4L3	Ouvertures sur les pratiques professionnelles (Introduction to professional practices)	1	Spring

Credit Total 60

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
L5A1	Projet (Design studio)	10	Autumn
L5A2	Cours théorique: dimension urbaine d'un projet (Theoretical course: urban dimension)	2	Autumn
L5C1	Maitrise des ambiances (Management of atmospheres)	4	Autumn
L5C2	Economie de la construction (Economics of construction)	2	Autumn
L5C3	Historique de la construction (History of construction)	3	Autumn
L5L1	Langues (Languages)	1	Autumn
L5L2	Infromatique (Informatics)	3	Autumn
L5L3	Préparation au rapport d'études (Preparation to report on studies)	1	Autumn
L5S1	Politique de la ville (Urban politics)	3	Autumn
L5S1	Urbanisation urbanisme et politiques publiques (Urbanisation, urbanism and politics)	2	Autumn
L6A1	Projet (Design studio)	10	Spring
L6A2	Cours théorique: dimension constructive (Theoretical course: constructive dimension)	2	Spring
L6H1	Fondements théoriques de l'architecture (Theoretic foundations of architecture)	2	Spring
L6V1	Histoire de la ville (History of the city)	2	Spring
L6V2	Théorie de la ville (Theory of the city)	2	Spring
L6V3	Institutions et droit de l'urbanisme (Institutions and law of urbanism)	2	Spring
	Rapports d'études (Report on studies)	5	Spring
	Stage pratique (Professional practice)	4	Spring

Credit Total 60

<u>Diploma in Architecture (2 years)</u>

Year 4 (*Elective Modules*)

Code	*Title*	*Credits*	*Taught*
	Projet (Design studio)	16	Autumn
	Séminaire (Seminar)	6	Autumn
	Projet (Design studio)	15	Spring
	Séminaire (Seminar)	5	Spring

(*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
M1CV1	Projet urbain (Urban design studio)	4	Autumn
M1CV2	Construction/ambiances/soutenabilité/accesssibilité (Construction/sustainability)	4	Autumn
	Espace matières, sociétés (Spaces, materials, society)	2	Spring

Code	Title	Credits	Taught
	Mémoire (Thesis)	8	Spring
	(Optional) Options	2	Spring

Credit Total 60

Year 5 (*Elective themes*)

Code	*Title*	*Credits*	*Taught*
	Projet (Design studio)	15	Spring
	Séminaire (Seminar)	5	Spring
	Projet de fin d'études (et séminaire) (Final project and seminar)	12	Spring
	Soutenance PFE (Defence Final Studio PFE)	10	Spring

(*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
	Communication/préparation aux exercices professionnels (Communication / practice)	5	Autumn
	Outils numériques (Numerical tools)	3	Autumn
	Langues (Languages)	2	Autumn
	Préparation au stage (Preparation of practice)	8	Spring

Credit Total 60

Learning Outcomes: The programme of the Bachelor and Diploma in Architecture allows the students to consolidate a critical thought, to approach architectural design in an autonomous way and to gain understanding of the construction processes, therefore getting prepared for the various modes of exercise and professional domains of architecture and for research in the field.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Various teaching modules related to sustainable development have been integrated since 2006 into the pedagogy of the ENSAG, at Bachelor and Diploma level, delivered in both theoretical courses and studios.

During the License (Bachelor), all the basic key components for the understanding of sustainable design are taught. In the first year, the course "Langage des forms" (**Language of forms**) is one of the first courses to talk about sustainable development. This course leads to the discovery and understanding of traditional and contemporary constructive cultures. It allows putting references and defining possible fields of investigation, so as to connect architectural production, social request and sustainable development.

In the second semester, the course entitled "Introduction au débat contemporain" (**Introduction to contemporary debate**) presents chronologically a series of interventions allowing the understanding of the architectural history and putting in perspective the huge current stakes in the construction industry.

During the second year, the course "Ambiances" (**Atmospheres**) presents the basic notions of comfort and atmosphere and shows how these elements can be taken into account and integrated in the architectural design. Three essential elements are introduced and investigated: climate, light and sound, in their sensitive (perceptive) and technical aspects. This knowledge is collocated in the approach of architectural and spatial design by questioning some references.

At the same time, the courses "Aménagement et politiques de développement local" (**Politics and planning of local development**) and "Analyse des formes urbaines" (**Analysis of urban forms**) redefine the contemporary environmental parameters of design at territorial and urban level.

During the fourth semester, the course "Construction and environment - Enjeux de l'éco-conception dans la production du cadre bâti" (**Construction and environment** - **Stakes of eco-design in the production of the built environment**) presents the relation and the coherence between architectural conception and "sustainable" parameters including energy, bioclimatic architecture, health, ecology and local specificities. The parameters of eco-design presented in the course are composed by: historical and contextual awareness of the relation between sustainable development and construction; the fundamentals of the bioclimatic conception; the architectural parameters which allow the climatic intelligence of the building envelope; proposition of a methodology of eco-conception: how to structure a not linear creative process to obtain a successful result from the energy point of view; analysis of examples of bioclimatic projects.

During the third year of the Bachelor, the course "Atmosphere II - Maîtrise des ambiances" (**Management of atmospheres**) presents the basic tools and working approaches allowing the integration of environmental data during the design process in a logic of sustainable development, and shows how these data are strictly connected to our historic, social and cultural environment. The students are invited to integrate the simple physical phenomena which bind the various parameters and the impact of the necessary notions to follow the evolution of the concepts and the tools.

Also within the Bachelor, some design studios are directly related to environmental and sustainable design. For example, a special theme for the third year studio is centred on the creation of a “river harbour” on the municipality of Culoz. In this studio, students have to realize an environmental diagnosis of the site, have to optimize the environmental conception of the design, and evaluate the impact of their project.

In the first year of the Diploma program, the compulsory and common course for all students entitled “Construction / ambiances / soutenabilité / accessibilité” (**Construction / atmosphere / sustainability / accessibility**) gives a global outline of the constituting and varied elements that together contribute to define the notion of urban project, by advancing its architectural dimension. The course is structured on the interaction between analytical studies of diverse case studies of urban projects on one hand, and the introduction of a set of "fundamentals" texts, on the other hand.

In the Diploma programme, the main characteristic is the close interaction between courses and the studios. This characteristic is a common point of most of the six themes that students can choose from:

1. Architecture as a discipline
2. Architecture between uses and urban landscapes.
3. Architecture and constructive cultures
4. Construction- large territories-cities
5. Architectures and sensitive cultures of the environment
6. Sustainability, city, mountains:
    - 6a. Architecture, landscape, mountain
    - 6b. Sustainability and placed Architecture, City

Some of the themes presented are directly related to sustainable design. For example, a special theme for the elective Diploma module entitled “**Architecture and sensitive cultures of the environment**” is to conceive the integration of solar energy into a design project. In collaboration with the Institut National de l’Energie Solaire (INES), one of the main projects is offered to students in Architecture enrolled in the 1st year of the Diploma degree program. The main objective is to familiarize students with the implementation and utilisation of solar energy in architectural design. Presenting all the new techniques of application of solar energy, it proposes a detailed approach to the design, from passive to active solar strategies.

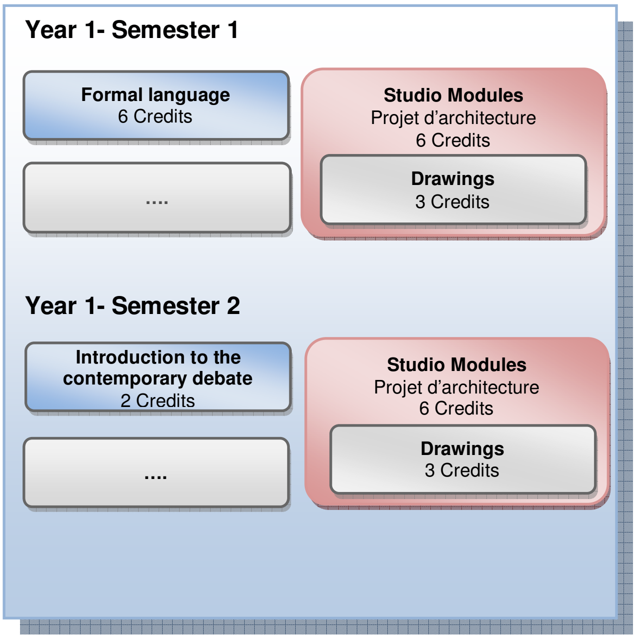
Another theme, developed in collaboration with the Institut d’urbanisme de Grenoble, the Institut de Géographie alpine, the Master Mobat and others partners, is “Chaleur urbaines” “(**Summer heat island**). This project is seen as a specific challenge for the city of Grenoble. The summer heat in Grenoble is often unbearable and with the announced global warming, this situation risks to get worse. Therefore, our way of living and our urban practices have to be modified. The worst can be previewed, but it is also the opportunity to raise a collective awareness so as to modify our manners to conceive and live in our environment, and combat and minimise the scale of climate change. From these stakes, 5 studios are established to experiment with projects and scientific research and provide an answer to the following problems: how to deal with hot season in the urban spaces? as architects, which position do we take today beside the climatologists, the geographers, the sociologists, the engineers, the town planner, the politics, and users?

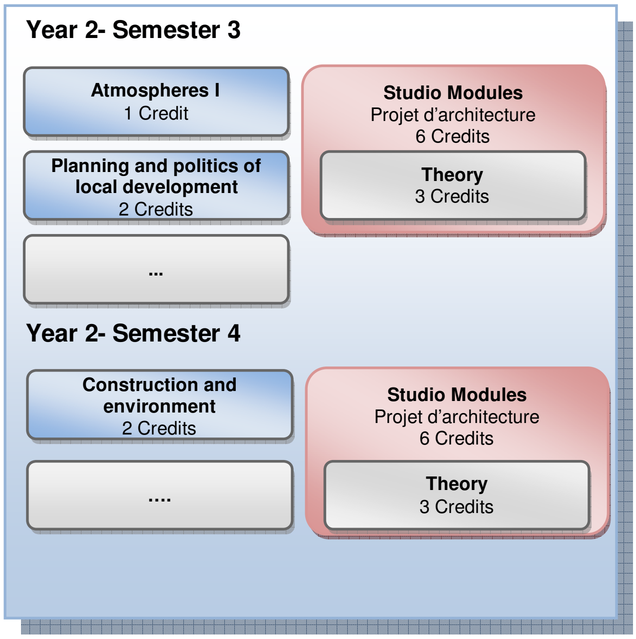
A theme for the orientation “**Architecture and constructive cultures**” of this year is centred on the participation at the International Solar Decathlon Europe 2010 to be hosted in Madrid. The aim of the competition is to conceive and to build a prototype of autonomous solar housing environment. The team for the project - called Armadillo Box - is composed by students from the ENSAG and the Polytech' Savoie, hoping to bring concrete answers to the question of building energy consumption. For this purpose, the team envisages a "low tech" passive envelope with strong heat insulation and with the use of natural and low cost materials, covered with a "high tech" envelope which produces solar energy. The project also integrates the question of transport into the energy balance. For the students, the objectives of this project are: estimation of the thermal resistance of the envelope and calculation of projected energy consumptions; calculation of the total embodied energy; structure of their environmental and sustainable design.

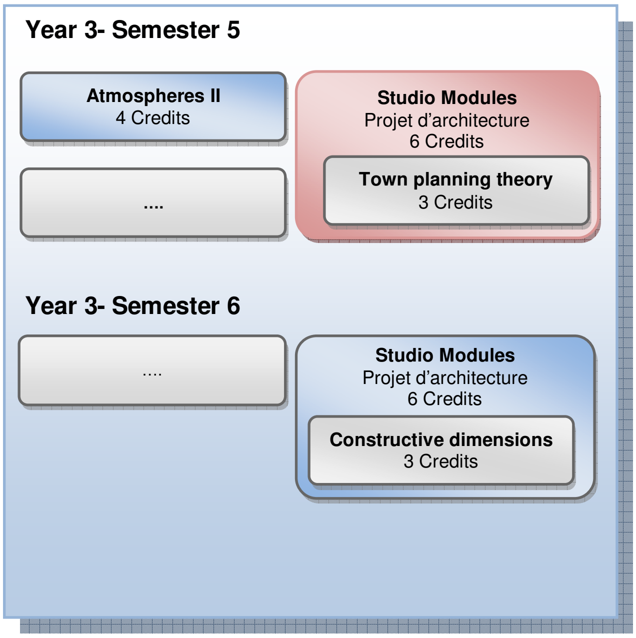
In the orientation “**Construction, large territories and cities**”, a proposed theme is City, territory and society. The project presents the notions of sustainable territories. In partnership with numerous European schools of architecture (e.g., ENSA Toulouse, Bordeaux, Paris la Villette, Politecnico di Torino, University of Cluj, Ljubljana, etc.) the seminar course, “**Architecture landscape and mountains**” introduces the problems relative to the development in mountains, in terms of protection and planning of sensitive sites and in terms of sustainability, from an economic, social, ecological, esthetical and ethical point of view.

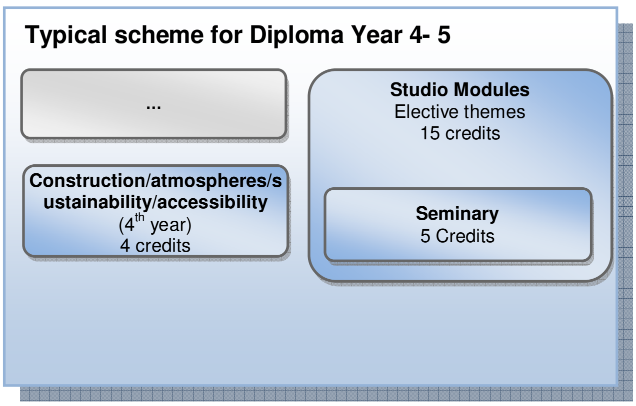
During the Diploma, some students can also participate at the “Biennale de l’habitat durable de la ville de Grenoble”. A complementary Diploma course about “Earth architecture” is also organized at the ENSAG.

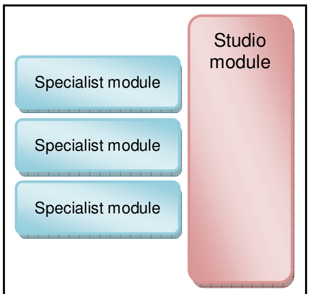
Integration of Environmental Design with Studio – Bachelor and Diploma in Architecture



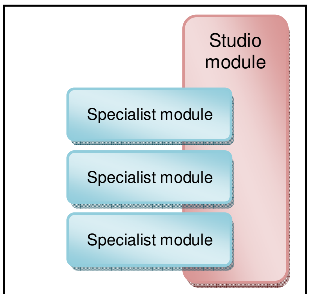




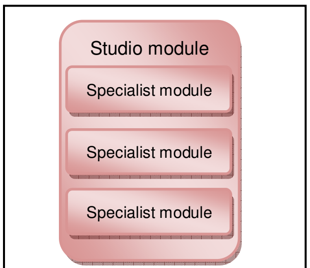




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Strengths:

- The curriculum is based on experimental learning theory and allows students to experiment full-size construction case studies, as in the studios “Grands Ateliers of Isle d’Abeau” (GAIA) - a technical platform built in 2001 in support of “learning by doing” pedagogies;
- The participation in studios focused on international projects such as the Solar Decathlon and other events such as the “Biennale de l’habitat durable de la ville de Grenoble”;
- The collaboration with various partners for the design studio and courses as INES (Institut National de l’Energie Solaire) and others European universities.

SOURCES AND REFERENCES

ENSAG website: www.grenoble.archi.fr
Academic Surveys and Feedback

ECOLE NATIONALE SUPERIEURE D'ARCHITECTURE DE NORMANDIE

Bachelor of Architecture (3 years) + Diploma in Architecture (2 years)

Level: Undergraduate (BArch, 3 years) + Graduate (DipArch, 2 years)

Accrediting Body: Conseil National de l'Ordre des Architectes

Educational Aims: The undergraduate Bachelor program of studies in Architecture at the ENSA Normandy leads to the "Diplôme d'études en Architecture". This program aims to set the basic knowledge concerning the discipline of architecture. The course depends on an alternate and localized approach within the framework of associated supervised work in the studio. It is a question of learning the fundamental keys and of trying out the application on a case-by-case basis. The Diploma / Master Program leads to the "Diplôme d'Etat d'Architecte". The course is based on a logical and open sharing of information and experiences within design studios and research. The domains of research are established on three main themes, which are the main specificities of ENSAN: Innovation; Town planning; Urban project & environmental landscape. All students have to integrate one of these themes in their final thesis.

Outline Description of Course: The Bachelor is dedicated to the formation of the methods and fundamental issues of Architecture. The design studio is thus placed at the centre of the learning, and design is continually investigated in its historic, artistic, scientific, technical, cultural and social aspects. The Diploma program is dedicated to the intensification of the knowledge already achieved during the 1st cycle, in its close relation with the project, and in the development of the design capacity and autonomy of the students. The program allows the student to build a personal project which will lead him/her either towards a mode of exercise of the architect's profession, or towards doctoral studies and research.

Course Structure: The Bachelor of Architecture is structured in 3 years of course followed by the 2 years of the Diploma / Master of Architecture.

<u>Bachelor of Architecture (3 years)</u>

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
10S01UE1	Architecture 1 - décrire, représenter, projeter (describing, representing, designing)	15	Autumn
10S01UE2	Sciences humaines et sociales 1 (Human and social sciences)	4	Autumn
10S01UE3	Arts et techniques de la représentation 1 (Arts and representation techniques)	5	Autumn
10S01UE4	Modéliser, construire (Modelling, building)	3	Autumn
10S02UE1	Architecture 2 – usages et references (Uses and references)	14	Spring
10S02UE2	Sciences humaines et sociales 2 (Human and social sciences)	5	Spring
10S02UE3	Arts et techniques de la représentation 2 (Arts and representation techniques)	5	Spring
10S02UE4	Construction et informatique 2 (Construction and informatics)	3	Spring

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
10S03UE1	Architecture 3 – contexte, limites et sociabilité (context, limits, sociability)	14	Autumn
10S03UE2	Sciences humaines 3 (Human sciences)	6	Autumn
10S03UE3	Arts 3 (Arts)	5	Autumn
10S03UE4	Maîtrise des ambiances (Management of atmospheres)	4	Autumn
10S03UE5	Stage en situation ST1 (Professional practice)	3	Autumn
10S04UE1	Architecture 4 – contexte et matérialité (Context and materiality)	14	Spring
10S04UE2	Sciences humaines 4 (Human sciences)	4	Spring
10S04UE3	Arts 4 (Arts)	5	Spring
10S04UE4	Structure 1 (Structures)	4	Spring

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
10S05UE1	Architecture 5 (Architecture)	14	Autumn
10S05UE2	Sciences humaines 5 (Human sciences)	5	Autumn
10S05UE3	*Optionnel* (*Optional module*)	3	Autumn
10S05UE4	Structure 2 (Structures)	4	Autumn
10S05UE5	Stage en situation ST2 (Professional practice)	6	Autumn
10S06UE1	Architecture 6 – tracer, découper, bâtir (tracing, cutting, building)	15	Spring
10S06UE2	Sciences humaines 6 – patrimoine et transformations urbaines (Heritage)	6	Spring
10S06UE3	Anatomie de l'enveloppe (Anatomy of the envelope)	4	Spring
10S06UE4	Rapport d'études (Report on studies)	4	Spring

Diploma in Architecture (2 years)

Year 4 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
10S07UE1	Projet architectural innovation et context (Design studio - innovation and context)	13	Autumn
10S07UE2	Séminaires– phase exploratoire (Research seminar - exploration phase)	7	Autumn
10S07UE3	Enseignements thématiques (ET) - innovation (Thematic teaching - innovation)	5	Autumn
10S07UE4	*Optionnels (Optional modules)*	3	Autumn
10S08UE1	Projet architectural paysage et environnement (Landscape and environment)	13	Spring
10S08UE2	Séminaires– problématique et développement (Problems and development)	11	Spring
10S08UE3	ET - paysage et environnement (Landscape and environment)	5	Spring
10S08UE4	*Optionnels (Optional modules)*	3	Spring

Year 5 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
10S09UE1	Projet urbain (Urban design)	13	Autumn
10S09UE2	Séminaires de recherche – synthèse et langues (Synthesis and languages)	8	Autumn
10S09UE3	ET – transformation et representation (Transformation and representation)	5	Autumn
10S09UE4	Stage de formation pratique ST3 (Professional practice)	11	Autumn
10S10UE1	Atelier PFE (Final design studio)	17	Spring
10S10UE2	Les outils et les acteurs des métiers de l'architecture (Tools and actors)	6	Spring

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Several educational activities integrated into the pedagogy of ENSA Normandy are directly related to sustainable and environmental design, including bioclimatic architecture, renewable materials, etc. The implementation of such themes is in place since 2007/2008 in a transversal way, although there is no particular course specifically related to sustainable development. The themes dedicated to environmental sustainability are in fact treated in theoretical courses and the design studios or in further education within the framework of TEASED (Regional Committee of further education in Architecture).

Amongst the courses on offer at undergraduate (Bachelor) level, the objectives of the second year module **"**Maîtrise des ambiances" (**Management of atmospheres**) are to introduce students to the environmental approach which will be developed in the Diploma programme, particularly in terms of the thermal, luminous and sound dimensions of our environment, and to present the fundamental bases of the behaviours of buildings to guarantee better controlled environments and qualities of use and of design of the projects.

During the third year of the Bachelor, "Anatomie de l'enveloppe" (**Anatomy of the envelope**) leads to the development of the necessary tools for the design of building skins in the context of comprehensive environmental design. The course also presents current European regulations and directives.

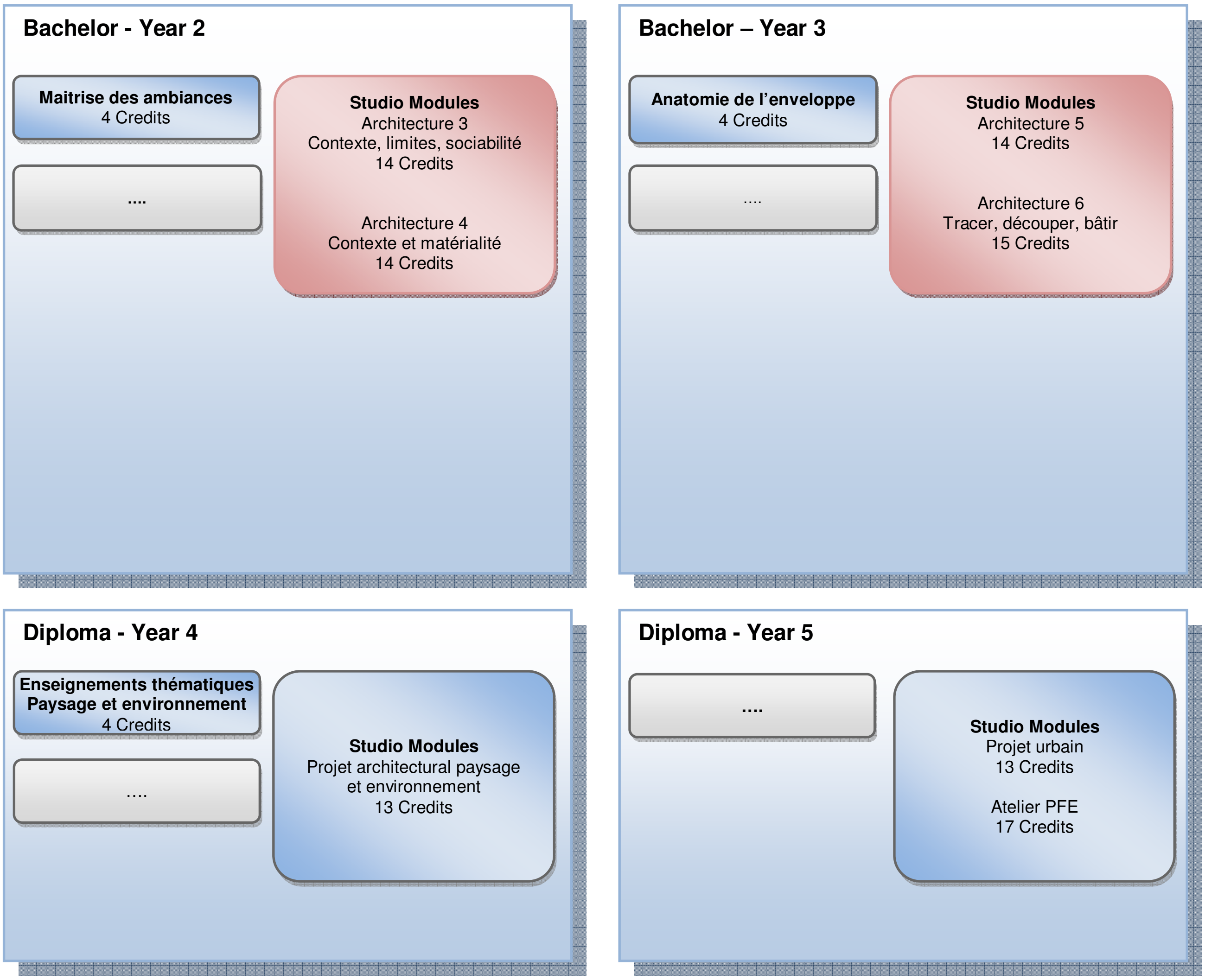
Another optional course entitled "Démarche environnementale et architecture climatique" (**Environmental approach and climatic architecture**) presents a detailed approach to climatic architecture and environmental design. In particular, it deals with: man and his environment; environmental impacts; challenges of sustainable development; energy strategies; resources management; passive contributions; air tightness and ventilation: passive house principles; comfort and quality of internal air; life cycle of materials and impact; water management; environmental approach in Europe; etc.

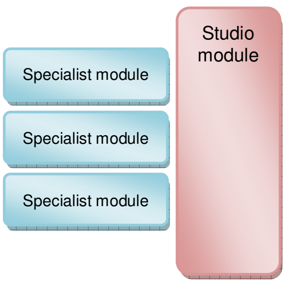
During the Diploma, the approach is different. The subjects related to sustainable environmental design are included in the design studios. For example, the studio "Projet architectural-paysage et environnement" (**Design Studio-Landscape and Environment**) is especially dedicated to the understanding of the relation between architecture and environment in the contemporary context (density, mixed use, etc.). Other courses connected to this theme are present in the 1st year of the Diploma, such as "Enseignements thématiques-paysage et environnement" (**Thematic teaching-Landscape and Environment**), and "Densification et nouveaux territoires naturels urbains" (**Densification and new urban natural territories**).

During the last year of the studies, the "Projet urbain: architecture et étalement urbain" (**Urban design – architecture and urban sprawl**) extends the reflections on the relationship between site and urbanization. Another design studio that can be also considered as a thesis focuses on "Architecture, paysage et environnement" (**Architecture, landscape and environment**). The studio deals with the complex links between space and time, and looks at transformations at different scales by insisting on the responsibility and the influence of the man in the transformation of its environment.

The Diploma degree DRAQ "Diagnostic et Réhabilitation des Architectures du Quotidien" (**Diagnosis and rehabilitation of today's' architecture**) is centred on the analysis of the building, ancient or contemporary, and architectural and technical rehabilitation, and is organised with the Université du Havre (engineering).

Integration of Environmental Design with Studio – Bachelor and Diploma in Architecture





Satellite structure
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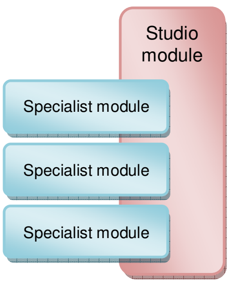

Partially integrated structure
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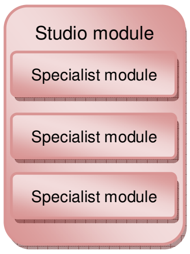


Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Strengths:

- The progressive and increasing implementation of principles and strategies of sustainable environmental design into the design studio;
- The collaboration for further education within the framework of TEASED (Regional Committee of Further Education in Architecture).

SOURCES AND REFERENCES

ENSAN website: www.rouen.archi.fr/base.php
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Conseil National de l'Ordre des Architectes

The architectural expression of culture is a matter of public interest. This proclamation, the beginning of section 1 of Act of 3 January 1977, highlighted for the first time the legislature's desire to preserve and promote architectural quality. This law on architecture completely renovated the architectural profession, including professional organization, the scope of work, and the modes of exercise of the profession.

The Order of Architects, established by the same Act of 3 January 1977 on architecture, is a body of private law, responsible for public service missions. The Order is endowed with legal personality and financial autonomy, and is placed under the responsibility of the Minister of Culture.

The Order of Architects is currently composed of 29,000 architects. Registration to the Order of Architects confers the right to practice and use the title of Architect in France. The order is composed of 26 Regional Councils and a National Council. 22 of the 26 Regional Councils correspond to the administrative regions of metropolitan France, whilst the remaining 4 include overseas departments (Martinique, Guadeloupe, Guyana, Reunion). The architects elect directly their regional representatives. They are elected for 6 years and half of them are renewed every three years. The Regional Councils have 6 to 24 consultants depending on the number of architects registered at the regional table. A regional representative of the Minister of Culture attends meetings of the Regional Councils in order to obtain information on the functioning of the Council and the implementation of its budget.

It is with the Regional Council that the architect must sign up for practice and to carry the title. The Regional Councils of the Order have as their principal purpose that of ensuring the holding of regional registers that lists all architects registered in architecture and architectural firms operating within their jurisdiction. Any changes in the life of the architect or the company (address change, mode of exercise, marital status, etc.) must be submitted by the architect to his Regional Council.

Regional Councils have standing to defend the title of architect and ensure compliance with the code of professional duties. Violation of the rules of the Code by the architect can lead to disciplinary sanctions imposed by the Boards of discipline. The Regional Councils of the Order may be involved in the organization of lifelong learning programmes and are in charge to promote the role of the architects in society. They can finally contribute to the financing of organizations involved in the development of the profession.

Generally, Regional Councils meet the demands of architects and individuals and are required to check every year the compulsory professional indemnity insurance that each registered professional has to hold.

In case of dispute between two architects, the Regional Council is required to implement a conciliation procedure. In case of dispute between an architect and his client, the same procedure of conciliation is possible up to the point where the management contract allows this implementation.

All the presidents of regional councils meet, at least every three months, at the headquarters of the National Council for briefings and consultation on issues affecting the profession. The members of the National Council are elected for 4 years by regional advisers. They must hold or have held a warrant membership in a Regional Council. The National Council is renewed by half every three years. It elects a Bureau composed of a president, two vice-presidents, a secretary and a treasurer. A representative of the Minister of Culture attends meetings of the National Council. It may obtain any information on the functioning of the Council and the implementation of its budget.

The National Council coordinates the activities of Regional Councils and contributes to their information. It represents the profession so that the government can consult it on all the issues affecting the profession. Like the Regional Councils, it has standing to legal action for the protection of the title of Architect and the rights and obligations imposed by the Architects Act. It may intervene in the organization of lifelong learning programmes and more generally to promote architects in the society and can contribute to the financing of organizations involved in the life of the profession.

The mission of the National Council is to establish contacts and partnerships, regular or occasional, with departments, agencies or organizations that form its institutional environment and represent the profession at a national, European and international level. The functioning of the National Council and Regional Councils are specified in Title I of Decree of 28 December 1977 on professional organization, which includes mandatory contributions paid annually to the National Council by registered architects on the board. The contribution was progressive until 1999, it has become standard since 2000.

The organization of the Order of Architects is provided by its internal rules. The services of the National Council ensure the daily functioning of the institution and prepare files needed for the task of elected representation.

Conditions for professional qualification

The access to the profession of Architect in France is registered by the Conseil National de l'Ordre des Architectes. The registration to the national chamber of Architects is made with the Regional Council of the Ordre des Architectes where the architect intends to establish his professional place of residence. This registration gives the right to practice on all the national territory. Once registered, the architect is indebted of an annual contribution following a table established every year by the Conseil National de l'Ordre des Architectes.

The title of architect or "agréé en architecture" of a company, are strictly protected by the law of the 3rd January 1977, which specifies the role of architects in the building industry. The initial formation of the architect is given by the schools delivering the diplomas. The complementary and continue training of the architects is an obligation fixed by the national code.

Specifically, the DPLG Diploma (*Diplome' par le Government*) title authorizes professional practice and registration to the Ordre is compulsory for the qualification and for professional practice. Permanent vocational training is not compulsory, although recommended by the Code of Practice. Training courses are organized by GEPA (Permanent Training Group for Architects) and by the Management of Architecture and Cultural Heritage.

SOURCES AND REFERENCES

Conseil National de l'Ordre des Architectes website: www.architectes.org

Germany

TECHNISCHE UNIVERSITÄT MÜNCHEN
FACULTY OF ARCHITECTURE

Bachelor of Arts in Architecture (4 years) + Master of Arts in Architecture (2 years)

Level: Undergraduate (BA Arch, 4 years) + Graduate (MA Arch, 2 years)

Accrediting Body: BYAK, Bayerische Architektenkammer (Chamber of Architects of Bavaria)

Educational Aims: The Faculty of Architecture at TUM is establishing a Bachelor degree of 4 years of duration followed by a Master degree of 2 years of duration. The academic qualification will be a Bachelor and Master of Arts in Architecture (BA Arch. and MA Arch.). The new study programmes will commence in the winter term of 2009/10 and this structure will replace/complement the existing Diploma in Architecture (DipArch), 6 years of duration. Through the collaboration of the four Institutes of the Faculty of Architecture (Institute for Architectural Design and Modelling; Institute for History of Architecture, History of Art and Restoration; Institute for Architectural Design and Building Technology; Institute for Urban Design, Urbanism and Landscape), TUM students are instructed using a holistic approach in dealing with complex systems, starting from the theoretical concepts and their cultural background, the allocation and dimensions of technical and spatial components, up to usability and appearance of the technical object 'building'. The management of energy resources of buildings, the extent to which the building can be recycled as well as the development and design of building components and systems are growing fields of work in the building process. On societal as well as urban and regional planning levels, questions of sustainability are successively expanded beyond the building through important future topics such as climate, mobility and energy cycles. The degree course in Architecture at TUM imparts knowledge and techniques that provide a sound footing for a professional architect's principal activities. At the same time, it sees itself as a tool designed to develop skills, to address problems of a fundamental, complex nature, to enlarge on them with the help of questions and approaches that feature in other disciplines and to tackle these issues in a holistic, responsible manner. As a project study program, the course adheres to the principle of research-based tuition, which means that the training is closely aligned to topical aspects of research.

Outline Description of Course: The 4-year *Bachelor of Arts in Architecture* degree is based upon project work combined with analytical and knowledge based seminars. At first and second year level, students initially undertake design projects with limited objectives accompanied by compulsory modules such as structural design, urban design, building climatics, building history, visualization and CAD. Students can choose additional courses of art history, entrepreneurial thinking and other general subjects. In the third year, students take part in a compulsory exchange program with one of the partner universities abroad. On their return, students in the 4th year choose a design studio project in combination with other compulsory and elective courses in the fields of technology, construction, law and management, and visual arts. The final semester focuses on the development of a Bachelor thesis according to a given project task. For the *Master of Arts in Architecture TUM*'s degree (2 years) students choose a mentor depending on his/her favoured design project. The mentees then develop an individual study programme through support and consultation with their respective mentors. The students have a choice of elective subjects from all Teaching Units such as: Climatic Design, Landscape Architecture, Structural Design, Advanced Materials, Lighting Design, Product Engineering, Housing, Planning, Urbanism, Spatial Sciences, History and Theory, Robotics, Business + Theory, Visual Arts or Industrial Design. Most subjects are taught in German language only. *Climatic Design and Building Services* of Prof. Dr. Gerhard Hausladen (ClimaDesign) is offered as one of three options for a technical thesis course, integrated with a design studio course and coordinated with the department that developed the particular studio course. This course integrates subjects of energy efficiency and building technology tightly into the design development. Assistants take part in studio sessions and critiques. The course concludes with a student thesis in the subject including a report of design decisions and calculations according to the design needs. *Integrated Design* of Prof. Dietrich Fink teaches through lecture series and studio courses that connect the areas of architectural design with the technical areas of teaching and research. This includes aspects of technology and construction, functionality, operation, economy and ecology in complex design tasks. The levels of mediation are of analytical, experimental and theoretical nature. As cooperation beyond the limits of the faculty is established, students gain the ability to decide and develop architectural projects through synergy with non-architectural resources of knowledge.

Course Structure: The BA Arch. TUM degree is composed by 240 credits and has 4 years of duration; for the MA Arch., 120 credits are needed (2 years). The BA Arch. is used in combination with the abbreviation "TUM" due to its extraordinary status of 4 years study. Each year or session of study consists of 60 credits, normally 30 in each semester. The workload of 240 credits for the BA Arch. TUM degree is designed to include 160 hours of student work, including taught / contact time, assessment and student-centred learning.

Bachelor of Arts in Architecture TUM (4 years)

Semester 1

Title	*Compulsory/Elective*	*Credits*	*Type*
Design Studio + Construction	C	9	studio project
Construction 1	C	6	lecture and test
Statics + Mechanics	C	6	lecture, exercise, test
History of Architecture	C	3	lecture and test
Visual Arts	C	6	lecture, exercise, test
Total		**30 ECTS**	

Semester 2

Title	*Compulsory/Elective*	*Credits*	*Type*
Design Studio + Construction	C	9	studio project
Construction 2	C	6	lecture and test
Structural Design	C	6	lecture, exercise, test
History of Architecture	C	3	lecture and test
Visual Arts	C	6	lecture, exercise, test
Total		**30 ECTS**	

Semester 3

Title	*Compulsory/Elective*	*Credits*	*Type*
Design Studio + Construction	C	9	studio project
Construction 3	C	6	lecture and test
Building Climatics	C	6	lecture, exercise, test
Theory of Architecture, Art and Design	C	3	lecture and test
Digital Form Finding	C	6	lecture, exercise, test
Total		**30 ECTS**	

Semester 4

Title	*Compulsory/Elective*	*Credits*	*Type*
Urban Design Studio	C	9	studio project
Urban Design	C	6	lecture and test
Urbanism	C	6	lecture, exercise, test
History of Urban Development	C	3	lecture and test
Visual Arts	C	6	lecture, exercise, test
Total		**30 ECTS**	

Elective Courses (Semesters 1 to 4)			
Scientific Methods	E	1	
History of Art	E	3	
Field Trip	E	3	
Field Trip	E	3	
Foreign Languages, Entrepreneurial Thinking, Practice Model Making	E	10	

Semesters 5 and 6

Integrated one year study abroad programme. Curriculum will be individually agreed with each partner university.

Total **60 ECTS**

Semester 7

Title	*Compulsory/Elective*	*Credits*	*Type*
Urban Design Studio	C	9	studio project
Technology	C	6	lecture and test
Management, Practice, Law	C	6	lecture, exercise, test
Theory of Architecture	C	3	lecture and test
Visual Arts	C	6	lecture, exercise, test
Total		**30 ECTS**	

Semester 8

Title	*Compulsory/Elective*	*Credits*	*Type*
History, Theory and Preservation	C	6	lecture and test
Elective Subjects	C	9	lecture, exercise, test
Colloquium	C	3	lecture and test
Bachelor Thesis	C	12	lecture, exercise, test
Total		**30 ECTS**	

Elective Courses by Subject (Semesters 7 to 8)

Technology		
Shell Constructions	E	2
Robot Oriented Design	E	3
Structural Design	E	2
Building Climatics	E	2
Integrated Construction	E	3
Architecture Technology	E	3
Industrial Design	E	3
Management Practice and Law		
Private Building Law	E	3
Applied Building Law	E	3
Estate Planning Law	E	3
Business Planning	E	3
Innovative Entrepreneurship	E	3
History, Theory and Preservation		
Preservation	E	3
Art History	E	2
Historical Buildings	E	3
Building Archaeology	E	3
Building History (2)	E	2
Intermediation of Arch. (3)	E	3
Visual Arts		
Light Planning	E	3
Acoustics	E	3
Visual Arts Theory	E	3
Experimental Form Design	E	3
Space Shaping	E	3
Building Restoration	E	3

Master of Arts in Architecture TUM (2 years)

Semester 1

Title	*Credits*
Elective Project	6
Elective Subjects	24
Total	**30 ECTS**

Semester 2

Elective Project	6
Elective Subjects	12
Integrated Subject	6
Digital Graphics	6
Total	**30 ECTS**

Semester 3

Elective Project	6
Elective Subjects	12
Integrated Subject	6
Digital Graphics	6
Total ECTS	30

Semester 4

Master Thesis	30
Total ECTS	**30**

Learning Outcomes: The BA Arch. degree provides opportunities for students to develop and demonstrate appropriate knowledge and understanding, intellectual and cognitive skills, professional and practical skills, transferable/key skills according to the requirements of the Bayerische Architektenkammer (BYAK). The MA Arch. degree is prepared and accredited by the Bavarian Ministry of Education, but not yet running. Students at Diploma level prove to have a wide horizon of knowledge concerning issues of sustainability and energy efficiency. They are able to develop designs according to climate, orientation and local context. Due to the elective nature of some of the components of the academic curriculum, not all students possess outstanding knowledge on sustainability and energy efficiency.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Summarising the TUM curriculum proves difficult due to the process of switching between Diploma and BA/MA program. The Bachelor programme started in September 2009, and experience yet only exists with pre-diploma and diploma courses.

Currently at Pre-Diploma level (2 years), the chair for **Climatic Design and Building Services** of Prof. Hausladen focuses teaching on the topics of energy efficiency and sustainability. The course analyses building physics and climatics. Students develop sensitivity and knowledge to build future buildings that offer a maximum of comfort and energy efficiency with a minimum of technical effort. In order to understand the processes of energy and the technology to control it, the performance of the façade and how these elements are integrated in a building volume, the course consists of a lecture series of two semesters and a week of workshops. Here, students use the gathered theoretical knowledge in a practical design *charrette*.

Students face issues related to sustainable environmental design at many levels of education, as for example material cycles (grey energy evaluation) in **Building Construction** or **Structural Design**. This occurs not only in courses related and named to deal with environmental issues, but also in a number of other modules (e.g., construction design, timber construction, urban design). The manifold occurrence of the subject forces students to connect knowledge from the different areas.

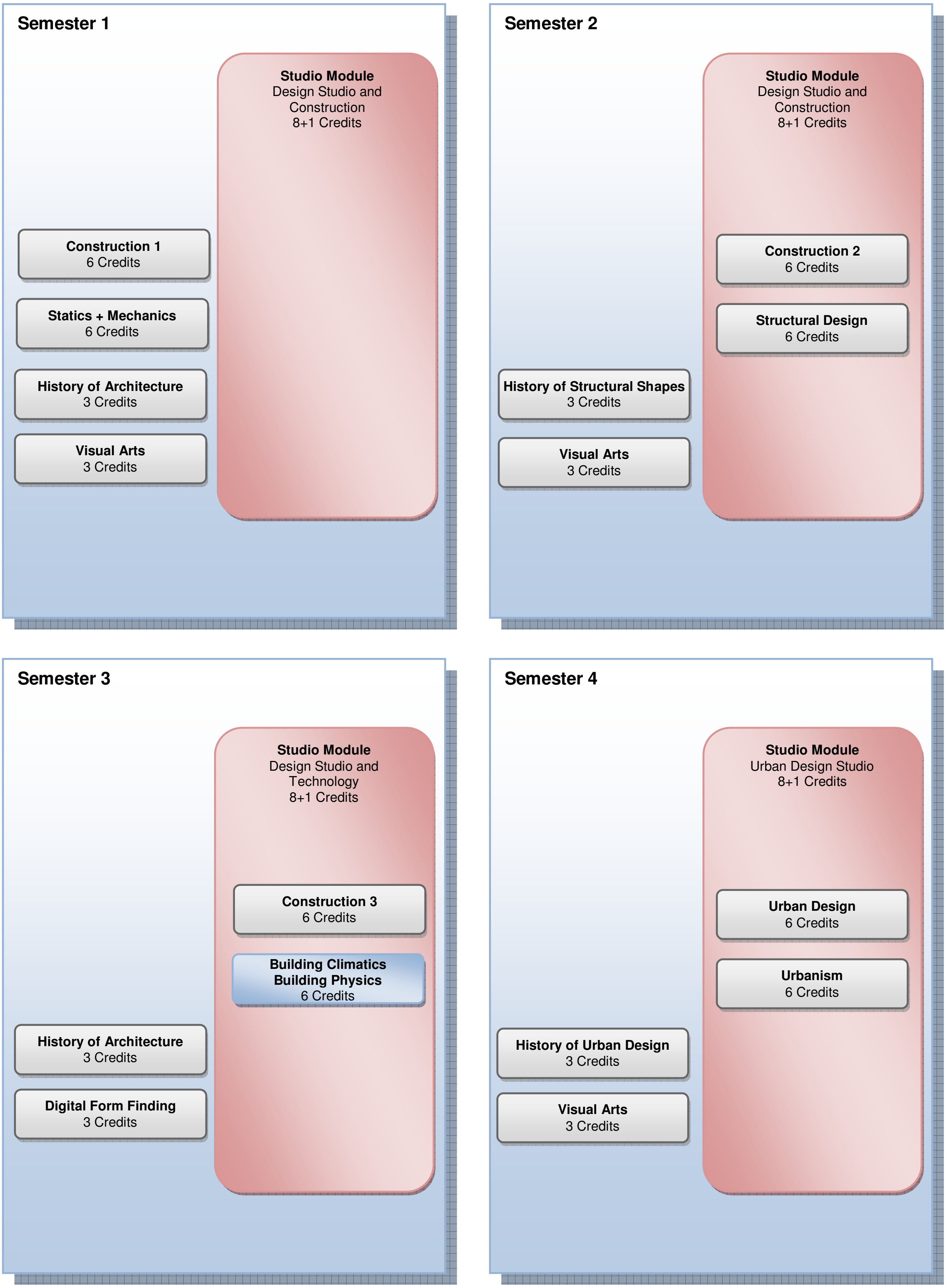
Teaching is organized by lectures in semesters 2 and 3, a workshop and an integrated project in semester 3. The lectures include basic information on issues of sustainability, energy efficiency and building physics. At the end of the lecture series, the workshop gathers information in a condensed lecture format. In the following 5 days, students have to design a simple building with aspects of the information in question. A final presentation and critique finalizes the workshop.

The integrated **Design Studio and Construction** is a unique development in Germany. The design task is developed by the Department of Building Construction and Material Science (Prof. Musso) in cooperation with the Department of Structural Design (Prof. Barthel) and the Department of Climatic Design and Building Services (Prof. Hausladen). The design studio offers joint critique by assistants of the named departments on a weekly basis. The course concludes with a final presentation with the professors of the departments and a guest critic. The concept is transferred into the Bachelor programme condensed in two semesters. The teaching concept of Prof. Gerhard Hausladen has been awarded the “Preis für gute Lehre” (Prize for Good Teaching) by the Bavarian Ministry of Science.

At Master and Diploma level, a number of compulsory and elective modules are offered on a wide range of subjects. A two semester research seminar includes specific topics of building climatics and building technology in variation by year and students choice. It is finalized by a written thesis. Studio design makes the central element of the course. Integration between studio design and the engineering related topics of energy efficiency is achieved through personal consultation. All technical departments offer such consultations on their respective subjects. These are independent of the final design. Furthermore, the Department of Climatic Design and Building Services works in co-operation with various studio design courses. In such co-operations, assistants of the design related department and of the technical department do studio workshops and sessions together. Final critiques are done with both professors and guests. The concept creates a variety of connections, themes and projects. The open nature of resulting design processes give students the opportunity to learn and use the interdisciplinary methods to their own needs.

TUM also offers the Postgraduate Master of Science (MSc) **ClimateDesign** (Prof. Dr. Hausladen), which started with the winter semester 2007/08 and is aimed at professional architects and engineers as a possibility of further education, and at graduates from the disciplines of architecture, civil engineering, building services and mechanical engineering and physics with at least one year of professional experience.

Integration of Environmental Design - Study Programme Bachelor of Arts in Architecture TUM
(The programme runs over 8 Semester. Not all semesters are shown).



STRENGTHS AND OPPORTUNITIES

Strengths:

- The issues of sustainability and energy efficiency are taught in all courses that involve architectural design, which include construction, construction physics, structural design, timber construction, and climatic design. The subject is not so much defined as such but rather it represents a fundamental theme that comes up in all different areas of architectural design;
- The building codes in Germany require a high standard in energy efficiency and thermal insulation. This standard generates a basic level of orientation and the high stakes of knowledge necessary in order to work as an architect;
- At pre-Diploma level, the "Integrated Studio" proves to be an individual and tightly integrated model that includes involvement in design decisions and learning based on the particular subject of design. The coordination of the design task between the professors of the three departments is useful in terms of focus for students and keeps all parties involved;
- At Diploma level, the cooperation model proves to be adaptive to the design tasks and thus open for new developments and trends.

Opportunities:

- Sustainable design is promoted throughout the curriculum, specifically at graduate and postgraduate level, its implementation in design should be more strongly supported in research activities;
- With a number of research activities within the faculty, a wide exchange between the research projects and teaching could be supported;
- Awareness of the subject among students is large but most often it is overcome by solving the basic tasks of a studio course.

SOURCES AND REFERENCES

TUM Faculty of Architecture website: www.ar.tum.de/
Academic Surveys and Feedback

UNIVERSITÄT STUTTGART

FACULTY OF ARCHITECTURE AND URBAN PLANNING

Bachelor of Science in Architecture and Urbanism (4 years), Master of Science in Architecture and Urbanism, Master of Science in International Urbanism (2 years)

Level: Undergraduate (BSc in Architecture and Urbanism, 4 years), Graduate (MSc in Architecture and Urbanism and MSc in International Urbanism, 2 years)

Accrediting Body: AKBW, Architektenkammer (Chamber of Architects) of Baden-Württemberg

Educational Aims: The ´Stuttgart School´ is a brand of national and international reputation. It is one of few faculties in Germany that puts together Architecture and Urban Planning in one integrated program of study and offers the possibility to students to determine their profile within a broad spectrum of architectural and urban contents. It has several contacts, cooperation and exchanges with a number of international academic and research institutions and prides itself of various members of staff with a worldwide standing.

Outline Description of Course: The Faculty of Architecture and Urban Planning offers a 6-year consecutive education through design. This is divided into an 8-semester international Bachelor's degree (BSc) and an ensuing 4-semester Master program (MSc). The *Bachelor of Science in Architecture and Urbanism* introduces the basic principles of the discipline in 1st to 4th semester within a planned schedule. Every semester has one topic: Shape; Space; City; and, Technique. Teaching includes lectures and practical work. At the end of the 2nd semester, an orientation exam includes all the fields of knowledge gained at that state of the studies. The 5th to 8th semesters are designed individually to elaborate a specific profile. Students can choose between five areas: Fundamentals; Design and graphics; Building technology; Building design; and, City and landscape – with an obligatory semester abroad or an international internship. The *Master of Science in Architecture and Urbanism* aims at a broad educated and versatile architect. The curriculum and modules offered allow many specifications that culminate in a Master of Science (MSc) degree. The programme will start in 2010, will be UNESCO certified and will allow continuation of studies towards a PHD. The *Master of Science in International Urbanism* is a 2-year programme that allows specialisation after studies of architecture. The Master course offers a professional specialisation for city planning. It is an interdisciplinary course, which qualifies graduates to manage international planning offices or administrative offices projects from the idea to the realization. The programme is bilingual and strongly interdisciplinary. Students of different fields (e.g., civil engineers, business sciences, politics and architecture) work together on interdisciplinary topics and with the use of multifaceted teaching methods.

Course Structure: The Bachelor of Science in Architecture and Urbanism has duration of 4 years and requires a total of 240 credits for completion. The course content of the BSc programme is grouped in 5 areas of teaching that are assigned to individual institutions within the Faculty. The courses are divided into modules, which are organised thematically in coherent units. Each module has its own defined and verifiable learning outcomes. Credit points indicate the amount of work that a student must spend in order to successfully complete a module. 1 credit point is equal to 30 hours of work. For each semester, about 900 hours are provided, therefore an average of 30 credits per semester. The Master of Science last for 2 years and comprise 120 credits.

Bachelor of Science in Architecture and Urbanism (4 years)

The Bachelor program includes a total of 240 credit points (CP) to be completed in a normal period of 8 semesters. The 240 credits are distributed into:

Modules	**Credits**
Specialised modules	180
Key skills modules	18
International module	30
Bachelor's thesis	12
Credit Total	**240**

The **Specialised modules** (180 CP) include basic modules, core modules and additional modules:

- **Basic modules** (72 CP) convey the fundamental methodological knowledge of all areas of teaching. The basic modules are compulsory modules which must be taken by all students.
- **Core modules** (66 CP) drive the disciplinary core competence: the integrative interdisciplinary program objectives in networking designs and project work. They form the respective term priorities. The core modules are compulsory modules which must be taken by all students.

- **Extension modules** (42 CP) are introduced to deepen the content of the core modules and can be used for individual profiling. The additional modules are elective and optional modules, i.e. students can choose modules from a set of available offers.

Key skills modules (modules worth 18 CP) supplement the course of study by fostering the acquisition of additional skills. They include:

- **Key skills** (compulsory modules in the range of 12 CP)
- **Interdisciplinary qualifications** (equivalent to 6 optional modules CP)

The **international module** (amounting to 30 CP) is aimed at preparing students for work in different cultural areas and different economic and social structures. It has the objective of increasing the international expertise of students and improving the employability of graduates. The required international knowledge and experience can be acquired in various alternative areas of application.

Master of Science in International Urban Studies (2 years)

The Master degree in International Urban Studies offers a bilingual interdisciplinary study full-time course in the technical area of urban and town planning. The course comprises a cohort of students from different disciplines (architecture, urban planning, civil engineering, (urban) geography, (urban) sociology, landscape architecture, political science, economy, etc.), and aims to deliver a sound knowledge and methods of work, building skills so that students are capable of the complex tasks of urban planning projects processes from idea to implementation. The main topics are:

- Project and Process
- Urban Development and Sustainability
- Urbanity and society
- Planning and Building
- Tools and methods

Learning Outcomes: The central aim of the BSc and MSc study programmes at the Stuttgart Faculty of Architecture and Urban Planning is the education of students to design and plan buildings and cities. Upon completion of their courses, graduates should be able to develop time- and space- related structures and processes. The achievement and proof of art-, technical- and scientific competences is part of the curriculum. Stressed within the teaching is the development of the skill to focus on different aspects of one problem and integrate it within one solution. This generalist teaching does have deeper education in construction/technique as well as city planning and landscape design.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum:

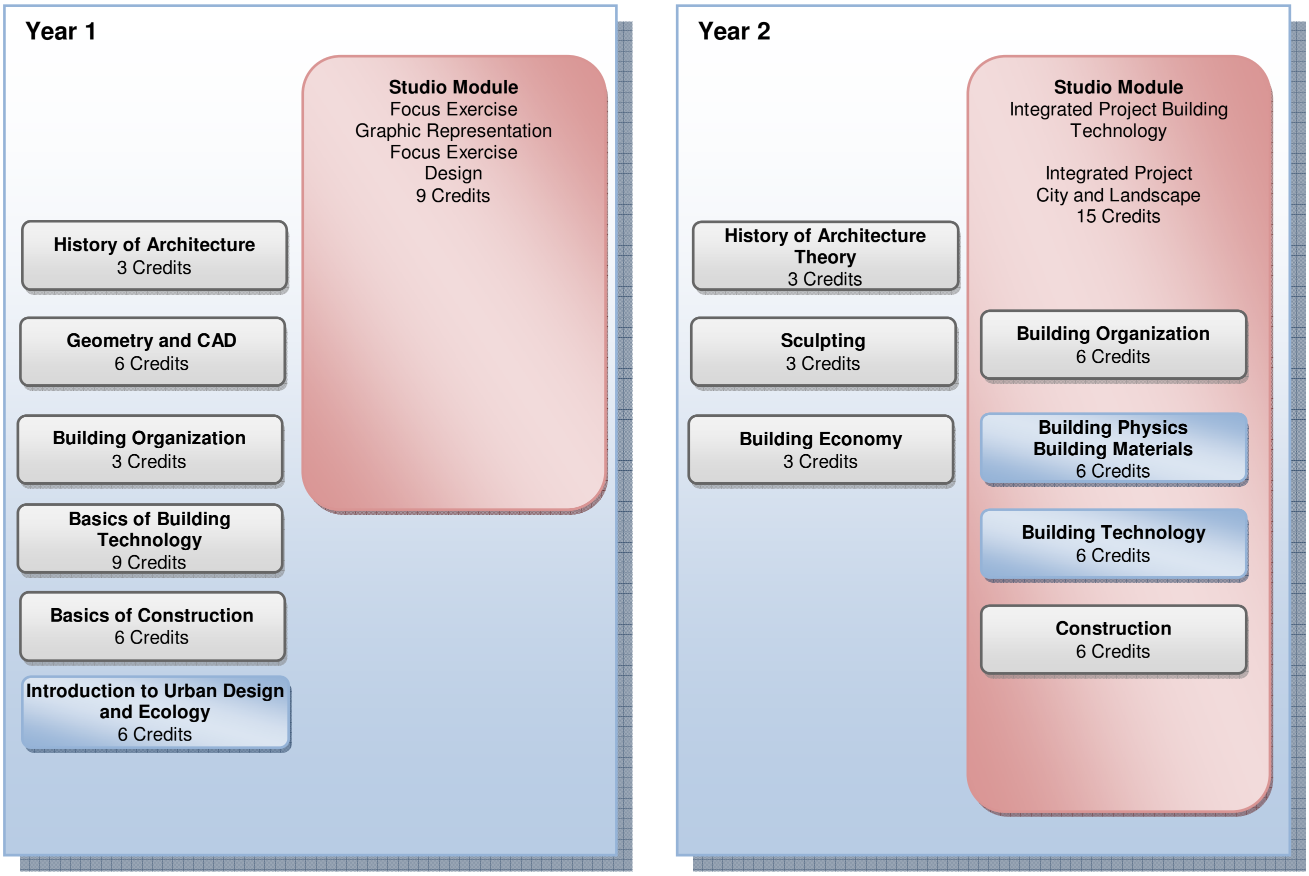
Within the curriculum offered at the Universität Stuttgart, it can be stated that the **Bachelor of Science** in Architecture and Urbanism degree aims to train the ability to focus different domains and views onto one problem. This means that basic knowledge is taught, and design studio focuses on basic education (although without a specific focal point or emphasis given to themes of sustainable environmental design).

Integration at the BA level is specifically achieved through the **Integrated Project** in semester 4 that includes building construction, structural design, material sciences and building technology. In Urban design, a similar integrated project is offered. The first semester includes the compulsory course **Introduction to Urban Design and Ecology**. The issues of environmental design have achieved a certain importance within the curriculum with the principle of integration running through a number of projects.

The **Master of Science** programme trains an Architect which is broad-based and specialized in his field of interest. Sustainable environmental design is brought into teaching mainly by elective modules offered by specialist professors, which already proved their knowledge by building significant projects. These professors are brought into dialogue with the students, who can learn from them and achieve knowledge by contact, interest and developing skills. Modules give to students the chance to put different aspects together and choose between different topics, depending on their own interests. The outcome of this structure is that environmental design is directly implemented into design studio by professors according to their own professional and research experience and the interest of students.

The final critiques and reviews involve both professors and external guests. This structure creates a variety of connections, themes and projects. The open nature of resulting design processes give students the opportunity to learn and use the interdisciplinary methods to develop an individual profile related to needs and problems which exists in the real business or in scientific approaches – depending on their own aims and skills.

Integration of Environmental Design - Study Programme Bachelor of Science (Years 1 and 2 only)



STRENGTHS AND OPPORTUNITIES

Amongst the major strengths and opportunities of the Bachelor of Science + Master of Science programmes in Architecture at the University of Stuttgart are the following:

Strengths:

- Sustainable environmental design represents a significant part of the curriculum at the University of Stuttgart, particularly in terms of passive design and occupant comfort and well-being;
- Significant technical knowledge is imparted to students in terms of themes of sustainable design;
- Participatory teaching is highly encouraged specifically in studio and in multidisciplinary design courses (e.g. learning units);
- Strengths in the structure are represented by the integrated project approach and the selection of professors and senior lecturers.

Opportunities:

- Sustainable environmental design should be considered as a compulsory requirement for the curriculum, as well as a requirement for accreditation of the course due to the creative inputs that it can afford to architectural design;
- A higher level of implementation is given in terms of graduate and postgraduate teaching, specifically in terms of specialisation courses which focus on sustainable environmental design.

SOURCES AND REFERENCES

Faculty of Architecture and Urban Planning website: www.architektur.uni-stuttgart.de
Academic Surveys and Feedback

UNIVERSITÄT KASSEL

FACULTY OF ARCHITECTURE AND URBAN PLANNING

Bachelor of Science in Architecture + Master of Science in Architecture (5 years)

Level: Undergraduate (BSc, 3 years) + Graduate (MSc, 2 years)

Accrediting Body: Architekten und Stadtplanerkammmer (Chamber of Architects and Planners) of Hessia

Educational Aims: Within the Bachelor and Master system, the University of Kassel has been developing a curriculum that offers a solid foundation in different subjects. The theoretical background is linked to project work which is developed in small groups. Closeness between teachers and students is core to the pedagogical method applied. Relation to practical experience is realized by closely assisting the students in their practical semester. Multidisciplinary subject offerings and cooperation with other faculties and departments show the priority of interdisciplinary thinking and the application of an integrated approach. The University of Kassel is the only institution in Germany which offers architecture, regional and city planning, and landscape planning under one roof and as interconnected themes of study. So, a unique option is given to students to get insight into the central planning disciplines and to get in touch with other ideas and concepts. The University of Kassel has been conceived as a polytechnic university. Research spreads from construction with digital design methods to demand for climate neutral buildings, up to questions of urban governance, sustainability effects of city planning subsidizes, the design of post-industrialization landscapes, sustainability demands for river basin management and the steering of sustainable use of land. Collaboration with a number of research institutes is in place, such as: ZUB, Center for ecological design; Fraunhofer Institut für Bauphysik, Helmholtz; Zentrum für Umweltforschung, Leipzig-Halle.

Outline Description of Course: The *Bachelor of Science in Architecture* has duration of 6 semesters (3 years) and education is structured in cooperation with courses in landscape architecture to convey to students basic education on a number of different topics. The training of design and development expertise is at the core of this course. In addition to teaching fundamentals in the areas of general science, fine arts, design and presentation tools, processes and technology and design objects and planning levels, subject-specific knowledge in the fields of design and technology, environment and sustainability, and construction and project development is taught. The course is highly practical with about 40% of its contents being studied in design projects, in addition to live projects and field trips. The *Master of Science in Architecture* programme conveys skills which are essential for all the relevant fields of design in structural - spatial or strategic - contexts and leads to the ability to do individual research and to get the qualification necessary for registration with the Chambers of Architects. Special aim of the 4-semester Master course is the ability to elaborate an individual study profile with orientation to the diverse and changing requirements of the work field. The entity of research and teaching forms the basis of the course together with an interdisciplinary approach. Methodologies and system competencies as well as strategies are taught. The Faculty of Architecture and Urban Planning at the University of Kassel also offers a *Bachelor of Science in Urban and Regional Planning* (3 years) and a *Master of Science in Urban and Regional Planning* (2 years).

Course Structure: The undergraduate degree Bachelor of Science in Architecture (BSc) has duration of 3 years, and requires the completion of 180 credit points. The Master of Science in Architecture (MSc) offers a programme of study of 2 years, which needs 120 credit points for completion.

Bachelor of Science in Architecture (3 years)

The Bachelor program in Architecture is based on common education together with landscape architects to get the basic fundamental knowledge on:

- Common science;
- Arts, form and design;
- Techniques, methods and tools;
- Planning hierarchy, planning.

Further to these, fundamental subjects of architectural education include:

- Design and Technology;
- Environment and Sustainability (including ecology, economy, sociology, as well as technology and culture in the context of planning and building);
- Building economy and project development.

Master of Science in Architecture (2 years)

Within the Master of Science in Architecture programme, several specializations are on offer for students. Specifically, the following are available:

- **Urban Design**: Special analysis and development of urban design with landscape and architectural aspects.
- **Design Research**: The focus is on planning and design strategies for design and construction, generative and parametric design, experimental, innovative questions and theory-based design.
- **UBP - Umweltbewusstes Planen und Bauen** (Environmental-related planning and building): The focus is on sustainability and innovation. Planning and design strategies are investigated towards functional design of the environment-related planning at all levels as well as the aesthetic dimension of building physics and building climate aspects for buildings and their surroundings.
- **Mastervertiefung BW - Bauwirtschaft / Projektentwicklung** (Building economy and project development): The specific focus is on economy and process-orientated concepts and planning strategies together with civil engineering and economics.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

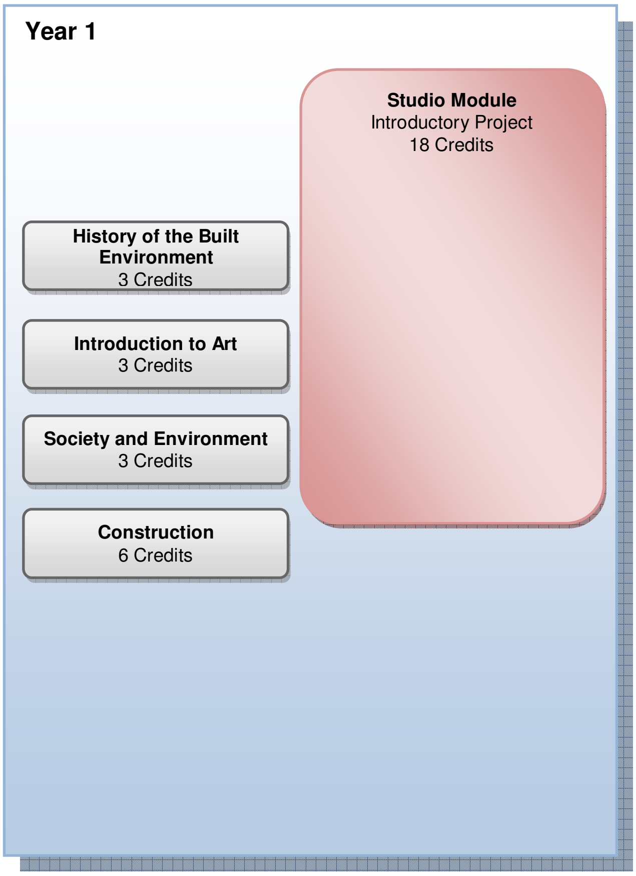
The Kassel programme is well structured and includes a number of modules that can be freely chosen by students. The Bachelor of Science in Architecture degree consists of examinations in the following modules:

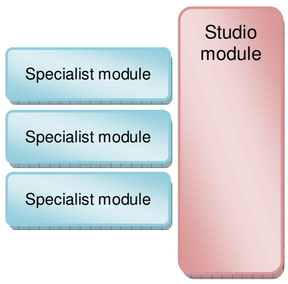
A. Sciences: History of the built environment, society and environment, one elective module
B. Arts: Basics of arts
C. Instruments and Techniques: Construction, including basic principles of building technology and building economy
D. Planning: Urban planning, building sciences.

The programme also includes a number of elective modules focusing on architecture, city and landscape. A unique character of the curriculum is the relation between architecture and landscape-related sciences. Issues of environmental design are generally dealt with in a number of compulsory modules which are taught by different Departments. The modules include basic topics of architecture education with compulsory components in building services in the fourth semester. The concept of integrated project can be found in the 3rd, 4th and 6th semester, where students can choose an additional subject of integration, namely construction, structural design or building services.

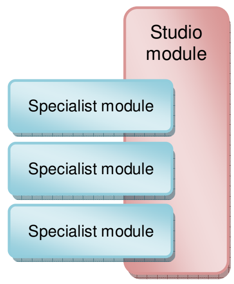
The Master course offers the focus subject of “Umweltbewusstes Bauen UBP” (**Environmentally Aware Building**). This course includes aspects of environmental design as compulsory components. Topics such as parameters of sustainability, energy design and architecture and environmental awareness in architecture are part of the curriculum. Additionally, a seminar on specific research topics is part of the course. The design studio integrates part of these seminars and focuses on new building typologies according to energy design and energy related refurbishment as architectural strategies. One project characterised by building-spatial orientated content has to be elaborated basing on individual interests of the students. This approach creates a variety of connections, themes and projects within the programme. The open nature of resulting design processes gives to students the opportunity to learn and use the interdisciplinary methods to their own needs.

Integration of Environmental Design with Studio (Bachelor of Science only)

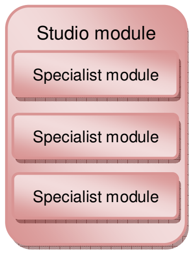




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Amongst the major strengths and opportunities of the Bachelor of Science + Master of Science in Architecture programme at the University of Kassel are the following:

Strengths:

- Sustainable environmental design is present in the curriculum particularly in terms of passive design, occupant comfort and well-being;
- Participatory teaching is highly encouraged specifically in studio and in multidisciplinary design courses (e.g. learning units);
- Integrated project approach, the presence of small group of students and close contacts between tutors and students present great opportunities for implementation of an environmental approach;
- Although sustainable environmental design is not primarily implemented in undergraduate programmes, the structure of the degree encourages the learning of basic techniques;
- The UBP Master course includes many aspects of environmental design including technical knowledge, social context and support for free research by students;
- The courses from UBP are also elective for other Master courses, thus spreading information to a wider audience.
- Studio projects integrate research activities.

Opportunities:

- Sustainable environmental design should be considered as a compulsory requirement for the curriculum, as well as a requirement for accreditation of the course due to the creative inputs that it can afford to architectural design;
- Sensitivity to fields regarding sustainability should be implemented at earlier stages of education;
- Students have to analyze the environments where they intervene and develop suggestions for improvements;
- The structure of the modules offers a choice and possibility for contamination between disciplines, which increases within the course of the programme in order to connect different fields of science, and promote understanding and competence.

SOURCES AND REFERENCES

Faculty of Architecture and Urban Planning website: www.cms.uni-kassel.de/asl
Academic Surveys and Feedback

HOCHSCHULE MÜNCHEN
FACULTY OF ARCHITECTURE

Bachelor (3 years) + Master of Science in Architecture and Urban Design (2 years)

Level: Undergraduate (Bachelor of Science, 3 years) + Graduate (Master of Science, 2 years)

Accrediting Body: BYAK, Bayerische Architektenkammer (Chamber of Architects of Bavaria)

Educational Aims: The University of Munich is the largest University of Applied Sciences in Bavaria and one of the largest of its kind in Germany. The University provides general education of architects on a wide range of professional and practice related-subjects. A focus is set on interdisciplinary work, with projects that involve experts of cognate disciplines from the Faculty of Engineering.

Outline Description of Course: The *Bachelor of Science in Architecture and Urbanism* aims to give to the students a broad-based, practice oriented, education in order to prepare them to diverse professional fields. Besides specific and theoretical training, efforts are made for students to deepen their social competencies and ability to interdisciplinary cooperation. The *Master of Science in Architecture and Urban Design* is aimed at graduates of first degrees from architecture and urban design with special interest in working on the scale of the city and on urban design and planning. The course leads to self-organised work in all hierarchies of city planning and architecture, development and planning offices. The education is oriented on the specific challenges of city planning and on architectural practice. Functional organisation and qualitative design of the city and its parts represent the core of the curriculum. Therefore, structural analysis of spatial connections is considered as necessary as creative development of strategies and problem solving within political and societal contexts and decision making processes.

Course Structure: The BSc/MSc programme provides training for the 'classic' practicing Architect, fostering skills, competence and knowledge in research-based design, arts, technology and management. The quality of the study builds on the 30 year long tradition of the Faculty of Architecture. Cooperation has been established with the FH University of Augsburg. The undergraduate degree (Bachelor of Science in Architecture and Urban Design) is delivered in 3 years and requires completion of 180 credits points. The Master graduate degree (Master of Science in Architecture and Urban Design) comprises 120 credit points of study and has duration of 2 years.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

The Hochschule München offers Bachelor and Master courses based on its experience as a School of Applied Sciences. These Schools were introduced in the 1970s in order to create educational levels with orientation in practice as opposed to the research base of universities. As a consequence, Hochschule München has a focus on forming practicing architects.

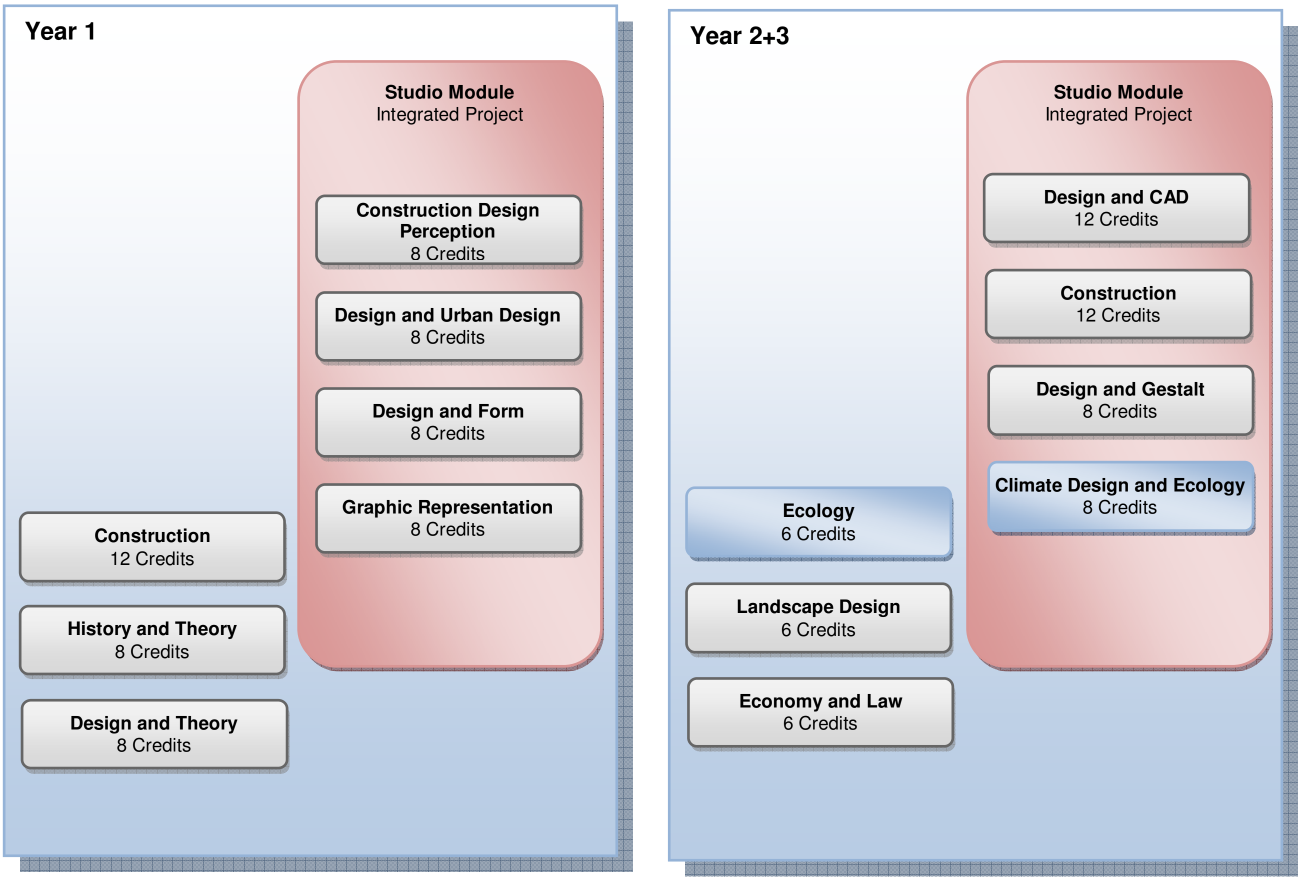
One of the distinctive characters of the Hochschule München is the process in place for the selection of candidate students, since successful outcome of a 3-day examination is needed for enrolment. Issues included in the examination are: spatial imagination ability, technical understanding, cognition and sensitivity, creativity, information management, team spirit, work habits, motivation and knowledge about problems and society. Conversely, teaching staff need to have a proved practical experience.

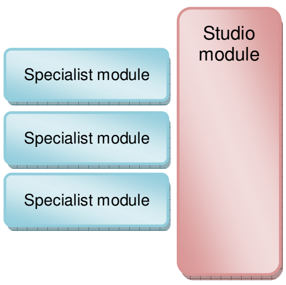
The Bachelor program is structured with integrated studio projects at the core. This includes integrated modules such as design, composition, construction and climatic design. Parallel modules in the subjects of material sciences, ecology, climate design and building physics (although these are not integrated in studio) are offered on a compulsory base.

The Master program is less structured and has no particular focus. Climate design is offered as an integrative part of a studio module on an elective base. This includes ecology as a separate module with aspects of refurbishment and new building projects and their energy systems, building services and passive measures.

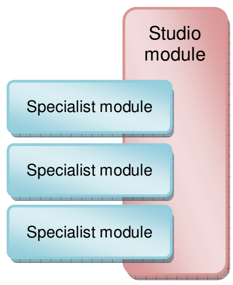
A postgraduate Master course with the topic **Sustainable Architectural Design** is offered since 2008.

Integration of Environmental Design - Study Programme Bachelor of Science

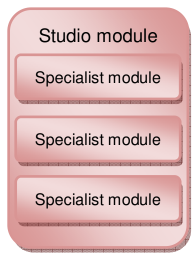




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Strengths:

- Sustainable environmental design represents a part of the curriculum, especially at the level of building services and climate design;
- The Bachelor program is developed on an integrated model that includes critique by professors of different subjects;
- Subjects like climate design and ecology create a wide knowledge base in sustainable design aspects for students.
- Working in small groups gives students more opportunity for critique by professors.

Opportunities:

- The well structured curriculum offers a very linear way of learning with a tight focus on practicing architecture in the contemporary environment.

SOURCES AND REFERENCES

Faculty of Architecture website: www.lrz-muenchen.de/~architektur
Academic Surveys and Feedback

TECHNISCHE UNIVERSITÄT BERLIN
FAKULTÄT VI - INSTITUT FÜR ARCHITEKUR

Bachelor of Architecture (3 years) + Master of Architecture (2 years)

Level: Undergraduate (Bachelor of Architecture, 3 years) + Graduate (Master of Architecture, 2 years)

Accrediting Body: BAK, Berliner Architektenkammer (Chamber of Architects of Berlin)

Educational Aims: On the background of the history of Berlin and the complex development of the city, today the studies at the Technical University of Berlin offer a wide range of topics for the education of architects. The Bachelor programme teaches the core competences and fundamental knowledge in the subjects of design, methods of planning, building typologies, city typologies, building construction and building technology. The existing Bachelor programme is scheduled to be accredited by an external agency and be developed further. The professional profile of the architect, differing from the technical engineer, is considered as a figure integrating the various requirements and conflicts within the development of a project. As the main focus of education, it is therefore necessary to integrate the whole of these individual aspects into the "systems of the building and the city". The Master course is designed to cope with these manifold and complex aspects and its dependencies in architectural and urban design. Research projects conducted in different Departments - such as megacities, energy efficiency and historical building analysis - are integrated in the pedagogical methodology applied in the architectural curriculum.

Outline Description of Course: Within the teaching programme of the *Bachelor of Architecture*, design studio sits at the core of the course, together with a number of other additional compulsory modules. Specific focus is given to social and theoretical background in relation to art and history. A wide educational horizon is offered through a number of elective courses which are chosen by the students. Compulsory courses in building physics and building technology are taught in semester 3 and in semester 4 of the Bachelor programme. The *Master of Architecture* degree gives specific emphasis to the themes of "Design, Construction and Energy", "Architecture in Existing Buildings" and "Development of Habitat and Design". Other themes are introduced in a range of other compulsory and elective modules.

Course Structure: The Bachelor of Architecture (undergraduate degree) requires the completion of 180 credits and is generally completed over three years of full-time study. For the award of the title of Master of Architecture, 120 credits over 2 years of course are required.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

The Bachelor of Architecture (3 years) degree gives broad and solid grounding on the issues of architecture fundamentals. Modules investigating issues of building physics and building technology are compulsory parts of the curriculum. The current Diploma course will be progressively replaced by the Master programme. Both are based on different core subjects that depend on the choice of the student. Due to the elective nature of a number of modules on offer, energy related issues are generally delivered as options. Within the course, several modules integrate design and technical knowledge.

The **Department of Building Technology and Design** of Prof. Claus Steffan offers basic seminars within several Master courses through lectures which focus on building physics, acoustics and materials. Various studio units with the main focus on energy efficient building are offered as a core component of the teaching programme. Theses studio courses are supported by seminars and lectures that provide specific knowledge according to the particular project proposed to the students. The Department also gives consultancy to students for specific studio courses managed by other Departments. These courses are coordinated with partner Departments accordingly.

The **Department of Constructive Design and Climatology** of Prof. Hascher offers architecture studio courses with the focus on climate-responsive construction. The name of the subject area refers to the two main points of focus of the teaching which cannot be conveyed independently of one another, but rather form a single didactic unit: the phenomena and fundamentals of climate-responsive construction are not to be recognized and evaluated separately from the specific planning task, but have to be integrated into a holistic design concept and also implemented in accordance with the current state of engineering in a constructive structure. The solid proof of the feasibility of a theoretical and abstract design approach should exceed the imaginative play of ideas and therefore promote creativity, logic and reasonable action in parallel.

The Department primarily offers design seminars and elective modules. Within the design seminars, which are generally organized over a period of two semesters, architectonic concepts are developed and implemented from the urban planning up to the job-planning scale. In the first part, i.e. during the summer semester, imaginative and conceptual solutions are developed. In the winter semester - basing on the results of the previous semester - a selected portion of the project is constructed on a 1:1 scale and the necessary detail work is completed. With impromptu designs and presentations, the students are provided with an initial relationship to the subject of design. Excursions, field trips, tours, guest lectures and workshops to which external experts are invited, round out the activities associated with the design seminars.

In the framework of the new examination orders, the Department of Constructive Designing and Climate-responsive Construction is responsible for a portion of the module Constructive Designing (1.3) within the degree on offer. Depending on the extent of the scope of the constructive elaboration, additional services will be recognized by the “Field of Structure Design and Construction”. Electives from the fields 6.4 – 6.7 can be attended as well as compulsory components, these being integrated into projects in the winter semester.

Depending on the specific design focus, various other subjects (fire protection, technical acoustics, lighting, heating and ventilation and air conditioning) can be integrated into the design seminar. The efficient use of resources and the application of energy saving strategies in building design are given particular emphasis.

Integration of Environmental Design – Study Programme (Bachelor of Architecture)

Bachelor Architektur - Modellhafter Studienplan (1graues Kästchen entspricht einem Modul, im darunterliegenen weißen Kästchen stehen die Modulbestandteile)

Fächergruppe	Fachsemester 1 LP	2 LP	3 LP	4 LP	5 LP	6 LP	
1 Entwerfen/ Baukonstruktion	**Entwerfen & Baukonstruktion 1 12**	**Entwerfen & Baukonstruktion 2 12**	**Entwerfen & Baukonstruktion 3 10**	**Entwerfen & Baukonstruktion 4 10**	**Entwerfen 5 14**		
	VL Entwerfen 1 1 *VL Baukonstruktion 1* 1 *EP Entwerfen & Baukonstruktion 1* 10	*VL Entwerfen 2* 1 *VL Baukonstruktion 2* 1 *EP Entwerfen & Baukonstruktion 2* 10	*VL Entwerfen 3* 1 *VL Baukonstruktion 3* 1 *EP Entwerfen & Baukonstruktion 3* 8	*VL Entwerfen 4* 1 *VL Baukonstruktion 4* 1 *EP Entwerfen & Baukonstruktion 4* 8	*VL Entwerfen 5* 1 *EP Entwerfen 5* 13		
2 Städtebauliches Entwerfen/ Gebäudekunde		**Grundlagen des städtebaulichen Entwerfens & Gebäudekunde 11**					
		VL Grundl. Städtebau 3 *VL Gebäudekunde* 2	*EP Städtebauliches Entwerfen* 6				
Soziologie, Geschichte und Theorie d. Architektu	**Soziologie, Geschichte&Theorie der Architektur 9**			**Bauaufnahme 3**			
	VL Theorie d.Architekt. 2 *VL Baugeschichte I* 2 *VL Architektursoziologie* 2	*VL Baugeschichte II* 2 *VL Stadtbaugeschichte* 1		*UE Bauaufnahme* 3			
4 Darstellung & Gestaltung	**Bildende Kunst 5**						
	UE Freihandzeichnen 1,5 *UE Sinnesschulung & räuml. Gestaltung 1* 1,5	*UE Farbgestaltung* 1 *UE Sinnesschulung & räuml. Gestaltung 2* 1					
	Darstellende Geometrie I+II 5		**Einführung in CAAD 3**				
	VL Darstellende Geometrie I 1,5 *UE Darstellende Geometrie I* 1,5	*VL Darstellende Geometrie II* 1 *UE Darstellende Geometrie II* 1	*VL Einführung CAAD* 1 *UE Einführung CAAD* 2				
5 Gesellschaftliche Grundlagen			**Baurecht und Bauökonomie 4**				
			VL Baurecht 2	*VL Bauökonomie* 2			
6 Naturwissenschaftlich-technische Grundlagen		**Tragwerkslehre I+II 10**		**Tragwerkslehre III 7**			
		VL Tragwerkslehre I 2 *UE Tragwerkslehre I* 3	*VL Tragwerkslehre II* 2 *UE Tragwerkslehre II* 3	*VL Tragwerkslehre III* 2 *PIV Tragwerkslehre III* 5			
	Materiallehre und Bauphysik 4						
	VL Materiallehre & Brandschutz 2	*VL Bauphysik/Raumakustik/baul Schallschutz* 2					
			Techn. Geb.ausr I 4	**Techn. Geb.ausr II 9**			
			VL Technischer Ausbau /Lichttech./-gestaltg. 2 *VL Heiz- und Raumlufttechnik* 2	*PIV Technischer Ausbau* 4,5 *PIV Heiz- und Raumlufttechnik* 4,5			
Vertiefung aus Fächergruppe 1-6					**Vertiefung aus Fächergruppe 1-6 18**		
					Wahlpflicht 9	*Wahlpflicht* 9	
Freie Wahl	**Freie Wahl 3**				**Freie Wahl 15**		
	3				*Freie Wahl* 6	*Freie Wahl* 9	
Bachelorarbeit						**Bachelorarbeit 12**	
	Summe 29	31	30	31	29	30	180

Legende: LP: Leistungspunkte, VL: Vorlesung, UE: Übung, PIV: Projektintegrierte Veranstaltung

STRENGTHS AND OPPORTUNITIES

The architectural curriculum on offer at the Technical University of Berlin, which includes the Bachelor of Architecture (3 years) and the Master of Architecture (2 years) degrees, presents the following major strengths and opportunities:

Strengths:

- Some professors and other members of the teaching staff have developed strong approaches in sustainable environmental design;
- Particular approaches can be independent of curriculum;
- Specific contribution to integration is achieved through architecture professors offering studio modules that include technical issues;
- Various enthusiastic staff members contribute to fill the gap between design and engineering disciplines.

Opportunities:

- Sustainable environmental design should be implemented as a compulsory component of the teaching programme as well as a necessary demand for accreditation of the architectural course due to the creative inputs that it can provide to the practice of design.

SOURCES AND REFERENCES

Institute of Architecture website: www.architektur.tu-berlin.de/architektur/menue/home/parameter/en
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

BYAK Bayerische Architektenkammer – Bavarian Chambers of Architects

The Bavarian Chamber of Architects (BYAK Bayerische Architektenkammer) is a professional body governed by public law. Every Architect, Interior Designer and Landscape Architect in Bavaria belongs to it as a compulsory member. The BYAK fulfils responsibilities of public administration supervised by the Bavarian Ministry of the Interior. Since 2007, the ByAK also administers the register of Urban Planners.

As Germany is a federal state, there exist 16 sovereign Chambers of Architecture which act as separate bodies of law throughout the territory. Only those who are registered within the Chamber of Architects in their respective state are entitled to call themselves “Architect”, “Interior Architect” or “Landscape Architect”. These titles are protected by the rules and regulations of the Chambers of Architects of the German federal states. The Federal Chamber of German Architects (BAK) in Berlin is not a body of law, but rather the umbrella organisation of the Chambers of Architects of the 16 German Länder. Its members represent each of the 16 chambers of architecture (in order for rights and duties to be federally organised). Preconditions to be enrolled within any of the professional registers in Germany are:

- Successful completion of studies in architecture (consisting regularly in a minimum of 8 semesters) or in landscape architecture or interior architecture (consisting regularly in a minimum of 6 semesters at a German university or equivalent recognised institution);
- Practical work experience in the specific subject (minimum of 2 years).

The ByAK represents the interests of its members, which include around 21,000 architects, interior architects and landscape/garden architects (as of the 1st February 2009) in the federal state of Bavaria. The majority of ByAK members (89.6%) work as construction architects, 6.7 % work as landscape/garden architects and 3.7% are registered as interior architects. As noted in the ‘*Bayerische Baukammerngesetz BauKaG*’ (Bavarian Law of Building Chambers), Art. 13, BauKaG, the principal tasks of the ByAK are to:

- Strengthen the consciousness of architectural culture;
- Act in the interest of its members in public and at a political level;
- Provide consumer protection;
- Offer general consulting services for members and the public;
- Offer special advice in technical and legal matters to its members;
- Carry out public relations for the profession;
- Offer education and training in all questions concerning architecture;
- Facilitate architectural competitions.

Prescription for Qualifications

The qualification and registration process of Architects in Germany follows the federal structure of the country. Each federal state of Germany runs a Chamber of Architects whereas the head organisation Federal Chamber of Architects (Bundesarchitektenkammer - BAK) represents the 121,800 architects in Germany internationally. The accreditation of architects is completely organized by the Chambers of Architects of each federal state. Therefore, the qualification criteria differ in details from state to state.

An architect who lives in Bavaria and wants to become a registered member of the Bavarian Chamber of Architects needs the following:

- A Diploma degree or a Master Degree in Architecture, Landscape Architecture or Interior Architecture of a German University or School of Applied Sciences or Academy of Arts;
- At least two years of professional experience within the area of practice according to the field of study. The practice has to include all phases of planning, design development, contracting and construction management according to the Regulation of Fees and Payment for Architects (*Honorarordnung für Architekten und Ingenieure - HOAI*). In case of gaps in the professional experience, applicants can take part in professional education programmes offered by the Chamber.

Degrees awarded by German Universities are generally accepted by registration boards, if there is no doubt about the content of the architecture, landscape architecture or interior architecture studies and if the universities that have awarded the degree are accredited. If there are any questions about equivalence, the registration board may ask assistance to the ‘*Permanent Secretary of the Cultural-Ministry-Conference*’ in Bonn. An assessment of the practical work has to be done by the registration board. In terms of course accreditation, however, the entire university system - and not only single programmes or schools/faculties - has to be accredited by the competent professional body

The Bavarian Chamber of Architects is currently facing the transitional process of applicants with Bachelor or Master Degree. Future applicants with a Master Degree will be considered equal to existing holders of Diploma degrees. Applicants with a Bachelor Degree of 6 semesters are not eligible to become a registered member. Conversely, applicants with a Bachelor Degree of 8 semesters are eligible to become a registered member. Professional experience of at least 2 years has to be accounted for.

The Chamber of Architects expects the professional experience indirectly to include issues of sustainability and energy efficiency according to the strict German building codes in this area, such as the Energy Saving Regulation (*Energieeinsparverordnung* - *EnEv*).

SOURCES AND REFERENCES

BYAK website: www.byak.de/

Greece

NATIONAL TECHNICAL UNIVERSITY OF ATHENS

SCHOOL OF ARCHITECTURAL ENGINEERING

Diploma in Architectural Engineering (5 years)

Level: Graduate (DipArch, 5 years)

Accrediting Body: Technical Chamber of Greece (TGC / TEE)

Educational Aims: The goal of the five-year degree in Architectural Engineering is to educate students in the theory and practice of Architecture and space development in general, focusing on both humanistic and technological issues. The course, with duration of 9 semesters plus 1 semester of project design, is built to allow students to deal with a variety of architectural and spatial issues, in the framework of a complex and changing environment. Students are provided with scientific and technical knowledge and, at the same time, they are given the opportunity to develop their creative and artistic skills. The School is structured into four departments: Department 1: Architectural Design; Department 2: Urban and Regional Planning; Department 3: Architectural Language (Visual Arts); Department 4: Architectural Technology.

Outline Description of Course: The five-year degree is clearly project-oriented. Indeed, it consists of 13 compulsory semesters of Architectural Design (studio modules): one module per semester in the 1st and 2nd year, two modules per semester in the 3rd and 4th year and one in the 9th semester. The topics treated determine which departments are involved other than the Architectural Design one. In addition, six optional design modules (Special Topics) allow students to develop advanced skills with a focus on architectural design. During the first year, students undertake design projects having limited objectives and complexity during both semesters, which are to be considered as a unit. In second year, students face small scale design, from a single family house (3th semester) to a small housing complex (4th semester). In parallel, they get introduced to concepts and issues pertaining to human and natural environment and the effects of design on it (3rd semester, Environmental Topics). During the third year, the Architectural Design modules focus on specific topics: educational and cultural buildings (5th semester) and integration of a modern building into a protected traditional environment or of special architectural character (6th semester). In parallel, Building Engineering 3 (5th semester) includes Energy Bioclimatic Design notions – a critical issue in the context of Environmental Design education. At fourth year, design efforts are focused on both the wider context of human settlements (7th semester, Planning and design of urban space and 8th semester, Architectural design of open public space) and the specific theme of Multipurpose Public Building (full year course: 7th & 8th semester). At this point, there are no more environmental compulsory courses but only optional ones that focus on Urban and Regional Environmental Planning. At the last year, an Architectural Design module focused on Urban design (9th semester) and the Diploma design project completes the educational program.

Course Structure: The course has duration of nine semesters, with compulsory and optional modules, divided in the following groups: Theory and Synthesis (Design and Theory); Theory and History; Artistic Expression and Representation (Visual Arts); Urban and Regional Planning; Architectural Technology. The 1st year consists of 8 compulsory modules per semester, 29 teaching hours per week in total (with the exception of foreign language and CAD). At 2nd year, the 3rd semester consists of 8 compulsory modules, 35 teaching hours per week in total (with the exception of foreign language). From the 4th semester on, by introducing two optional courses per semester (6 teaching hours per week), compulsory modules decrease to 4 and 5, as well as teaching hours which also decrease to 20 or 25 per week. Last semester is dedicated to the Diploma design dissertation, considered as the final and most important element in the curriculum.

<u>Diploma in Architectural Engineering (5 years)</u>

Year 1 (*Compulsory Modules)*

Depart.	*Title*	*Hours/Week*	*Taught*
1	Architectural Design 1 (Studio) - Introduction to architectural synthesis 1	8	Autumn
1 & 2	History and Theory 1- Prehistoric and Archaic Period	4	Autumn
3	Free Hand Drawing 1- Drawing Approach of the Space	3	Autumn
3	Plastic Arts 1- Introduction to Basic Concepts Of Plastic Arts	3	Autumn
3	Computer Science 1- Introduction to Computer Science	2	Autumn
4	Building Material Technology 1- Building Material Technology, General Part	2	Autumn
4	Structural Engineering 1- Statics	4	Autumn
	Mathematics	3	Autumn
	Foreign Languages	2	Autumn
	CAD Seminar		Autumn
1 & 4	Architectural Design 2 (Studio) - Introduction to architectural synthesis 2	8	Spring
1 & 2	History and Theory 2- Greek and Roman Antiquity	4	Spring
3	Free Hand Drawing 2- Fundamental synthetic principles research	3	Spring

3	Plastic Arts 2- Applications on a variety of materials	3	Spring
3	Geometrical Representations- Principles in Architectural Representation	3	Spring
3	Computer Science 2- Computer science and architecture	2	Spring
4	Building Material Technology 2- Building Mat. Technology, Special topics	2	Spring
4	Structural Engineering 2- Materials Resistance	4	Spring
	Foreign Languages	2	Spring

Year 2 (*Compulsory Modules)*

Depart.	*Title*	*Hours/Week*	*Taught*
1 & 3	Architectural Design 3 (Studio) - Architectural Synthesis 3: residence	8	Autumn
1 & 2	History And Theory 3- Medieval Era	4	Autumn
2	Environmental Topics- Environment and Spatial Planning	2	Autumn
3	Painting- Introduction to Colour	3	Autumn
3	Plastic Arts 3- Plastic constructions with traditional and contemporary materials using multiple techniques and methods	3	Autumn
3	Computer Science 3- Geometrical Representations and Computer Science	3	Autumn
4	Building Engineering 1- Small Scale Construction. Structure's Analysis and Buildings' Networks	5	Autumn
4	Structural Engineering 3- Reinforced Concrete	4	Autumn
	Foreign Language	2	Autumn
	Architectural Design 4 (Studio) - Collective Housing	8	Spring
1	Housing complex		
3	Social housing-participatory planning		
	Gender and space		
1 & 2	History and Theory 4- Modern Times	4	Spring
1	Measured Drawing- Systematic measured drawing of a building	3	Spring
4	Building Engineering 2- Small scale construction.		
	Analysis of construction elements, buildings systems	5	Spring
	Foreign Languages		

(Optional Modules) – Students must take 2 optional modules amongst the following:

	Planning and Environmental Law	2	Spring
	Legal Framework on urban planning and environmental protection		
	Statistics	2	Spring
	Physics	2	Spring
	Surveying	2	Spring
	Philosophy – Aesthetics	2	Spring
	Urban Sociology	2	Spring
	Cognitive and Representational Space	2	Spring
	Synthesis through fundamental drawing principles and colours' features		
	Development of Plastic applications in structured public space		
	Gender and Space- Introduction to gender and space issues	2	Spring
	Foreign Languages	2	Spring

Year 3 (*Compulsory Modules)*

Depart.	*Title*	*Hours/Week*	*Taught*
1	Architectural Design 5 (Studio)	8	Autumn
	Architectural synthesis 5: educational and cultural use building		
1 & 4	Architectural Design 5* (Studio) Analysis of Traditional Buildings and Complex	6	Autumn
1 & 2	History and Theory 5- Modernism	4	Autumn
2	Urban Planning 1- Analytical Approach to Urban Space	4	Autumn
4	Building Engineering 3-	5	Autumn
	Large-Scale Construction Advanced Structural Systems		
	Energy bioclimatic design		
1	Architectural Design 6 (Studio) - Architectural Synthesis 6	8	Spring
1	Integration of a Modern Building into a Highly Protected Traditional Environment		
1	Integration of a Modern Building into an Environment of Special Architectural Character		
3	Integration of a New Function in an Existing Building Structure		
	Architectural Design 6* (Studio) - Traditional Buildings and Complexes	6	Spring
3	Introduction to the Concept of the "Object for Everyday Use"		
4	Architectural Constructions		
1, 2 & 3	History And Theory 6- Contemporary Times	4	Spring
2	Urban Planning 2- Planning Interventions And Urban Design	4	Spring

(Optional Modules) – Students must take 4 optional modules (2 per semester)

	Special Topics in Synthesis 5		
	Environmental bioclimatic design and urban regeneration	3	Autumn

	Special Topics in Synthesis 5- Architectural archives	3	Autumn
	Special Topics in Architectural Space & Communication	3	Autumn
	Public Space and Communication		
	Special Topics in Architectural Morphology 5th	3	Autumn
	Morphological Analysis of Contemporary Architecture		
	Special Topics in History of Art- From Antiquity to Byzantium	3	Autumn
	Special Topics of Painting	3	Autumn
	Urban Space: Colour Interpretation in Internal Space		
	The Landscape of Archaeological Sites		
	Special Topics in Plastic Arts	3	Autumn
	Geometrical Specifications (Restrictions) of Plastic Arts' Objects		
	Special Topics in Perspective	3	Autumn
	Special Topics in Computer Science- Architect's Desktop	3	Autumn
	Special Topics in Building Engineering- Architecture and Earthquake	3	Autumn
	Special Topics in Structural Engineering	3	Autumn
	Large-Scale Shells, Folded Bearers, Membranes		
	Special Topics in Building Material Technology- Special Chapters	3	Autumn
1	Special Topics in Synthesis 6	3	Spring
	Urban Block of Flats in Greece		
	Structure and Function of Facade In Architectural Design		
	Music and Architectural Correspondences: «Counterpoint» as a Music and Architectural Tool		
	Environmental Design and Urban Regeneration, the "Xenias" Hotels		
1	Special Topics in Architectural Morphology 6th - Large Spaces Covering	3	Spring
1	Special Topics in History of Art-	3	Spring
	Monumental Painting in Greece From The Byzantine Period Until Today		
1	Special Topics in Restoration	3	Spring
2	Special Topics in Urban Planning - The Architecture of the City	3	
3	Special Topics in Painting-	3	Spring
	A. Urban Landscape: Interpretation of Outdoor Spaces		
	B. The Landscape of Archaeological Sites		
3	Special Topics in Plastic Arts- Applications of Plastic Arts on Architectural Surfaces	3	Spring
3	Special Topics in Computer Science	3	Spring
	Digital Design of Buildings. Designing The Digital Building		
3	Special Topics in Geometrical Representation- Geometry And Holography	3	Spring
4	Special Topics in Buildings' Infrastructure		
	Architectural Lighting of Buildings and Open Spaces	3	Spring
4	Special Topics in Building Engineering	3	Spring
	History of Techniques and Technology of Construction Projects		
4	Special Topics in Structural Engineering	3	Spring
	Large Scale Shells with Space-Nets, Inflated Constructions, Mixed Systems		

Year 4 (*Compulsory Modules)*

Depart.	*Title*	*Hours/Week*	*Taught*
1, 3 & 4	Architectural Design 7 & 8 (Studio) - Architectural Synthesis 7	8	Full Year
	Public Service Multiple Functions Building		
2 & 1	Urban Design - Urban Space Planning	6	Autumn
1 & 2	History and Theory 7	4	Autumn
	Architecture from Enlightenment to the End of the 19th Century - Greek Neoclassicism		
	Post-war Art In Europe And America		
	Aesthetic Approach to Architecture		
2	Regional Planning	3	Autumn
3 & 2	Architectural Design 8*- Analysis of Traditional Buildings And Complexes	6	Spring
1 & 2	History and Theory 8	4	Spring
	Modern Greek Architecture		
	Post-war art in Greece		
	City and politics in Greece and the rest of Europe		
	Forms and Space in the middle Ages		

(Optional Modules) – Students must take 4 optional modules (2 per semester)

1	Special Topics in Synthesis 7th	3	Autumn
	Airports: Their Programming And Layout		
	Hospital Architecture: General Hospital		
	Reuse of Building		
1	Special Topics in Architectural Morphology 7th		
	Large Spaces Covering	3	Autumn
	Stage-Design. Historic Approach		
	Critical Approach to the Integration of a Modern Building in Traditional Settings		

	Morphology and Significance of the Christian Temple		
3	Special Topics in Architectural Space & Communication 7^{th}	3	Autumn
	Theoretical Approach of Design Issues		
2	Special Topics of Environment		
	Open and Green Spaces In The City	3	Autumn
2	Special Topics in Regional Planning		
	Law, Sustainable Development and City	3	Autumn
3	Special Topics in Painting - The Imaginary Museum	3	Autumn
3	Special Topics in Plastic Arts- Plastics and New Media	3	Autumn
3	Special Topics in Geometrical Representation	3	Autumn
4	Special Topics in Structural Engineering	3	Autumn
	Parameters of Design of the Supporting Structure of Building Projects		
1	Special Topics in Synthesis 8^{th}	3	Spring
	Building Re Use		
	Reuse of Protected Buildings and Their Conversion into Museums		
	3d Digital Building Design- Structural Form Research		
	Internal Landscapes. Architectural Design of Contemporary Apartments		
	Spaces of Work and Production		
3	Special Topics in Architectural Space & Communication 8^{th}	3	Spring
	The Poster as a Synthesis Instrument and a Medium of Communication		
	The Structure of Architectural Space		
1	Special Topics in Architectural Theory		
	The Significance of Theory In Architecture	3	Spring
2	Special Topics in Urban Planning 8^{th}	3	Spring
	Urban Planning and Sustainable Development of the City and its "Periphery"		
	Contemporary Urban Planning - New Approaches in Classic Urban Planning Theories		
	The European Cities		
2	Special Topics in Regional Planning 8^{th}	3	Spring
	Environment and Development		
	Regional Planning, City and Environment		
2 & 3	Special Topics of Environment 8^{th}	3	Spring
	Environment, Landscape, Architecture		
2 & 3	Special Topics in Gender and Space	3	Spring
	Identity, Difference, Space		
3	Special Topics in Painting- The Imaginary Museum	3	Spring
3	Special Topics in Plastic Arts		
	Plastic Arts and New Communication Technologies	3	Spring
4	Special Topics in Building Engineering	3	Spring
	Construction Analysis and Intervention on Traditional Buildings		
4	Special Topics in Structural Engineering	3	Spring
	Bearing Structure of Building Projects		

Year 5 (*Compulsory Modules)*

Depart.	*Title*	*Hours/Week*	*Taught*
1, 2, 3, 4	Architectural Design Studio 9- Architectural Synthesis 9	8	Autumn
	Urban Design		
	Individual Research Project – Lecture		Autumn
	Detailed Study and Documentation of a Topic, chosen by the Students from the Curriculum of the Departments.		

(Optional Modules) – Students must take 2 optional modules

1	Special Topics in Synthesis 9^{th}	3	Autumn
	Movement and Architecture		
	The Relation between Museum and Archaeological Site		
2	Special Topics in Urban Planning 9^{th}	3	Autumn
	Applications of Geographical Information Systems in Spatial Planning		
3	Special Topics in Architectural Space & Communication 9^{th}	3	Autumn
	Conceptual Approach of Design Problems		
2	Special Topics of Spatial Planning and Development 9^{th}	3	Autumn
	Special Topics in Development		
2	Special Topics in Gender and Space 9^{th}	3	Autumn
	Places and Groups of Women		
4	Special Topics in Building Engineering	3	Autumn
	Digital Documentation and Information Management In Design And Construction		

Thesis — Spring

Architectural topics of diploma projects are chosen by students in collaboration with their tutors, in the broader thematic areas taught by the 4 departments.

Learning Outcomes: The programme provides students with the opportunity to develop and show appropriate knowledge and understanding, intellectual and cognitive abilities, professional and practical competence, transferable/key skills according to the requirements of the Technical Chamber of Greece.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

At 2nd year, in the 3rd Semester, the **Environmental Topics** compulsory module introduces issues and concepts pertaining to human and natural environment and the effects of design on it. The module is aimed at the comprehension of basic concepts and methods of approaching the environment and ecosystems as well as the encouragement of the exploration of the causes of degradation of urban environments and the policies for its upgrading. The module also attempts to explore the prospects of natural environment's viability in and around the city, to approach the evaluation methods of environmental problems as they appear in the urban space, as well as to evaluate the possibilities of intervention of planning and their solutions. Moreover, it investigates topics such as sustainable transport and renewable energy sources. Contents are delivered in lectures and the theory is then applied through analysis of case studies. Students are evaluated through written exams at the end of the semester (2/3) and attendance to the lectures (1/3).

At 4th semester, **Planning and Environmental Law**, an optional module, provides a legal framework on urban planning and environmental protection, with special attention to international legal documents which regulate environment protection.

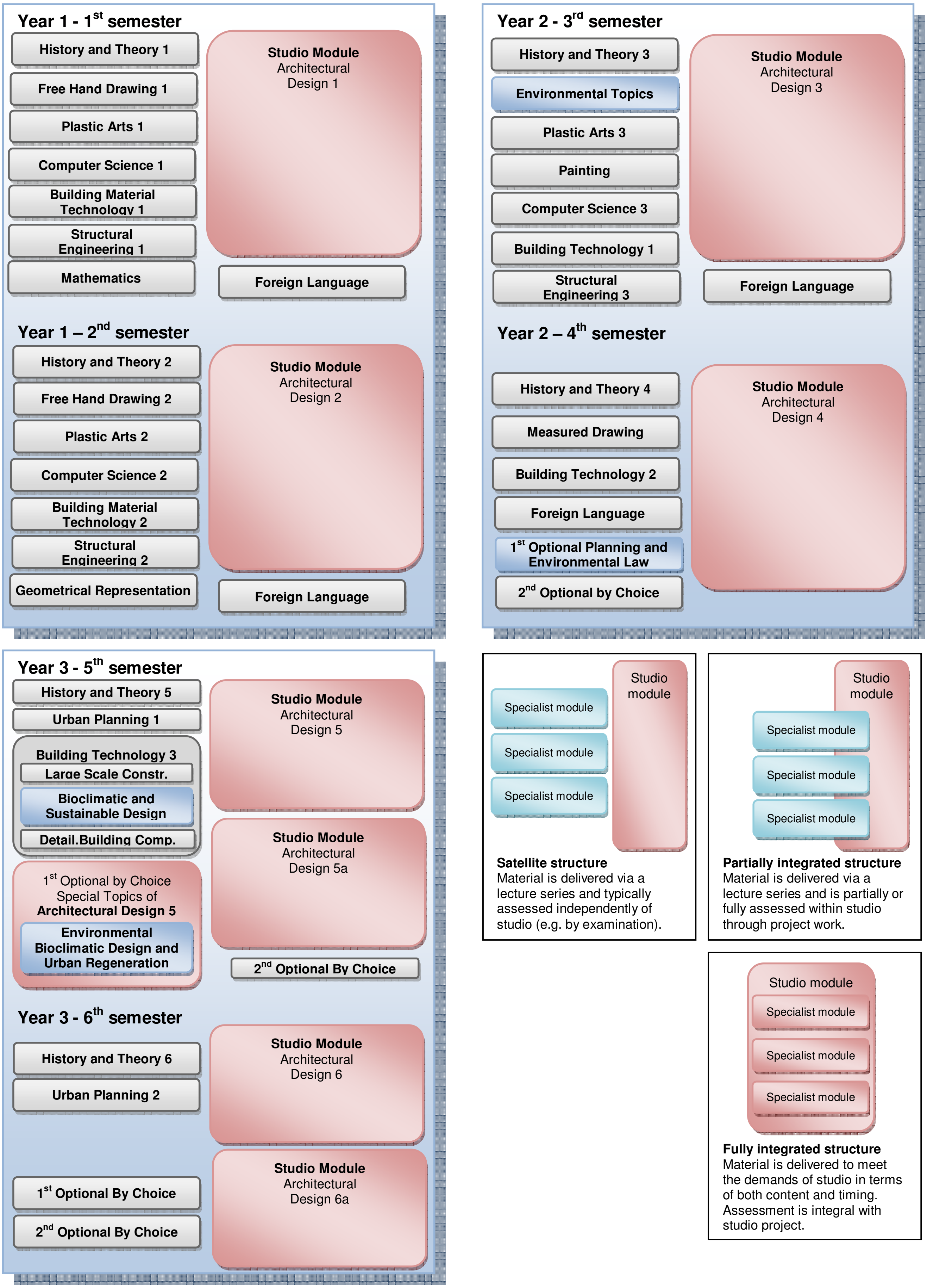
At third year, in the 5th Semester, **Building Engineering 3**, a core course, includes the module **Energy Bioclimatic Design,** which through coursework analyses both buildings' and settlements' environmental design and takes notice of external spaces and urban systems. Lectures range from general energy policies aimed at a rational use of energy, to passive solar systems and renewable sources. Furthermore, topics as important as natural lighting of buildings and building systems (heating, ventilation and air-conditioning) are examined: Delivery is first of all by lectures with tutorial support given in design studio, in order to assess, through individual project work focused on a single family house and a block of houses, the integrated use of passive and active systems applied to architectural design. Students are assessed by way of written exams (1/2) and individual project work (1/2). At the same time, **Special Topics in Synthesis 5 - Environmental bioclimatic design and urban regeneration**, an optional module, focuses on sun and light as parameters of architectural synthesis. The module is focused on the research of alternative ways for three-dimensional design (plan, section, façade) of a conventional teaching class aiming to achieve the best natural lighting and solar contribution in the teaching space and its quality upgrade. The module is assessed by individual design work. An oral exam is combined with the presentation of the student's work.

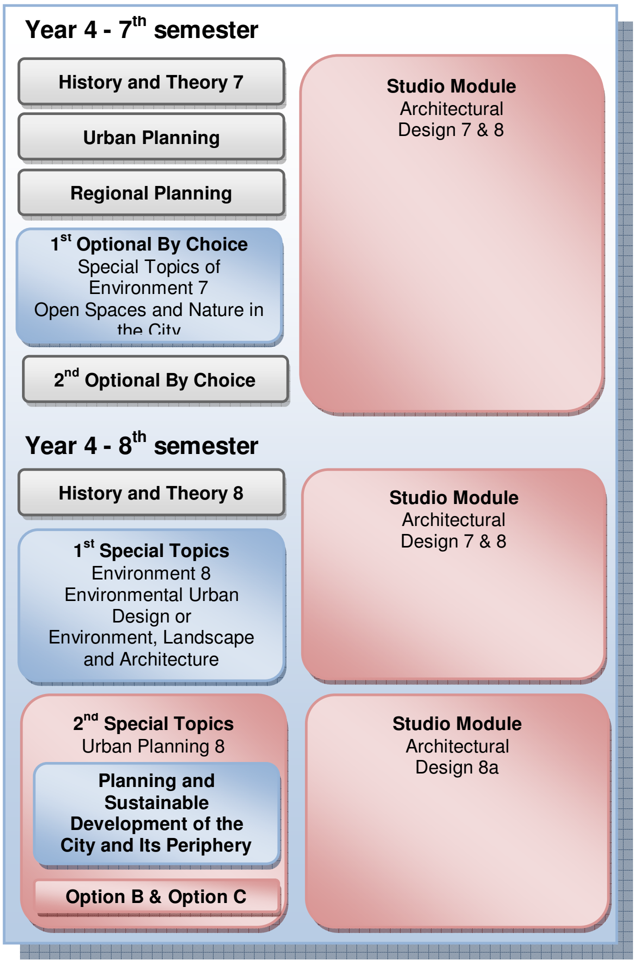
At fourth year, 7th Semester, **Special Topics of Environment 7** (optional module) carries out a wide ranging analysis of natural, semi-natural and manmade open spaces and landscapes as well as their relation with the environment of settlements and cities. The course is aimed at helping students to get acquainted with various design approaches in the re-establishment of natural environments and the improvement of microclimates in the built environment of settlements and cities. In addition to attending lectures, students undertake group project work focused on issues concerning design units of open spaces in settlements and cities, which refer to the appraisal and improvement of urban environmental conditions (i.e. vegetation, soil, water, protection from noise and climatic factors, air circulation/ventilation, etc.). Students' evaluation is based for 2/3 on the project produced and submitted during the year and for 1/3 on the final presentation.

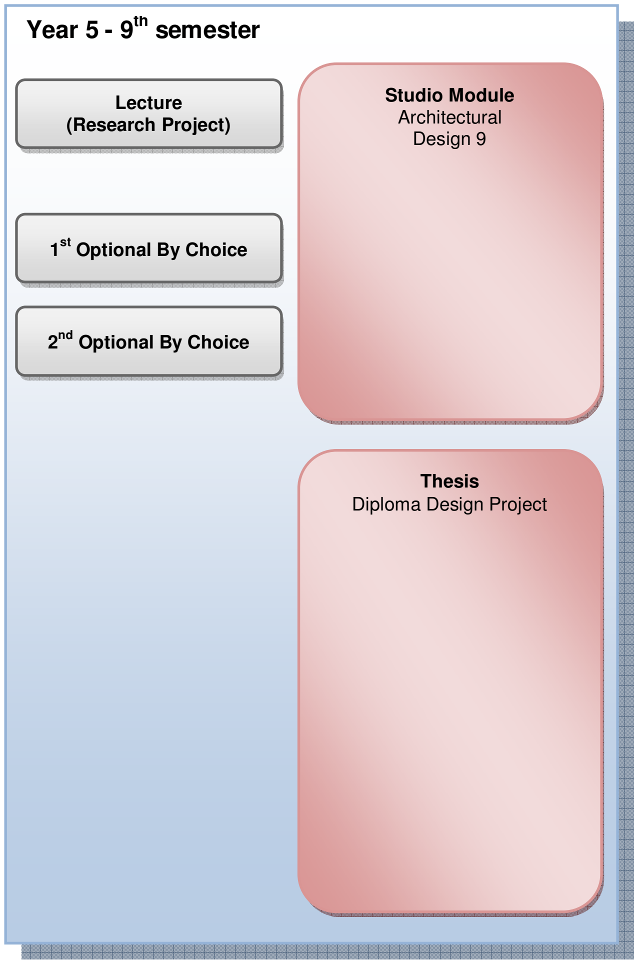
In the 8th semester **Special Topics of Environment 8** optional module, students have the opportunity to investigate specific issues regarding environmental design at an urban scale both by lectures and a design project. In particular, course A, Environmental urban design, focuses on policies concerning the built environment (e.g. European conventions and directives, sustainable mobility, etc.), renewable energy sources integrated in the built environment, protection and conservation of urban fragile ecosystems and methodology of environmental impact assessment. Conversely, course B, Environment- Landscape-Architecture, focuses on conceptual aspects of landscape and the various natural elements related with the built environment. Both courses, A and B, are assessed by a final design submission (2/3) and by work presentation (1/3).

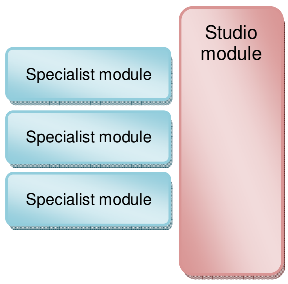
At the end of the programme, **Special Topics in Urban Planning 9** gives a choice to students to investigate topics regarding sustainable development on specific urban Greek contexts by examining both the state of the art and the current tendencies development, and the strengths and weaknesses from a sustainable development point of view, with the objective to produce a final proposal for a project. The evaluation is based on the developed project work and its presentation at the end of the semester.

Integration of Environmental Design with Studio – Diploma in Architectural Engineering

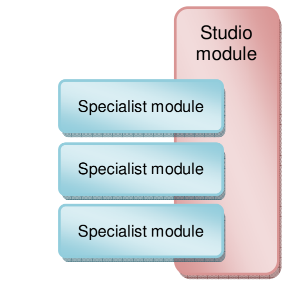




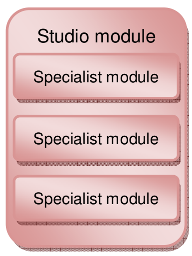




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Theoretical notions delivered during the course of the degree program are rarely explicitly assessed within architectural design modules. On the other hand, often the classes given beside lectures consist in a coursework such as complex exercises or project work. Environmental issues are implemented within design modules at the discretion of each Professor. There is only one compulsory module exclusively dedicated to environmental issues that takes up to two hours per week and is delivered by lectures only. Furthermore, the Energy Bioclimatic Design sub-module, with a widespread programme, is the only course which inquires buildings' bioclimatic design and it is integrated in the Building Technology 3 compulsory module at 3rd year. Numerous environmental design compulsory courses applied to urban and regional planning are available. This structure reveals strengths and opportunities, such as:

Strengths:

- The contents regarding environmental issues delivered in all degree courses embrace, even if only with limited scope, all the different scales of design. Therefore, students have the opportunity, by choosing certain optional modules, to acquire strong foundations for environmental design;
- The effort to integrate environmental design into Urban and Landscape Design courses as well as into Building technology courses represents a string asset.

Opportunities:

- The architectural design modules are designed to be gradually more complex, in line with the gradual implementation of environmental design systems.

SOURCES AND REFERENCES

School of Architectural Engineering website: www.acrh.ntua.gr
Academic Surveys and Feedback

APPENDIX
SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Technical Chamber of Greece (TCG/TEE)

The Technical Chamber of Greece is the institutional technical advisor to the Greek State and the leading Professional Engineering Association in Greece.

Established in 1923, it is a Public Legal Entity with elected administration, supervised by the Greek Ministry for Environment, Physical Planning and Public Works. It is headquartered in Athens with regional sections in 17 geographic areas throughout the country. All qualified architects/engineers in Greece are registered members of the Technical Chamber of Greece. It has over 90.000 members. Among various professional roles, the following can be underlined:

- Holds the engineering license examinations and grants license for the practice of the engineering profession;
- Studies the curricula of Engineering Schools and general educational issues, introduces improvements and comments on the professional rights of engineering graduates;
- Studies the institutional framework of professional rights of Engineers, informs its members and introduces relevant improvements;
- Codifies National and European legislation for all matters concerning the engineers and gives opinion on bills introduced in the Parliament;
- Deals with employment issues of engineering graduates and suggests new fields of employment for young Engineers.

Prescription of Qualifications

The TCG is the authorized body to provide work licenses to engineers of all disciplines as well as to architects, graduated in Greece or abroad. The license is awarded following examinations that take place three times a year.

The exams are oral and can be based, at the discretion of the student, on the work performed for the Diploma design dissertation and its field, or on questions about three of the five following topics about the law which regulates the accreditation exams (*Ministerial decree no. ΕΔ5/4/339*)

- Architectural design;
- Architectural form;
- Urban and regional planning;
- Building technology, building engineering, materials;
- History of architecture, restoration.

In the first case, the Commission can ask questions about more general issues, if this is considered appropriate in order to assess the student. The student has to provide the original drawings as well as a written dissertation. The commissions are composed by three members plus the secretary appointed by the TCG/TEE. These members have to be chosen between professors (at all levels) and professionals with at least ten years of experience.

SOURCES AND REFERENCES

Technical Chamber of Greece website: www.portal.tee.gr
Official Journal n.713, 5 October 1984; Official Journal n.1910, 23 December 2004.

Hungary

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS (BME) FACULTY OF ARCHITECTURE

Master of Architecture (5 years)

Levels: The BME currently offers a 5-year undivided Master Degree in Architecture (Graduate, MSc); a 4-year primary Undergraduate course (BSc/BA) and, as a continuation, a 1, 5-year Graduate course (MSc)

Accrediting body: MAB (Hungarian Higher Educational Accreditation Committee; independent professional organization responsible for the quality of higher education in Hungary)

Educational Aims: Architecture is at the same time artistic and technical in nature. The traditional strength of the courses in architecture at BME is the balance of these two fields; the technical, engineering knowledge and the development of artistic creative qualities are represented in the same way. The balanced, dual nature of the education elevates the international value of the graduates since most other institutions offer architectural courses where either the artistic or the engineering competence dominates, overwhelming the other equally important field of the profession. The goal of the *undivided 5-year Master course in Architecture (MSc)* is to train architects who are ready to satisfy the requirements of urban development, urban design and architectural or construction tasks generally associated with the human built environment. Students attending the course will be ready to solve specific professional tasks independently and/or to potentially continue with a PhD or DLA level education. Alternatively, the first stage of the *4-year primary (BSc/BA) Bachelor course* lays theoretical and professional foundations which are then utilized through practical exercises. The latter can only be done with considerable independent student work. The primary course aims to give a general knowledge of the profession in a particular field, and those students who wish to further deepen their knowledge in the chosen area can do so after obtaining their diploma in the Master program. The *1.5-year Master (MSc) program* gives specific knowledge in a particular, more narrow, field, also focusing on the theoretical principles of the chosen specialization. The Master system is characterized by teaching in small groups. Student work is often connected to work done by the University itself and/or work done by external companies in the profession. Competence gained in this manner will greatly aid the chances of graduates to access high-profile available employment positions. The MSc course is also the entrance requirement for the doctoral program. The doctoral candidate is in an employed-student status within the University. The *doctoral program* gives access to either the DLA (Doctor of Liberal Arts) or the PhD (doctor of philosophy) titles, depending on the artistic or engineering direction taken, once the graduate can show an elevated, high, independent level of competence and knowledge in the chosen field.

Outline Description of Course: The first eight semesters of the multi-cycle (4 + 1.5 years) program are basically identical to the initial stages of the undivided Master program. The five year program contains further elements, such as 4 weeks of construction and 8 weeks of design studio practice. In the BSc program, mandatory practice may be done in 4-week stages in a technical, construction, authority or design studio practice. Two practice stages must be chosen. Students in the single 5-year program, as well as students entering into the program with accreditation, after the successful completion of the first 5 active semesters may choose between design and technical directions. The courses include introduction to architectural history, architectural principles and associated arts, technologies and sciences. Connections and interactions between people and buildings as well as between buildings and their surroundings (foundations of architecture), residential and public functions, workspaces and urban design basics are explained. The knowledge gained is utilized by the students in faculty-aided and supervised work, although mainly applied to independently-completed practical design exercises. Design principles and design processes are shown in depth by the design departments of the faculty. As an integral part of the architectural programs, structural engineering, building construction principles, construction practices, related building physics and materials knowledge are also analysed in detail dedicated courses. Students will become familiar with realization processes, the planning, organization, controlling, supervision, and controlling of these processes and shall obtain the necessary technical, economical quality control and legal background. Basic computer skills, hardware and software knowledge, engineering packages generally used and the competence in the at least one CAAD software are required from all students. Furthermore, native students are required to show documented competence in at least two recognized foreign languages. Design and construction principles and the correlations of the various fields above are understood and demonstrated through so called “complex design” exercises. In the integrated process, various faculty members are available for simultaneous consultation. Preceding the preparation of the Diploma project, depending on the chosen design or technical direction, various intermediate collective examinations are held in a specific area. During the final Diploma semester, students will prepare close to construction level documentation drawings so as to give proof of acquired skills not only in the architectural field, but also in all of the special trades’ directions, such as statics, building constructions, building mechanics, site constructions and so on.

Course Structure: The undivided program contains 300 credit points, while the BSc program contains 240 credit points, typically in a 30 credit/semester system. Subjects mostly are accredited with 2, 3, 4, 6 - and exceptionally 10 - credit points. Courses contain various, basic, professional as well as differentiated technical, economical and other, more artistic-type subjects.

Master of Architecture (MSc, 5 years, undivided)

Year 1
Semester 1

Name	*Theoretical/Practical*	*Credits*
Mathematics 1	2/2	4
Philosophies	2/0	2
Descriptive geometry 1	3/2	5
Introduction to building constructions	2/0	2
Introduction to structures	2/0	2
History of architecture 1	2/1	3
Freehand drawing 1	0/5	5
Introduction to architecture	2/0	2
Composition in space	0/5	5
Credit Total		**30**

Semester 2

Name	*Theoretical/Practical*	*Credits*
Mathematics 2	0/2	2
Descriptive geometry 2	3/2	5
Building constructions1	2/2	4
Statics	2/2	4
History of architecture 2	2/1	3
Freehand drawing 2	0/4	4
Residential design 1	2/0	2
Basics of Architecture	0/6	6
Credit Total		**30**

Year 2
Semester 3

Name	*Theoretical/Practical*	*Credits*
Building materials 1	2/1	3
IT for architects 1	1/1	2
Building physics	2/0	2
Building constructions 2	2/2	4
Rigidity 1	2/2	4
History of architecture 3	2/1	3
Freehand drawing 3	0/4	4
Public design 1	2/0	2
Residential design2	0/6	6
Credit Total		**30**

Semester 4

Name	*Theoretical/Practical*	*Credits*
Sociology for architects	2/0	2
IT for architects2	1/2	3
Building constructions 3	2/2	4
Rigidity	4/2	6
History of architecture 4	2/1	3
Freehand drawing 4	0/2	2
Design processes	2/0	2
Workplace design 1	2/0	2
Public design 2	0/6	6
Credit Total		**30**

Year 3
Semester 5

Name	*Theoretical/Practical*	*Credits*
IT for architects 3	1/2	3
Realization of buildings 1	2/0	2
Building mechanics 1	2/0	2
Building Constructions 4	2/2	4

Support structure design	4/2	6
History of architecture 5	2/1	3
Freehand drawing 5	0/2	2
Urban design 1	2/0	2
Workplace design 2	0/6	6
Credit Total		**30**

Semester 6

Name	*Theoretical/Practical*	*Credits*
Economics for architects 1	2/0	2
Building mechanics 2	2/0	2
Realization of buildings 2	2/0	2
Building Constructions 5	2/2	4
Special support structures	2/2	4
History of art	2/0	2
History of architecture 6	2/1	3
Freehand drawing 6	0/2	2
Department designation (environmental)	0/3	3
Urban design 2	0/6	6
Credit Total		**30**

<u>Year 4</u>

Semester 7

Name	*Theoretical/Practical*	*Credits*
Construction of buildings 2	2/0	2
Realization of buildings 3	2/2	4
Building Constructions 6	2/2	4
Optional support structures	2/2	4
Heritage protection	2/0	2
Freehand drawing 7	0/2	2
Department designation (interior design)	0/3	3
Pre-complex design	0/8	8
Credit Total		**30**

Semester 8

Name	*Theoretical/Practical*	*Credits*
Mandatory technical elective	2/2	4
Building Constructions 7	2/2	4
History of Hungarian architecture 1	2/0	2
Freehand drawing 8	0/2	2
Mandatory architectural basics elective 1	2/2	4
Mandatory architectural basics elective 2	2/0	2
Mandatory architectural basics elective 3	2/0	2
Complex design 1	0/10	10
Credit Total		**30**

<u>Year 5</u>

Semester 9

Name	*Theoretical/Practical*	*Credits*
Mandatory technical elective	2/2	4
Mandatory architectural history elective	2/2	4
History of Hungarian architecture 2	2/0	2
Freehand drawing 9	0/2	2
Mandatory interior architectural elective	0/2	2
Mandatory form design elective	0/2	2
Mandatory architectural basics elective 4	2/0	2
Design process	2/0	2
Complex design 2	0/10	10
Credit Total		**30**

Semester 10

Name	*Theoretical/Practical*	*Credits*
Diploma project		30
Credit Total		**30**

Programme Credit Total		**300**

Learning Outcomes: Within the courses in Architecture at BME, professional architects are taught to complete the structural and architectural design work of buildings, building groups and shown how to organize, oversee and control the construction processes. The graduates gain knowledge and expertise about facility management, reconstruction and heritage protection, while, according to the education level gained, they are prepared to undertake theoretical, educational or practical work in reality. Graduates get prepared to directly control the building regulatory or authority work of municipalities or other government organizations. The Master course, with the required post-graduate practice, qualifies graduates for professional association memberships and consequent independent design work.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Students are introduced to sustainable energy forms in the third semester's **Building Physics** module (year 2) for the first time. During the lectures, the latest EU Directives and energy regulations are shown in order to provide the theoretical background necessary to comprehend the complex idea of sustainable architecture.

An elective of the sixth semester (third year), **Environmentally-friendly Construction Methods I** and **II**, is a 2-semester long module offered by the Department of Building Constructions. Being a complex subject, a strong suggestion is given to students to take the module upon successful completion of the following modules: Building Constructions 1-5, Building Physics and Building Materials. During the first semester, where principles are laid down within the discussion of natural-social-economical relationships of buildings and integrated into the existing issues of sustainable development, the idea of sustainable architecture is introduced and explained. The module analyses in depth the micro-climatic aspect of buildings related to their location, introducing themes such as: sun exposure, properties of surfaces, radiation, reflection properties of materials, etc. Water surface cooling and local ventilation aspects are shown, while wind protection and use are specifically investigated. The options of fossil and renewable energy sources and the qualities and behaviours of environmentally-friendly building materials are also detailed. Based on the above, students gain understanding of climatic processes (including comfort and other phenomena) and building-use related health issues (S.B.S. Sick Building Syndromes, B.R.I. Building Related Illness, etc.) along with the question of energy interdependence. In the second semester, the practical application of the learnt information is expected from students. The macro and micro-climate, positioning of structures (e.g., elevations, radiation exposures, water surfaces, wind channels, vegetation), mass and space forming, specific building materials and constructions are introduced. Options of utilisation of renewable energy forms are shown (e.g., passive and active heating, cooling and lighting), while natural ventilation techniques, water collection and water use, waste water treatment and some alternative building solutions (e.g., earth, hay, environmentally-friendly renewal of existing buildings) are explained. In the first semester, students are expected to design the central buildings of a southern-Hungarian eco-community at a concept-plan level (with the consultation of local representatives), while in the second semester they continue the design of the buildings up to the design documentation level. Both semesters finish with exams covering the materials taught, with the design and the results of the final exams weighing equally in the final mark. Concurrently, specific energy calculations are shown and practiced in other subject areas/elective modules, which belong to the Department of Building Energetics and Mechanics.

In semester 8 (year 4), **Building Constructions 7 (Sustainable construction)** is a module that explains and shows the available technical tools for sustainable architecture, being a mandatory course for the technical specialisation and an elective for the architectural specialisation of the Faculty. After discussion of theoretical foundations, the course program focuses on environmentally-conscious options for building renovations, analysing several issues that include energy, health, drinking water, waste water disposal, materials selection, etc. The single-semester subject also includes practical exercises where students, partially through design work, are shown applications of specific materials and solutions. Students prepare design documentation drawings for an environmentally-conscious renewal project. The semester is closed with an examination, with the design and the results of the exam weighing equally in the final mark.

Amongst the elective modules offered in the two final years of the programme (year 4 and 5), **Natural lighting methods** investigates the qualitative and quantitative aspects of natural light in detail, as well as the various options available together with their limitations, while attention is also given to the effects of location, general assembly of buildings and results of economical calculations.

The elective module **Thermal water utilization and heat and water sourcing of buildings** shows the positive geothermic conditions of Hungary, explaining the types of thermal waters available, their qualities, the methods for utilization, the techniques of water well creations and the heating of industrial and residential buildings with thermal energy. Multi-stage heat sourcing, complex thermal utilization systems, the relationship between building constructions and low temperature and radiating heat are analysed in detail, while further attention is paid to the subsequent surface allocation of used thermal water, nature protection, re-injection of thermal water and the correlations of modern thermal systems to urban design questions.

Computer aided calculation and sizing of solar buildings is an elective module which aims to introduce and explain the principles and practices of software solutions that aim to aid the design of buildings utilizing solar energy to a maximum extent. Software that is shown and applied are mostly used for the evaluation of correlations between architectural concepts (e.g., mass, orientation, man-made and natural environment, floor plans) structures and building elements (e.g., boundaries, surfaces, glass elements, shading devices) and the energetic and heat comfort effects of solar radiation.

Energy conscious design is an optional course that investigates the results of space-volume and mass correlations on the energy balance. The realistic limitations of insulation is shown, whilst building construction relations with air replacement and energetic aspects are analysed in detail. Students are introduced to the effects of natural ventilation, heat storage capacity, peak heating energy demands as well as the summer heat comfort requirements of periodic use buildings. Other ideas explained include passive cooling options, selective surfaces, transparent insulation, the problems of high and low tech solutions, and typical current EU directives in the realm of energy conscious design. Design software such as Passport, COOL B and the official heat calculation of the CEC are also referred to in the lectures.

The structures of solar buildings is an elective module that introduces in detail passive, hybrid and active solar systems, their components, functions and special building construction solutions, sizing and detailing. Connected and integrated solar space energy results, internal temperatures, viable hours are calculated, while heat storage options (e.g., stone base, brick walls, etc.), solar air collectors, hot water heating, ventilated crust structures, heat storage capacity of the soil, etc., are all evaluated, calculated and explained in depth with practical examples and realized applications.

The technical tools of sustainable architecture is an elective module currently under development. This course will have a similar content to the elective subjects offered at the moment in the regular academic system, but it will be offered as a specialized training option for the MSc programme currently undergoing the accreditation process.

All of the elective modules illustrated above are typically tailored for a single semester and are structured in lectures, which in some cases are linked to case studies and applied practice. Successful completion of all modules includes the passing of final examinations.

STRENGTHS AND OPPORTUNITIES

Strengths:

- Two semester-long elective modules (Environmentally-friendly construction methods I and II) aim to summarize and translate to students the full spectrum of the ideology of sustainability. The module reaches approximately 55-60 students per semester;
- A new module (Sustainable construction) will show specific and, at the same time, thought evoking ideas;
- Cooperation between the Departments, and specifically with the Department of Building Energetics and Mechanics, allow detailed analysis of construction options;
- The Department of Building Construction is currently preparing lecture materials on the subject that is expected to become publicly available in a book format. This publication will aim to clear and specify technical terminology and will support the theoretical base through case studies;
- Students, especially at the selection of complex diploma project topics, demonstrate an increased interest towards energy conscious, environmentally-friendly, ecologically appropriate building solutions and construction methods. More and more students select projects that accommodate such ideas.

Opportunities:

- Sustainable architecture is an important issue that introduces real life solutions that in turn allow students to develop a potential for utilizing these techniques in reality;
- The introduction of a specifically-dedicated course in the MSc system allows the education of a generation of highly trained professionals with the potential to aid and consult with practicing architects who may not yet have the necessary knowledge;
- The developments in curricular structures, the introduction of fundamental concept ideas and the explanation of economical-architectural-sociological correlations in the education will find their way to design development and, in the end, to public consciousness.

SOURCES AND REFERENCES

BME Faculty of Architecture website: www.epitesz.bme.hu
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Magyar Építész Kamara (MÉK, Chamber of Hungarian Architects)

The Magyar Építész Kamara (MÉK, Chamber of Hungarian Architects) is a public body with nationwide duties and jurisdiction, divided into a number of Regional Chambers of Architects. There are about 10,000 members in the Chamber, including: architects, urban planners, interior designers and landscape architects. The underlying functions of the Chamber of Hungarian Architects (MÉK) are:

- To determine the vocational and ethic rules for architects in Hungary;
- To supervise and control the legality of architectural activities;
- To represent the interests of Hungarian architects nationally and internationally;
- To coordinate the activities of the Regional Chambers of Architects.

In addition to this, the Chamber of Hungarian Architects regulates membership and affiliations of building practitioners and is responsible for several services and activities that guarantee continuing support in terms of information, education and public relations. The Chamber of Hungarian Architects is also responsible for the organization of professional training and CPD courses for its registered members. MÉK is a member of the Architects' Council of Europe (ACE) and the European Forum for Architectural Policies (EFAP).

Conditions for Professional Qualifications

The requirements to exercise the profession as an independent Architect, and lawfully use the title of Architect, in Hungary are as follows:

- Possession of a finalized MSc education (5 years) in Architecture with award of a final Certificate of Diploma;
- Membership of the Chamber of Hungarian Architects;
- Registration in the Register of Hungarian Architects;
- 2 years period of professional practice;
- Passing an examination proving the acquisition of legal, financial, standards and quality knowledge (organized by the Chamber of Hungarian Architects)

These requirements apply to a *restricted license* for the exercise of the profession. Conversely, for an *unrestricted license* there is a requirement of additional 5 years (altogether 7 years) of professional practice.

Environmental Sustainability in Higher Education in Hungary

Currently there are four institutions, besides the Budapest University of Technology and Economics, where University-level architectural education is available in Hungary. In three cases, a 4-year BSc system (Bachelor of Science in Architecture) is in operation, while in the fourth, in Pécs, a unified 5-year MSc curriculum is offered. The duration of the curricula is a minimum of 8 and 10 semesters respectively. These academic institutions are as follows:

- Szent István Egyetem Ybl Miklós Építéstudományi Kar (Budapest)
- Széchenyi István Egyetem Műszaki Tudományi Kar (Győr)
- Pécsi Tudományegyetem Pollák Mihály Műszaki Kar (Pécs)
- Debreceni Egyetem Műszaki Kar (Debrecen)

At the Ybl Miklós Faculty of Architecture and Civil Engineering (Ybl Miklós Építéstudományi Kar), a mandatory one-semester subject is offered in 'Energy and nature conscious building' with a 2/2 credit value. 'Ecology' as an elective subject is offered as an urban-ecology focus course.

At the Széchenyi István University (Széchenyi István Egyetem Műszaki Tudományi Kar) 'Nature protection' is offered as an optional module with a 2-credit value, and the course includes analysis of themes of environmental sustainability.

At the Pollack Mihály Faculty of Engineering (Pécsi Tudományegyetem Pollák Mihály Műszaki Kar), 'Ecology in Architecture I and II' is a two-semester module offered with a 3- and 4-credit value, respectively.

At the University of Debrecen (Debreceni Egyetem Műszaki Kar), 'Energy conscious architecture' is offered with a 2 credit value, dealing deal with ecology and energy in detail.

Ireland

UNIVERSITY COLLEGE DUBLIN

UCD SCHOOL OF ARCHITECTURE, LANDSCAPE & CIVIL ENGINEERING

BSc (Architectural Science) + BArch (5 years)

Level: Undergraduate (BSc, 3 years) + Graduate (BArch, 2 years)

Accrediting Body: RIAI (Royal Institute of Architects of Ireland), RIBA (Royal Institute of British Architects)

Educational Aims: This five-stage (years) professional undergraduate degree is the only architecture degree programme in the Republic of Ireland that is accredited by both the Royal Institute of Architects of Ireland (RIAI) and the UK Royal Institute of British Architects (RIBA). Many students interrupt the five years period to gain practical experience and, in general, the practice of taking a 'year out' is encouraged by the School. There are two main elements to the degree: project work (architectural design, drawing and model making) and lecture programs (theoretical material). Project work is taught in the design studios through a combination of lectures, individual tuition, field trips, group tutorials, large reviews and exhibitions. The lecture programmes are grouped under the broad headings of Technical (Architectural Technologies, Structures, Environmental Science), Cultural (Architectural History & Theory, Ecology, Conservation) and Managerial (Professional Studies). Studio work is assessed on the basis of students' efforts over both semesters, while the lecture programmes are assessed by a combination of written exams, continuous assessment and projects. The BSc degree is awarded to all students who have satisfactorily completed the first 3 years of the architectural programme but do not proceed to the BArch. This qualification provides an avenue into careers in associated professions such as landscape architecture, planning or research.

Outline Description of Course: The three-year BSc (Architectural Science) degree programme leads to the Bachelor of Architecture degree after a further two years of study and is geared primarily towards the architectural profession. After two years of approved graduate practical experience, holders of the Bachelor of Architecture degree may take the examination for the Certificate in Professional Practice and Practical Experience. Graduates who have passed this exam are entitled to exemption from the examinations in Professional Competence of the RIAI and the RIBA Part 3 and qualify for membership of these institutes.

Course Structure: The degree programme is divided into stages, which correspond to years for full-time students. Modular programs work on the principle of credit accumulation. Each stage represents 60 credits. A full-time student will normally complete a 60-credit stage in one academic year. A module is a self-contained unit of learning, which is studied over a semester. Each module has a credit value. A 5-credit module will require 100 to 125 hours of work. This includes lectures/seminars, self study and assessment. Core/compulsory modules are mandatory for the completion of the programme. Optional modules are modules which students can pick from a list of possibilities within a specific subject area. Elective modules can be chosen by students without a specific reference to any subject area.

<u>Bachelor of Science in Architectural Science (3 years)</u>

Stage 1

Code	*Title*	*Credits*	*Taught*
ARCT10010	Architectural Design I	15	Autumn
ARCT10030	Architecture & its Environment	5	Autumn
ARCT10060	History & Theory of the Designed Environment I	5	Autumn
ARCT10040	Architectural Technologies I	5	Autumn
ARCT10020	Architectural Design II	15	Spring
ARCT10070	History & Theory of the Designed Environment II	5	Spring
CVEN10020	Theory and Design of Structures I	5	Spring
Optional/Elective Module		5	Spring
Credit Total	**60 Programme Credits**		

Stage 2

Code	*Title*	*Credits*	*Taught*
ARCT20010	Architectural Design III	15	Autumn
ARCT20020	The Indoor Environment	5	Autumn
ARCT20030	Architectural Technologies II	5	Autumn
ARCT20040	History & Theory of the Designed Environment III	5	Autumn
ARCT20050	Architectural Design IV	15	Spring
ARCT20090	Architectural Technologies III	5	Spring
CVEN20040	Theory and Design of Structures II	5	Spring
Optional/Elective Module		5	Spring
Credit Total	**60 Programme Credits**		

Stage 3

Code	*Title*	*Credits*	*Taught*
ARCT30010	Architectural Design V	15	Autumn
ARCT30020	Architectural Technologies IV	5	Autumn
ARCT30030	History & Theory of the Designed Environment IV	5	Autumn
CVEN30100	Theory and Design of Structures III	5	Autumn
ARCT30040	Architectural Design VI	15	Spring
ARCT30050	Ecology of Architecture	5	Spring
ARCT30060	Architectural Technologies V	5	Spring
Optional/Elective Module		5	Spring
Credit Total	**60 Programme Credits**		

(Programme Related Elective Modules – electives can be taken from any programme in UCD)

ARCT 10080	Visualisation and Photographic Techniques	5	Spring
ARCT 20070	Drawing Systems	5	Spring
ARCT 20060	An introduction to Urban Design	5	Spring

Bachelor of Architecture (2 years)

Stage 4

Code	*Title*	*Credits*	*Taught*
ARCT40010	Design Technologies I: Integrated Design Strategies	5	Autumn
ARCT40040	Architectural Design VII	15	Autumn
ARCT40050	Architectural Design VIII	15	Spring
ARCT40060	Design Technologies II: Special Topics	5	Spring
ARCT40080	Research and Innovation in the Designed Environment II	5	Spring
Optional/Elective Modules		15 (3 x 5)	Autumn/Spring

(*Optional Modules*) - Students taking an Erasmus Exchange in Semester 2 must take ARCT40020 as their option module

ARCT40020	Research & Innovation in the Designed Environment I	5	Autumn
ARCT40170	Conservation History, Theory and Policy	5	Autumn
ARCT40180	Urban Design Theory and Practice 1	5	Autumn
Credit Total	**60 Programme Credits**		

Stage 5

Code	*Title*	*Credits*	*Taught*
ARCT40150	Research and Innovation in the Design Environment III	5	Autumn
ARCT40350	Architectural Design IX	15	Autumn
ARCT40360	Architecture Thesis Preparation	5	Autumn
ARCT40190	Professional Studies II	5	Spring
ARCT40370	Architecture Thesis	20	Spring
ARCT40390	Research and Innovation in the Designed Environment IV	5	Spring
Elective Module		5	Autumn

(Programme Related Elective Modules – electives can be taken from any programme in UCD)

ARCT 40030	Professional Studies	5	Spring
ARCT 40270	Development and its response to context	5	Spring
Credit Total	**60 Programme Credits**		

Learning Outcomes: On completion of the 5 years BArch, graduates can go into employment in practice or go on to further academic study in architecture or related discipline. After 2 years of approved postgraduate practical experience, holders of the BArch may take the examination for the Certificate in Professional Practice and Practical Experience. Graduates who have passed this exam are entitled to exemption from the examinations in Professional Competence of the RIAI and the RIBA Part 3 and qualify for membership of these institutes and also for registration as an architect under the Building Control Act 2007.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

During the first semester of Stage 1 of the BSc (Architectural Science), **Architecture and its Environment** introduces the students to the relationship between the built and natural environments in the context of sustainability and, more specifically, to the siting of buildings within the landscape in an ecologically informed manner. The module approaches the subject through theory and analysis with application. The module considers architecture in a broad environmental context with emphasis on climatic response. Course topics include: environmental concepts, landscape & site ecology, natural resources, comfort, climate, wind and shelter, shading and solar access. On completion of this module, students should be able to describe and explain the relationship between climate, the built environment and the broad environmental impact of design and construction and have acquired the ability to develop, represent and articulate environmentally responsible siting of buildings, utilising analysis techniques to inform and interpret design decisions. The module is delivered through lectures and assessed via an end of semester examination (50%) and a precedent study involving computer-based modelling and analysis (50%).

At Stage 2 (first semester), **The Indoor Environment** explores the relationship between external microclimate, indoor environment and occupant comfort through theory and application. It considers the physical role of the building and its components in modifying the internal environment. Subject areas covered include the visual, thermal and auditory environments, ventilation, indoor air quality and health, comfort and the energy and environmental consequences of related design strategies. On completion of this module, students should be able to demonstrate comprehension and understanding of key concepts of sustainable and healthy design and of generic environmental attributes of contemporary buildings and their indoor spaces. In addition, they should show familiarity with building energy modelling and performance assessment tools and techniques, understanding their applicability to inform design decisions and assess comfort, environmental impact and performance of buildings and urban spaces taking account of climate, site and building occupancy. The module is delivered through lectures and assessed by a final examination (50%) and a project study involving computer-based modelling and analysis (50%).

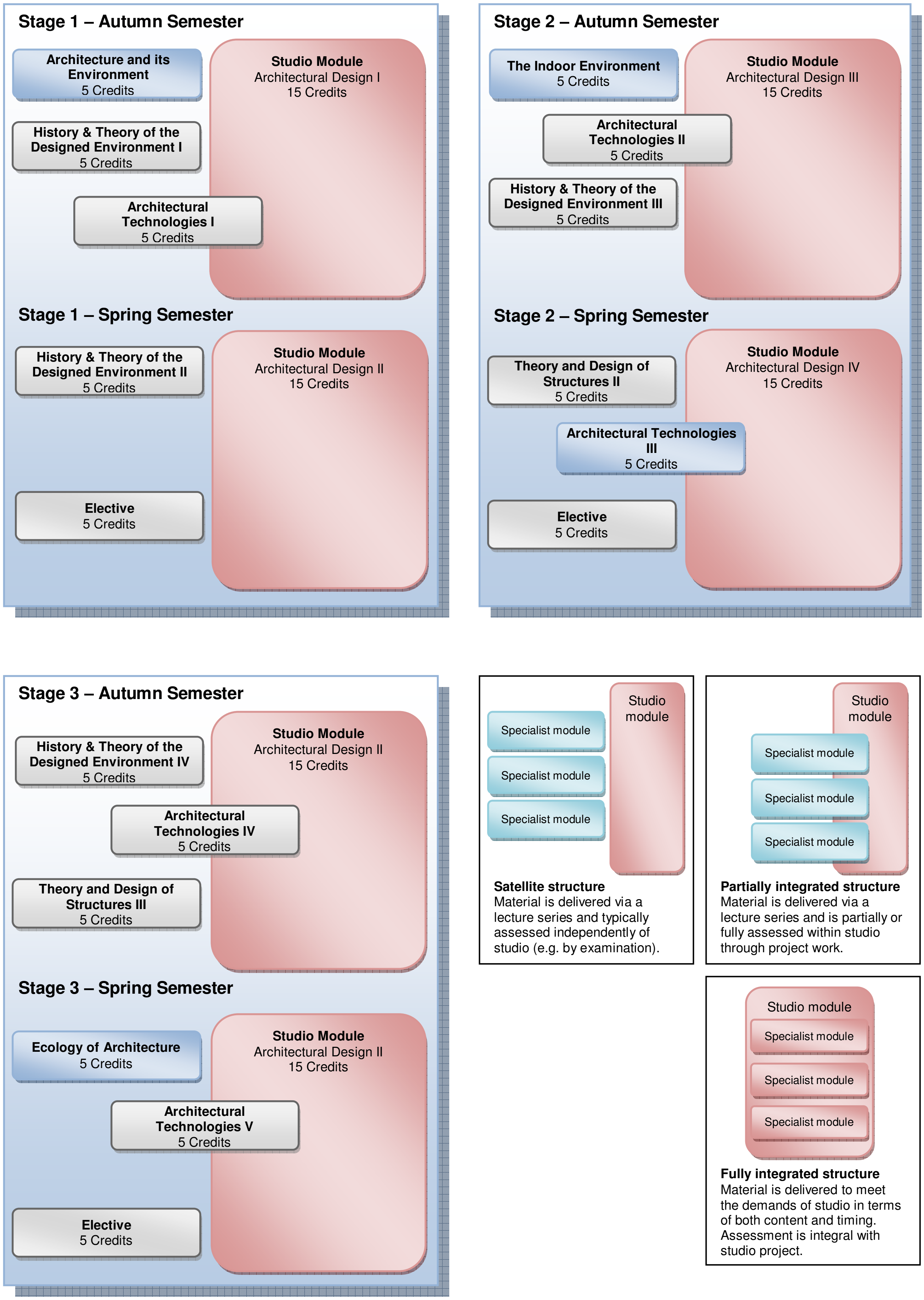
In Stage 3 (2nd semester), **Ecology of Architecture** investigates the complexity of the interaction between humans and environment. The module aims inform the contemporary debate on sustainability, viewed not only as an environmental issue but also as a socio-cultural subject. The ideas of social and environmental justice and of inclusive design are introduced and discussed with relationship to the production and conservation of the designed and natural environments. The modes and consequences of the perception of the designed environment through the senses and bodily movement are introduced, and their bearing on the quality of life for an inclusive populace are investigated. Aspects of environmental sustainability are explored through study of: traditional modes of designing with the climate; the water cycle and the consequences on it of development; elements of landscape and their contribution to the quality of life. Finally, cultural sustainability is explored through the history and theory of architectural, urban and landscape conservation and restoration. The module is assessed by project assignment (30%) and a final examination (70%).

Throughout the six semesters of the three Stages of the BSc, **Architectural Technologies I, II, III, IV** and **V** introduce and analyse technology principles and applications in order to provide a foundation for an understanding of the construction methods and performance of a building ranging from a domestic scale up to medium-rise complex public buildings. Through a formal lecture series, the modules at Stage 1 start from examining the building envelope and introduce materials, their properties and appropriate applications. Subsequently, the modules focus on diverse construction methods such as timber frame walling, concrete, steel structure and introduce new materials and structural methods as well as relevant environmental issues so as to facilitate understanding of integration of technology into design. Issues that must be addressed to achieve environmental quality in an energy efficient manner are analysed specifically in the second semester of Stage 2 (Architectural Technologies III). At this stage, students are also introduced to innovative and renewable energy technologies and their integration into the building envelope, with specific reference to medium-sized multi-storey buildings. In third year, the subject of building economics is introduced, in particular cost efficiency, cost control and procurement, as well as the analysis of electrical and mechanical building services, including air-conditioning, water services, fire safety, etc. Building laboratory complements the lecture series with a number of demonstrations of construction techniques, partly presented by the construction industry, so as to help the students to foster a critical understanding of design and realisation of a building. 20% of the overall grade for the modules is allocated to Technology Studio to recognise the role of architectural technologies in the creative process of making architecture. Other components of assessment include a project and building laboratory work (30%) and a final written examination (50%).

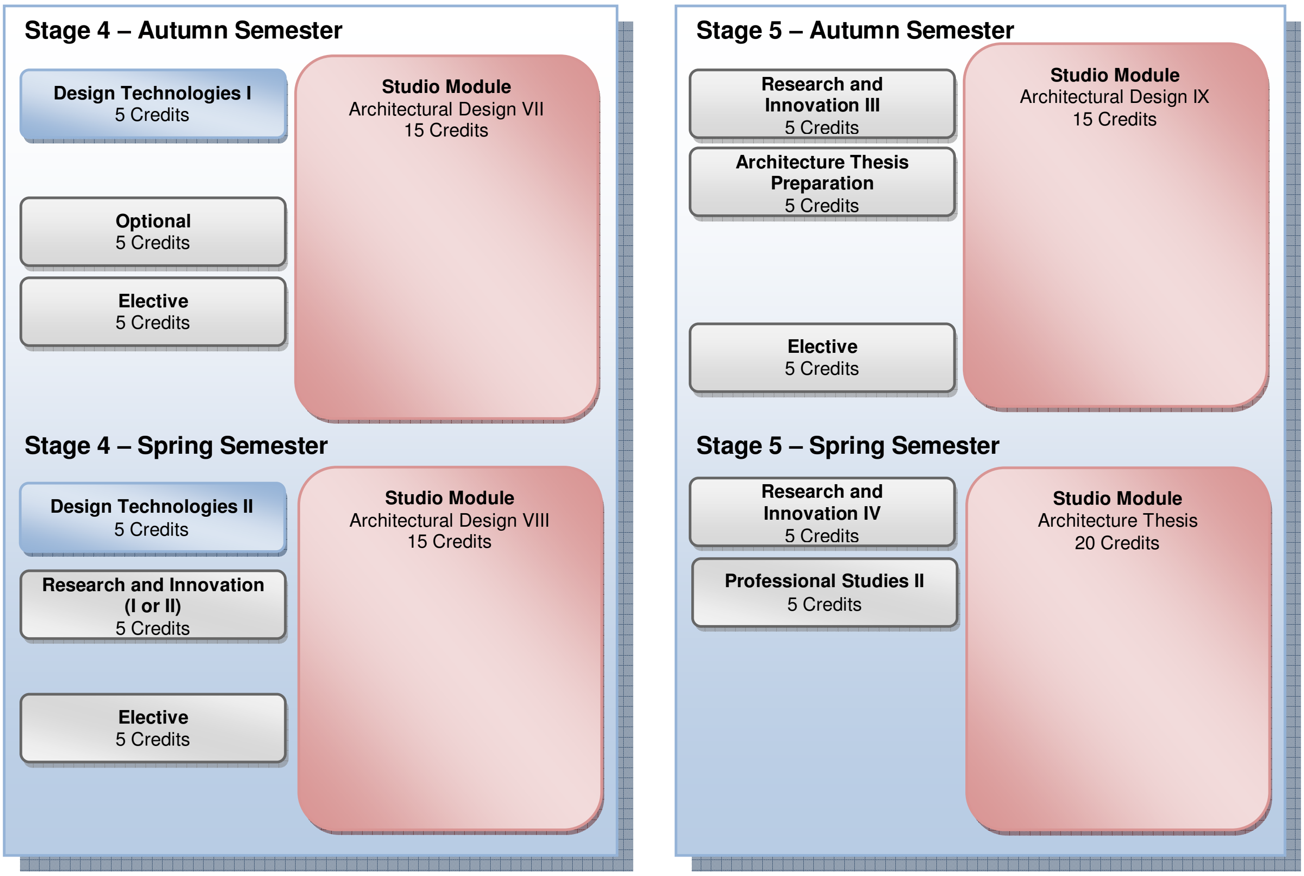
In Stage 4 (BArch), **Design Technologies I: Integrated Design Strategies** focuses on environmentally based building technologies and structural systems. An overview of sustainable building principles, advanced envelope technologies and the appropriate selection and assembly of materials for energy performance is given, together with a review of preliminary scheme design principles and design tools with respect to both structure and enclosure technologies in the context of professional practice. On completion of the module, students will be able to define relevant criteria in assessing environmental impact of materials and structures and demonstrate understanding of structural principles and environmental/building physics in schematic design, extending this understanding into detail realization in design project The material presented is to be applied as design strategies in project work focusing on specific issues or technological concerns raised in the lecture courses. Project work represents 80% of the final assessment, with the remaining 20% being assessed via a comprehensive final written exam.

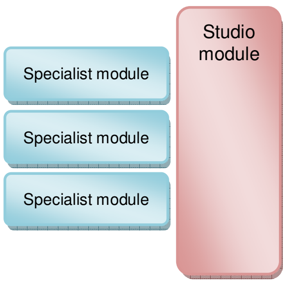
In the second semester of Stage 4, **Design Technologies II: Special Topics** varies to represent emerging issues in contemporary architectural technologies and the research interests of staff (recent topics include Irish timbers and sustainability; light experience perception; research in concrete design; advanced envelope design; performance analysis methods, etc.). Although the structure of assessment varies slightly in each option, in general all units consist of project and seminar-based courses with no examination.

Integration of Environmental Design/Tectonics with Studio – BSc (Architectural Science)

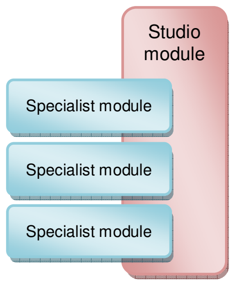


Integration of Environmental Design/Tectonics with Studio – BArch (RIBA Part 2)

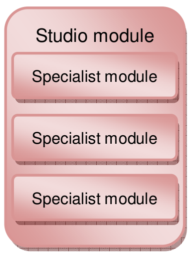




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

A number of strengths and opportunities concerning the implementation of sustainable environmental design in the curriculum can be highlighted within the BSc (Architectural Science) & BArch (5 years programme) at the UCD School of Architecture, Landscape & Civil Engineering. Namely:

Strengths:

- Sustainable environmental design represents an important part of the curriculum at undergraduate graduate and postgraduate level, particularly in terms of passive design, energy efficiency, occupant comfort and well-being and social sustainability;
- Students are adequately encouraged to explore environmental design in a creative way, and there is a general commonality of intents between technical staff and those responsible of studio teaching;

Opportunities:

- While there is room for improvement, the theoretical introduction through lectures and projects and the more practical implementation in technology and design studio seems to work well and accommodates both students and staff at all levels.

SOURCES AND REFERENCES

School of Architecture Landscape and Civil Engineering website: www.ucd.ie/arcel/index
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Royal Institute of the Architects of Ireland (RIAI)

The Royal Institute of the Architects of Ireland, founded in 1839, is the representative body for professionally qualified architects in Ireland as well as a registration body. Members must hold a qualification from a recognised school of Architecture and pass the RIAI Examination in Professional Practice. The affix MRIAI is recognised under Article II of the EU Directive (85/384EEC) on the mutual recognition of diplomas, certificates and other evidence of formal qualifications in architecture. The RIAI offers useful advice and information to students on careers, job opportunities, competitions, etc.

The RIAI's qualifications for membership are accepted by the Government, the courts and the EU as the required standard. A high standard of professional competence among its members is maintained by means of examination prior to entry, continuing professional development and sustained information programmes. The RIAI has been designated by the State as a Competent Authority in relation to the EU Architects Directive. In Europe and worldwide, the RIAI represents the profession through membership of the Architects Council of Europe and of the International Union of Architects.

The objectives of the RIAI are the advancement of Architecture and the associated Arts and Sciences, the promotion of high standards of professional conduct and practice and the protection of the interests of architectural training and education. The activities of the RIAI are carried out by its operating divisions: Practice Standards; Management and Technology; The Building Framework; The Built Environment; Architecture and Design. Each Division reports on its activities to a 24-member Council, the governing body to the RIAI, which is elected by the membership.

Accreditation of academic curricula

The RIAI is committed to the development of knowledge required for the practice of architecture. The Council of the RIAI is charged with determining all matters relating to the educational policy of the Institute. In discharging this responsibility, the Board of Architectural Education (BAE) advises the Council on all matters relating to the education and training of Architects and of Architectural Technicians and to carry out such related functions as Council may determine. Among these are:

- Liaison with educational institutions with regard to the conduct and content of courses devoted to the education and training of Architects and Architectural Technicians.
- Accreditation of architectural courses and architectural technology courses which are consistent with RIAI education policy.
- Monitoring changing requirements for architectural education and training.

The process of Accreditation is entrusted to Visiting Boards appointed by the Council. Their role is to carry out an objective assessment of the content and standard of courses in terms of the requirements set out in the Institute's *Statement of Policy on Architectural Education*, so as to ensure, in the interests of students, the public and the architectural profession, that the range of skills and the standard of performance attained/demonstrated by students graduating from the course is adequate in terms of preparation for a career in architectural practice.

In formulating its *Visiting Board Procedures*, the Institute has had regard to the *UIA Recommended Guidelines for the Accord Policy on Accreditation / Validation / Recognition*, adopted in Beijing in 1999. The Procedures also take cognisance of the Qualitative Criteria set out in the *UNESCO-UIA Validation System for Architectural Education*, adopted by the XXII UIA General Assembly in Berlin in July 2002. Approved undergraduate courses in Architecture, post-graduate courses in Professional Practice, and undergraduate courses in Architectural Technology are normally evaluated every five years. Formal evaluation visits for the purpose of Accreditation renewal are carried out by full Visiting Boards in two Phases: Phase 1 during term-time and Phase 2 at the conclusion of the same academic year, during the period when the year's work is on exhibition. In the case of post-graduate courses in professional practice, the Phase 1 and Phase 2 activities are normally combined within a single visit. Where possible, Visiting Boards are scheduled to align with the Educational Institution's internal Quality Assurance cycle for the course concerned.

RIAI Statement of Policy on Architectural Education

Selected excerpts (amended in 2001):

"*3.4 Education of Architects*

- *The institute takes the view that the particular characteristics of the architect lies in the capacity for creative design and realisation of the built environment in the service of society. Thus, formal qualifications in architecture must be based on qualitative and quantitative criteria ensuring that those possessing these qualifications are able to understand and give practical expression to the needs of individuals, social groups and communities as regards spatial planning, the design, organisation and construction of buildings, the conservation and enhancement of the architectural heritage and the preservation of the natural environment.*
- *The Institute takes the view that the basic training and education of the architect is best achieved through full-time undergraduate courses in architecture conducted at university or equivalent level, and extending over a minimum of five years, supplemented by at least two years of post-graduate approved or accredited practical experience.*

  […]

3.4.1 Fundamental Requirements for Architectural Studies

Architectural Studies should be balanced between the theoretical and the practical aspects of architectural training and should ensure the acquisition of:

- *An ability to create architectural designs that satisfy both aesthetic and technical requirements.*
- *An adequate knowledge of the history and theories of architecture and the related arts, technologies and human sciences.*
- *A knowledge of the fine arts as an influence on the quality of architectural design.*
- *An adequate knowledge of urban design and planning and of the skills involved in the planning process.*
- *An understanding of the relationship between people and buildings, and between buildings and their environment and of the need to relate buildings and the spaces between them to human needs and scale.*
- *An understanding of the ethical basis of the profession of architecture and the role of the architect in society, in particular in preparing briefs that take account of social factors.*
- *An understanding of the methods of investigation and preparation of the brief for a design project.*
- *An understanding of the structural design, constructional and engineering problems associated with building design.*
- *An adequate knowledge of physical problems and technologies and of the function of buildings so as to provide them with internal conditions of comfort and protection against the climate.*
- *The necessary design skills to meet building users' requirements within the constraints imposed by cost factors and building regulations.*
- *An adequate knowledge of the industries, organisations, regulations, contracts and procedures involved in translating design concepts into buildings and integrating plans into overall planning.*

3.4.2 Duration of Academic Education

- *Candidates for registration as architects should complete an academic professional education at university level, over a minimum of five years full-time equivalent of academic study. The learning outcomes must satisfy the Fundamental Requirements listed at 3.4.1. The candidates' performance will be assessed by the academic institution.*

  […]

3.7.1 Initiatives at Undergraduate Level

The Institute will support initiatives at undergraduate level which are aimed at:

  […]

- *Improving understanding of environmental sustainability. The Institute recognises the need to ensure that development which benefits the present generation does not prejudice the right of future generations to a clean and healthy environment. Students should have an unequivocal understanding of the issues involved in waste reduction, recycling, energy reduction, use of renewable natural materials and life-cycle costing.*

[…]

Conditions for Professional Qualification

To qualify as an architect in Ireland, it is necessary to:

- get a degree from a recognized school of architecture, followed by
- two years of approved practical experience, and
- an examination in professional practice.

The Building Control Act 2007 requires all of those using the title 'Architect' to be registered. Any person not on the Register who uses the title 'Architect' or practices under any name, style or title containing the word 'Architect' is guilty of an offence under the Act. Part 3 of the Building Control Act 2007 requires the RIAI to establish the Register for Architects. The RIAI is defined as the Registration Body for the purposes of Part 3 of the Act (the Part relating to architects). The RIAI has a number of grades of membership for which professionals can apply, including:

- Architect / MRIAI (Member);
- Architectural Technician / RIAI (ArchTech);
- Architectural Graduate (no affix, graduates on their way to becoming architects);

Graduates of three-year courses in Architecture are not eligible for any class of RIAI membership. To reach this level, a graduate must complete the final two years of a five-year full-time approved course in architecture.

RIAI members in the MRIAI (above) and FRIAI (Fellow) categories are eligible for registration as architects as well as access to the European market. RIAI Membership (MRIAI) is open to professionals that can demonstrate through the routes provided that they meet all of the requirements for independent practice in Ireland. MRIAI is a listed qualification in Directive 2005/36/EC and therefore enables professionals to provide architectural services in all EU member States as well as Norway, Iceland, Liechtenstein and Switzerland.

There are a number of routes to demonstrate that professionals meet all of the requirements for independent practice in Ireland. The routes as outlined below are in accordance with the requirements of the Building Control Act 2007, and the Directive 2005/36/EC on the mutual recognition of professional qualifications.

<u>Route A1 - For professionals that have</u>:

- a prescribed qualification in Architecture, or
- an accredited non-EU qualification in architecture, and
- have already passed a prescribed Irish post-graduate Examination in Professional Practice.

<u>Route A2 - For professionals that have</u>:

- a prescribed qualification in Architecture, or
- an accredited non-EU qualification in architecture, and
- are applying to take the RIAI Examination in Professional Practice

<u>Route B - For professionals that have</u>:

- a prescribed qualification in Architecture, or
- an accredited non-EU qualification in architecture ,and
- at least two years of approved post-graduate practical experience, and
- have passed a post-graduate Professional Practice Examination in another jurisdiction.

<u>Route C - For professionals that have</u>:

- a prescribed qualification in Architecture, or
- an accredited non-EU qualification in architecture, and
- have acquired seven or more years of post-graduate practical experience.

<u>Route D1 - For professionals that are</u>:

- a national of an EU Member States, Iceland, Liechtenstein, Norway or Switzerland, and
- have a recognised qualification in Architecture from an EU Member State other than Ireland, and
- meet the requirements of Directive 2005/36/EC on the Recognition of Professional Qualifications.

<u>Route D2 - For professionals that are</u>:

- a national of an EU Member State, Iceland, Liechtenstein, Norway or Switzerland, and

- have a Qualification in Architecture from an EU Member State other than Ireland which does not meet the requirements of Chapter III Article 46 of Directive 2005/36/EC on the Recognition of Professional Qualifications

Route E - For professionals that:

- have been performing duties commensurate with those of an architect in Ireland for 10 or more years prior to 1 May 2008

Route F - For professionals that:

- have at least 7 years' practical experience of performing duties commensurate with those of an architect in Ireland, and
- are at least 35 years of age

The RIAI is also empowered to grant authorisation to use the title architect to individuals whose work in the field or architecture is especially distinguished and who are Irish citizens.

Architectural Technician membership (RIAI ArchTech) is open to professionals that have an accredited qualification in Architectural Technology and at least two years of approved post-graduate practical experience, or have passed the RIAI Architectural Technician Entry Examination.
Architectural Graduate membership of the RIAI is open to professionals that have an accredited qualification in architecture (i.e. a prescribed qualification in architecture, or its equivalent), and are undergoing a period of practical training in preparation for Registration and/or RIAI Membership. This category of membership carries no affix and is limited to six years from the date of qualification. In exceptional circumstances, the RIAI Council can give a waiver on the six year deadline.

RIAI Examination in Professional Practice

The purpose of the RIAI Examination in Professional Practice is to assess suitability for admission to Membership of the RIAI. The Examination must establish whether the candidate:

- fully understands the nature and responsibilities of professional practice
- has sufficient knowledge of Irish law and contract procedures, and
- has had enough practical experience of all the stages of a building project.

A candidate for the Examination in Professional Practice must have a recognised qualification in architecture and, a minimum of two years of post-qualification approved or accredited experience, at least one year of which must be within the EU. Approved experience is practical experience gained under the supervision of a Fellow or Member of the RIAI or of another architect who, in the opinion of the Institute, is equally competent to supervise the work of an architect. Candidates whose post-qualification experience does not meet the requirements for approved experience must apply to have their experience accredited. Recognised qualifications in architecture include:

- the RIAI Final Examination;
- a qualification from a recognised school of architecture;
- a qualification recognised by the Competent Authority in another EU Member State;
- a qualification recognised by the professional or registration body in a non-EU state and assessed by the RIAI as equivalent to a qualification from a recognised school of architecture.

Currently, the only accredited examinations are the *RIAI Examination in Professional Practice* and the *UCD Certificate in Architectural Professional Practice and Practical Experience*.

RIAI Standard of Knowledge, Skill and Competence for Professional Practice as an Architect (2009)

This document lays out "*the requirements for professional practice as an architect in Ireland [...] reflecting national standards and integrating into the broader European and global frameworks for recognition. [...] This document is intended to provide those seeking Registration and RIAI Membership with a clear statement of what is required for recognition as an architect at the professional level. It is also intended to provide a framework for Continuing Professional Development, keeping architects aware of the key areas of knowledge skill and competence which must be maintained for effective practice*."

Selected Excerpts:

DEVELOPMENT OF THE STANDARD

"*The RIAI Standard thus describes the knowledge, skill and competence required for independent practice as an architect in Ireland. The emphasis is on the core knowledge skills and competence of the 'GP'* *architectural practitioner; specialist areas are not included. Most of the knowledge, skill and competence items are 'universal' or common to architects anywhere in the world. Some are 'domain specific' to practice in this jurisdiction.*

It is important to note that no single indicator listed in this Standard of knowledge, skill and competence stands on its own; all are contextualised within the overall role and responsibilities of the architect. In its "Architect's Profile" the Architects Council of Europe observes that the function of the architect calls for creativity, structured knowledge, organisational skills, mediation skills, a mind capable of synthesis, an independent and ethical stance, and a vision of the world.

The capacity to reason and conceive at different scales (the detail, the building, the urban and the wider context) allows the architect to address what is often an ill-defined problem, give 'shape' to a project, not only in the physical sense, and, taking account of functional, technical, aesthetic, social, cultural, economic and environmental context and demands, reconcile divergent factors to produce a coherent and holistic solution that satisfies the needs of client, user and society."

[...]

READING AND INTERPRETING THE STANDARD

"*The 11 elements listed under Article 46 of the EU Qualifications Directive (2005/36/EC) provide the framework for the Standard. Indicators are provided for each element in the form of manageable and clearly defined requirements that are recognisably related to the realities of architectural practice. The indicators outline the specific areas in which a candidate is expected to demonstrate expertise, and the level of that expertise.*

To provide clarification and support interpretation by users each indicator has been tagged as relating to one of the following eight major dimensions of practice: Design, Context, Technology, Regulation, Professionalism, Procurement, Management and Communication. The tags represent the dimension of practice with which a particular indicator fits most closely although the integrative nature of architectural practice means that, in reality, most indicators could be aligned to more than one tag."

[...]

RIAI STANDARD OF KNOWLEDGE, SKILL AND COMPETENCE FOR PROFESSIONAL PRACTICE AS AN ARCHITECT

Article 46.1 (a) ability to create architectural designs that satisfy both aesthetic and technical requirements

> *A2, Design - Ability to create an ordered and holistic layout of spaces that uses light, mass and form in three dimensions, based on clear conceptual thinking, that satisfies aesthetically, functionally and technically.*
> *A6, Design - Ability to analyse and understand the environmental, social and cultural context of a project and to respond to them in a design solution finding appropriate balance.*

[...]

Article 46.1 (e) understanding of the relationship between people and buildings, and between buildings and their environment, and of the need to relate buildings and the spaces between them to human needs and scale

> *E1, Design - Understanding of the relationship between people and buildings, and between buildings and their environment, and of the need to relate buildings and the spaces between them to human needs and scale.*
> *E2, Context - Understanding of the relationship between a building and its immediate context and wider environment.*
> *(This includes, inter alia, the physical and climatic environment, planning, conservation & heritage, spatial quality, landscape quality, natural disaster risks, biodiversity, environmental impact of construction, life cycle of materials and issues of ecological sustainability).*
> *E3, Context - Understanding of the enduring nature of architecture.*
> *(This involves/includes an appreciation of the nature and extent of the impact of buildings which, because of their scale and lifespan, will be lasting and significant in cultural and physical terms).*

[...]

Article 46.1 (f) understanding of the profession of architecture and the role of the architect in society, in particular in preparing briefs that take account of social factors.

F1, Design - Ability to collaborate with and lead other specialists in the field as required during the realisation of proposals, so that concepts are developed and implemented appropriately.
(The requirement for leadership will vary according to the project, but the architect as lead designer should have the capacity to provide it. This capacity should extend to knowing when additional/specialist input is required).

[...]

Article 46.1 (i) adequate knowledge of physical problems and technologies and of the function of buildings so as to provide them with internal conditions of comfort and protection against the climate.

I1, Technology - Ability to provide, through design and technology, appropriate conditions of comfort in response to environmental context and climate.
I2, Technology - Ability, through design technology, to manage the impact of structures, when built and in their ongoing operation, on the physical and natural environments.
(Current considerations include: conservation and waste management systems; design and service life of materials; ecological sustainability; passive systems; environmental issues; sustainable design)."

[...]

SOURCES AND REFERENCES

RIAI website: www.riai.ie
Published documents provided by the RIAI

Italy

UNIVERSITY OF ROME LA SAPIENZA

FACULTY OF ARCHITECTURE "Ludovico Quaroni"

Bachelor of Architectural Sciences + Diploma of Architecture / Architectural and Urban Design (5 years)

Level: Undergraduate (BArch, 3 years) + Graduate (DipArch, 2 years)

Accrediting Body: Chambers of Architects, Heritage Conservators, Landscape Architects and Planners

Educational Aims: The three-year degree Bachelor of Architectural Sciences provides the first stage in the five-year education of an architect. Structured both in a theoretical and practical part, it allows the students to acquire the necessary basic skills and "know-how" on professional practice in the broad architectural field. Therefore, students gain ability to analyze and understand specific issues, problems and interrelationships between the different components of the built environment and address them in planning by managing traditional and contemporary design techniques. The BArch degree aims to equip students with independent professional skills as well as be productive within the design-construction field. The Diploma of Architecture aims to create practitioners that can fully interact with the issues of urban design, an important field for the evolution of the contemporary city. It consists of a curriculum based on the principles outlined by the European Commission for Architecture. Therefore, the programme provides a scientific, technological, historical and aesthetic training so as to form practitioners capable of dealing with all issues of architectural and urban design, from large to small scale, in the design of the new constructions as in restoration projects.

Outline Description of Course: The BArch degree is based upon project work that consists of three Architectural Design Laboratories (Studio modules), one per year offered during the spring semester, which are supported by Architectural and Urban Design sub-modules structured in lectures, theoretical and technical studies and seminars. Furthermore, each year a different thematic sub-module is integrated in the Architectural Design Laboratory: Interior and Exhibition Design the first year, Heritage Restoration in the second year; and Architectural Technology in the third year. During the first two years, Architectural Technology (in Italy, this discipline includes Environmental Design) is taught in autonomous modules that provide basic and intermediate knowledge to be studied in depth and assessed within the third year Architectural Design module. Other subjects such as Mathematics, Technical Physics, Design and History, etc., are delivered by growing in complexity as the course develops in order to provide students with the necessary knowledge for dealing consciously with design exercises. In addition to the compulsory design modules, during the spring semester of the third year, students must attend an Integrated Studio module, by choice, which consists in an Architectural Design module focused on special topics to be chosen amongst different thematic areas (Physics, Technology, Environmental Design, Structures, etc.). At the end of the third year, the student must take a training period (100 hours at least, corresponding to 4 ECTS) within Firms, Professionals and/or Research Centres, in Italy or in a foreign country, to be able to sustain the dissertation. The final work must be supported by a portfolio able to communicate the results and the knowledge acquired during the whole three years and the training. At Graduate level (DipArch) the educational program is still based upon project work. The course is organized into five design modules, two integrated modules and 8 ECTS to be obtained on special topics by optional modules. Design modules aim to provide students with trans-disciplinary and trans-scalar practical skills in the fields of Architectural and Urban Design, Urban Renewal, Urban Planning, Construction and Technology. Each module consists of a core thematic area and a sub-module with a greater number of ECTS and other complementary sub-modules from different thematic areas. Integrated modules are organized in a similar way. The DipArch also attributes remarkable importance to the Training (250 hours, 10 ECTS). The introduction to the professional practice in public or private structures - Technical Offices, Engineering Societies, Construction Societies, Professionals - aims to provide students with operational practices in architecture and urbanism. The activity of training belongs to the final test and is complementary of the degree thesis.

Course Structure: Each year consists of 60 credits, normally 30 in each semester. Each module has a credit value. 8 credits are designed to require 100 hours of student work, including taught and contact time.

<u>Bachelor of Architectural Sciences (3 years)</u>

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
1006055	Mathematics 1	8	Autumn
1026354	Geometric Description	8	Autumn
98750	History of Architecture 1	8	Autumn
1026362	Technology of architecture 1	6	Autumn
1026463	Architectural Design Laboratory 1		Spring

	Architectural and Urban composition	8	
	Interior and Exhibition Design	4	
1026592	Structural Mechanics 1	8	Spring
1006054	Technical and Environmental Physics	8	Spring
Credit Total	**58**		

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
1027371	Mathematics 2	4	Autumn
102654	Geometry descriptive basics and applications	8	Autumn
1026340	History of Architecture 2	8	Autumn
1026475	Urban Design and Planning		Autumn
	Urban Design and Planning	6	
	Urban Design and Planning Techniques	6	
1026357	Architectural Design Laboratory 2		Spring
	Architectural and Urban composition	8	
	Restoration in Architecture	4	
1026605	Technology of architecture 2	6	Spring
1026517	Interior and Exhibition Design	6	Spring
1007339	Economic assessment	4	Spring
Credit Total	**60**		

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
1026593	Structural Mechanics 2	8	Autumn
1026341	History of Architecture 3	8	Autumn
1026380	Architectural Design Laboratory 3		Autumn
	Architectural and Urban composition	*8*	
	Technology of architecture	*4*	
	Optional modules	12	Spring
AAF1185	English	3	Autumn
AAF1042	Training	4	Spring
AAF1001	Final work	3	Spring

(*Optional Modules*) - Students must take 12 credits from this group:

1026456	Architectural Design Laboratory integrated with Construction Technique		Spring
	Architectural and Urban composition	6	
	Technology of architecture	6	
1026451	Architectural Design Laboratory integrated with Interior and Exhibition Design		Spring
	Interior and Exhibition Design	8	
	Industrial Design	4	
1026483	Architectural Design Laboratory integrated with Urban Design		Spring
	Architectural and Urban composition	8	
	Urban Project	4	
1026513	Architectural Design Laboratory integrated with Restoration and Conservation		Spring
	Applied Restoration Construction Techniques	8	
	Architectural Restoration Techniques	4	
Credit Total	**62**		

Diploma of Architecture / Architectural and Urban Design (2 years)

Year 1 *(Compulsory Modules)*

Code	*Title*	*Credits*	*Taught*
1026433	Urban Restoration and History of the city		Autumn
	Architectural and Urban Restoration	6	
	Architectural survey	2	
	History of the city and territory	4	
1026389	Urban Design Laboratory		Autumn
	Urban Design	6	
	Transportation	2	
	Urban Law	6	
1026464	Theories of Aesthetics and Architectural Research		Autumn
	Theories of Contemporary Architectural Research	4	
	Aesthetics	4	
1026490	Architectural and Urban Design Laboratory 4		Spring
	Architectural and Urban Design 4	8	

	Typological and morphological characters of urban projects	4	Spring
	Computer modelling	2	Spring
1026486	Construction Laboratory		Spring
	Construction Technique	8	
	Computer modelling of structures	2	
	Geotechnical studies	4	
Credit Total	**60**		

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
1026481	Architectural and Urban Design Laboratory 5		Autumn
	Architectural and Urban Design 5	8	
	Landscape Design	2	
	Economic Assessment	4	
1026461	Technology Laboratory and building installations		Autumn
	Experimental technologies	6	
	Building systems	4	
	Optional module (by choice)	8	Autumn
AAF1048	Training	10	Spring
AAF1048	Final work	18	Spring
Credit Total	**60**		

Learning Outcomes: The undergraduate BArch degree provides a curriculum that meets the Chambers of Architects, Heritage Conservators, Landscape Architects and Planners prescription of qualifications for Junior Architect (Section B) and enables students to access the Diploma of Architecture / Architectural and Urban Design. The Graduate in Architecture / Architectural and Urban Design, according to the requirements of the Italian Law DM 270/2004, can develop his activity with functions of elevated responsibility, in the private and/or public sector. The DipArch course provides a curriculum that meets the Chambers of Architects, Heritage Conservators, Landscape Architects and Planners prescription of qualifications for Senior Architect (Section A).

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

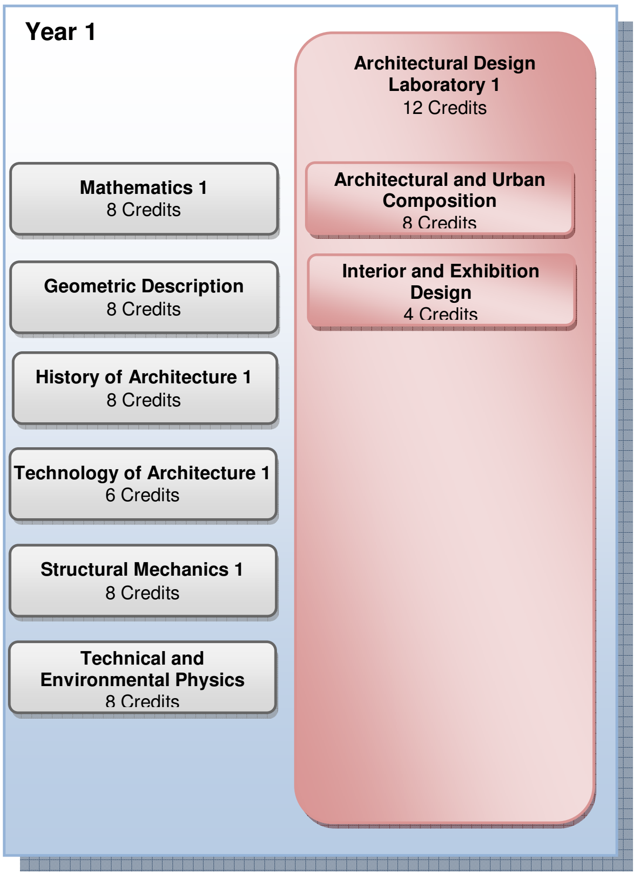
The **Bachelor of Architectural Sciences** started during the Academic Year 2009/2010 following a Regulatory Reform occurred at national level (DM October 31, 2007. n° 544/2007) that led to a reorganization of all degree courses. Amongst other requirements, the Regulatory Reform imposed the review of the older BArch degree in Techniques and Construction of Architecture, the reduction of the number of courses and exams and the elimination of the specialist modules (including those focusing on Environmental Design). Therefore, in the BArch of Architectural Sciences the notions of environmental design are offered at the discretion of the professors in Design and Technology. The BArch of Architectural Science is currently on offer only for the first year of the degree, therefore the following summary consolidates the teaching of environmental design as per the older degree in Techniques and Construction of Architecture, which is currently offered at the second and the third year only (and progressively substituted by the new degree).

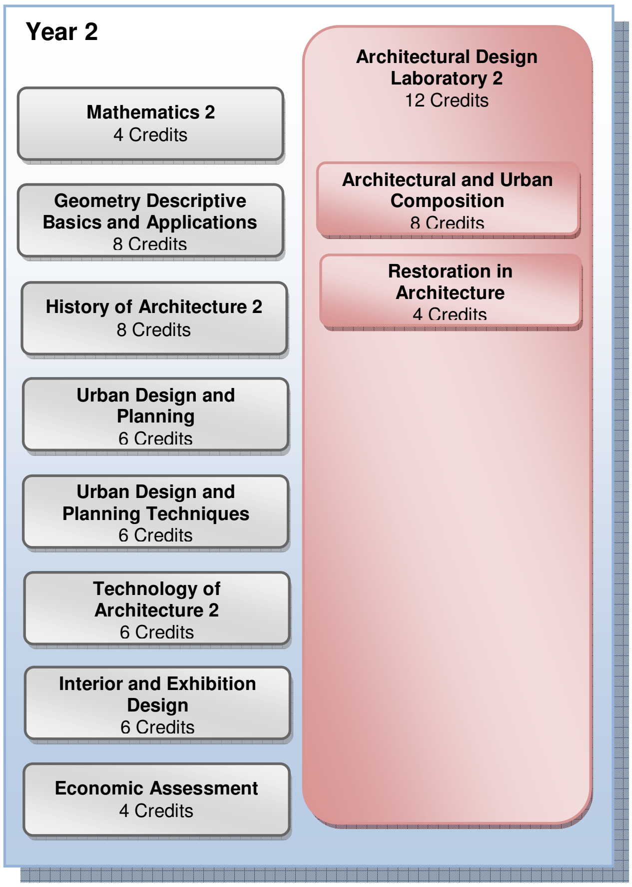
At second year level of the Bachelor degree course, **Environmental Design** is a specialist 25 hours teaching module that is offered within the **Architectural and Urban Design Laboratory II**. The goal of the Environmental Design course is to provide students with basic knowledge in order to enable them to optimize the relationship between the design project and bio-physical and microclimatic characteristics of the context, while maintaining a high architectural and technological quality. The module also explores assessment and monitoring methods and tools for the environmental performances of buildings in order to identify and verify principles and design criteria for a bio-ecological conception of the built environment.

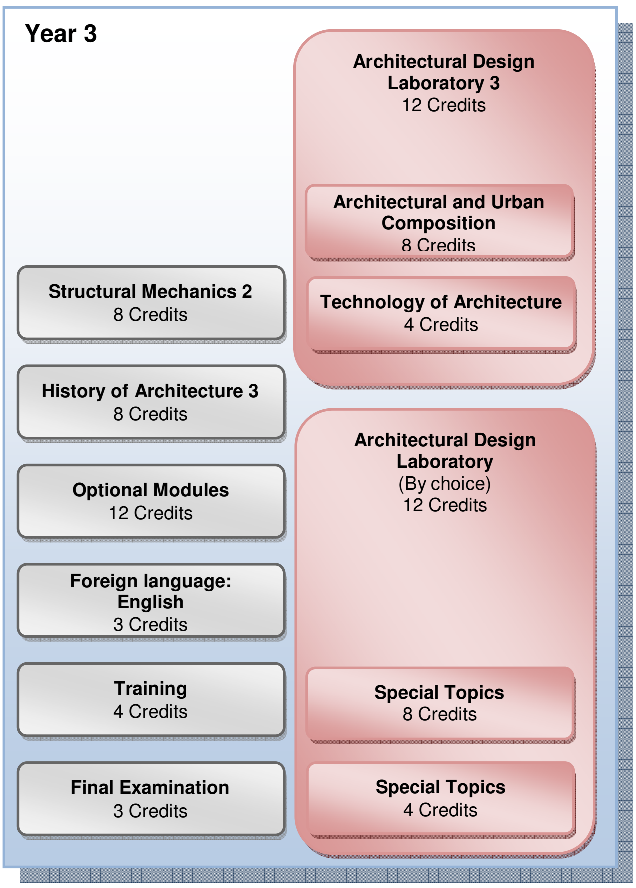
During the third year, **Environmental Design** is a 75 teaching hour module offered within **Architectural and Urban Design Laboratory III**. The course provides the theoretical and methodological bases for an architectural design project highly integrated with environmental dynamics. It represents the first stage of educational training that will lead students to the proper use of materials and construction techniques in the design choices at different scales of intervention. The course introduces students to the comprehension of the role of technology in the design project dealing with environmental and energy efficiency issues in architecture. The module aims to provide students with the tools for a technological and environmental management of the project, highlighting the interconnections between technical and environmental choices and the aesthetic values of architecture. The ultimate goal is to provide information about technological innovation and the most recent construction procedures that affect the design choices in order to ensure the application of appropriate technologies in different contexts (e.g., new materials and innovative use of existing materials, innovative building systems, along with social, economic and environmental context). The students must acquire the methodological and operational tools necessary to ensure, according to an accurate use of resources and technologies, a congruent relationship between feasibility and aesthetic expression of architecture.

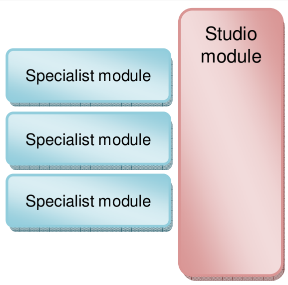
At **Diploma** level, sustainable environmental design is mainly taught in the **Technology and Building Systems Laboratory**, which contains the module of **Experimental Technologies**. The Experimental Technologies module covers topics referring to environmental design and, more specifically, themes related to the innovation of the architectural process. Such innovation relates to the design project from the planning stage up to the maintenance and managing phases of the built product, prioritizing the feasibility and attainability of the project, and the life cycle of the building. The assessment of acquisition of foreground knowledge and design capabilities is related to the programs of the single didactic activities: usually there are intermediate and final tests. For the Design, Urban and Construction Laboratories the assessment includes active participation of students at technical workshops and the production of technical drawings, multimedia presentations and models.

Integration of Environmental Design - Bachelor in Science of Architecture:

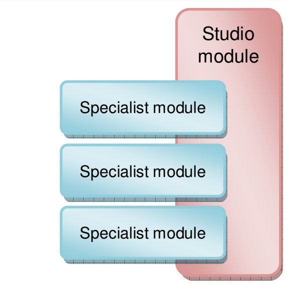




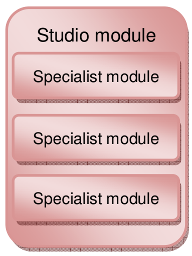




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).

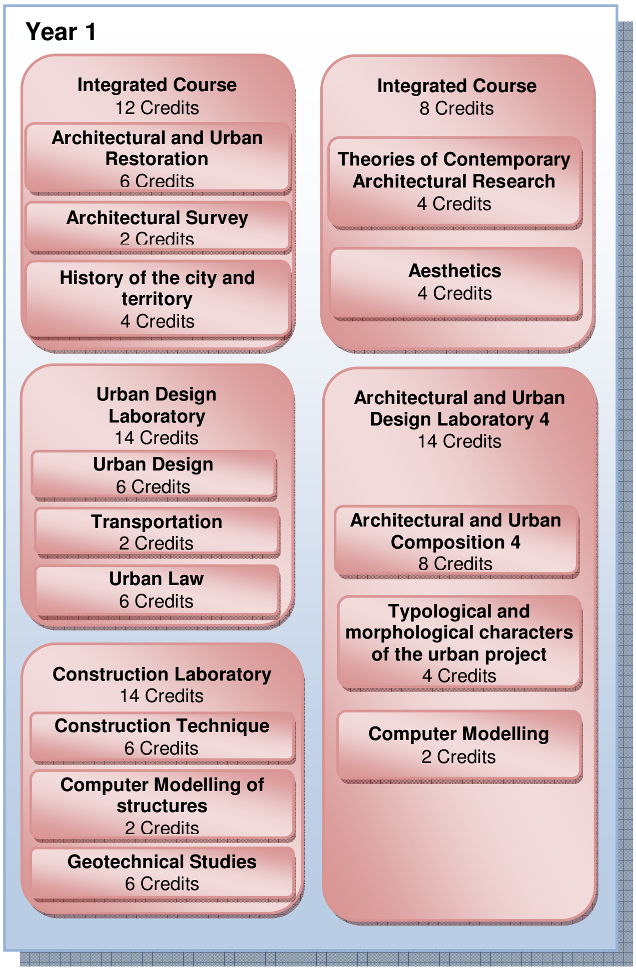


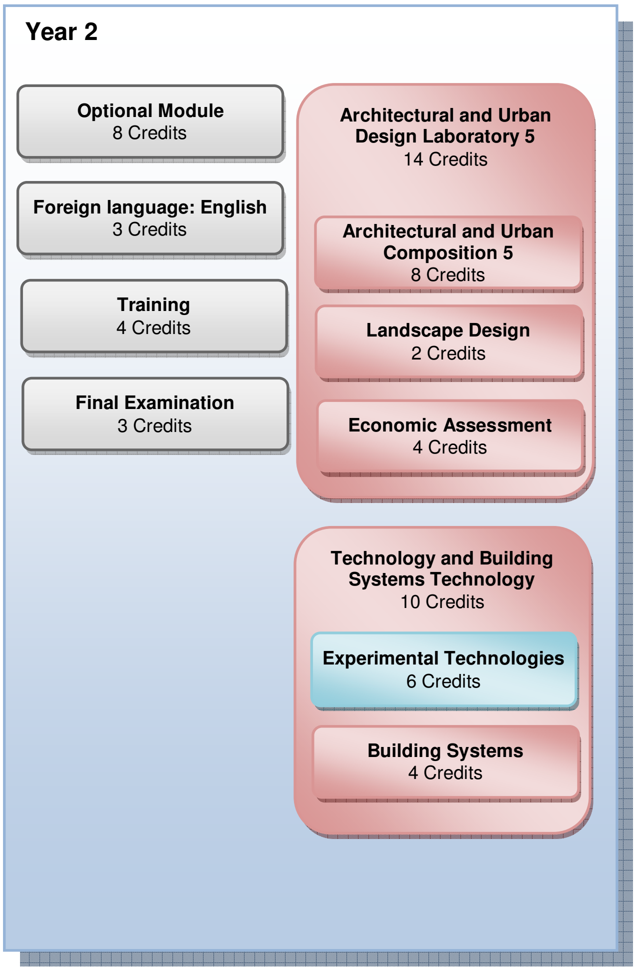
Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.

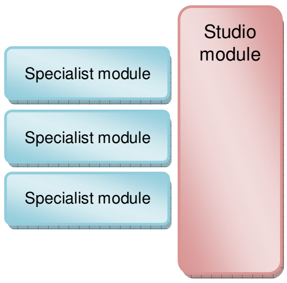


Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

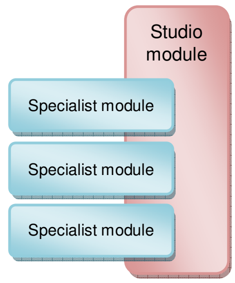
Integration of Environmental Design - Master of Architecture / Architectural and Urban Design:



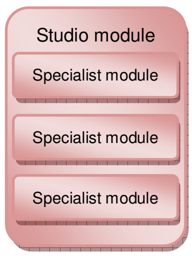




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Up until the academic year 2008/2009, environmental design modules were integrated within the Architectural and Urban Design Laboratories I and II at undergraduate level. With the new restructuring, there are no specific teaching units, except for the notions of environmental sustainability that professors autonomously choose to insert into their programs. Analyzing the 2009/2010 curriculum, it appears that the technology modules are present in the right proportion, while there needs to be reinforcement in modules covering the basic knowledge of materials and their environmental aspects.
This structure reveals strengths and opportunities, such as:

Strengths:

- The integration of aspects of environmental design in the Architectural Design Laboratories allows for a more complete vision of the design project;
- Attention to the different aspects of design, including the scale of the landscape, that become a characterizing part of the architectural design project;
- Adequate training to get admission in post graduate courses of specialization, Master degrees and PhDs;
- Knowledge of international literature and an understanding of contemporary research outcomes;
- The presence of a teaching staff qualified to teach environmental design;
- Enthusiasm of students and their interest in sustainable architectures and high environmental performance in which architectural design is perfectly integrated with environmental aspects and innovative technologies.

Opportunities:

- Seek a bigger operative integration in the learning process at the first level degree;
- Seek a larger dialogue between disciplines that contribute to the definition of sustainability in reference to the post graduate specialization degrees (Master Courses/PhDs);
- Provide a wider technical operative education focused on the utilization of specific instruments for the eco-technological control of the design project in the post graduate specialization degrees.

SOURCES AND REFERENCES

Faculty of Architecture “Ludovico Quaroni” website www.arc1.uniroma1.it
Academic Surveys and Feedback

UNIVERSITY OF ROME LA SAPIENZA

FACULTY OF ARCHITECTURE "Ludovico Quaroni"

Master of Architecture (MArch) in Bio-ecological Architecture and Sustainable Environmental Technologies

Level: Postgraduate (MArch, 1 year)

Accrediting Body: Not applicable

Educational Aims: This professional Master course has been conceived to build up a training path whose aim is to focus on the main problems of environmentally conscious design, of eco-efficiency and sustainable processes related to urban transformation, planning, rehabilitation and redevelopment, buildings' planning and rehabilitation, appropriate systems and technologies. The course also takes into account renewable energy systems within an integrated approach, conscious of the needs of building design and of the integration of passive strategies. The course is primarily addressed to building practitioners who wish to keep abreast of the times and enlarge their knowledge in sustainable design in favour of a holistic approach at all levels of design. It is a studio-based course, where theoretical and technological aspects are delivered by lectures and supported by seminars, and are totally assessed within a design exercise.

Outline Description of Course: The Master is articulated in thematic fields that imply a comprehensive programme with seven different modules, whereas each one is made up of theoretical lectures and related coursework, and all are delivered during the spring semester. At the end of the semester, students begin to work on a supervised design dissertation where the level of knowledge acquired will be assessed. All professors, from all thematic fields, are involved into the final design module. Furthermore, lectures, workshops and conferences provide additional knowledge and intellectual support to the students' dissertation, which also has to be fully-integrated with a period of practical training.

Course Structure: To fulfil the requirements for the one-year MArch in Bio-ecological Architecture and Sustainable Environmental Technologies (60 credits), students have to attend 300 hours of lectures and seminars in addition to 1,200 hours dedicated to the individual or group final project and a period of compulsory training at selected public offices or companies.

Compulsory Modules

Code	*Title*	*Credits*	*Taught*
Module I	Eco-efficiency of settlements and certification of ecological quality	8	Spring
Module II	Planning and bio-ecological rehabilitation of the built environment	8	Spring
Module III	Building systems, energy and bioclimatic performance of buildings	8	Spring
Module IV	Photovoltaic systems and architectural integration	8	Spring
Module V	Evaluation and control of buildings' environmental performance	8	Spring
Module VI	Building materials, innovative components and technological systems	5	Spring
Module VII	Eco-sustainable architectural technologies	5	Spring
	Studio module: Design Dissertation	10	Autumn
Credit Total	**60**		

Learning Outcomes: The goal of the Master programme is to educate technically competent, aesthetically sensitive and socially responsible building professionals, practicing in the architectural field at different scales. The course aims to provide them with the capability to understand contemporary issues deriving from the priorities that topics of sustainability and urban rehabilitation impose and the capacity to promote innovative and eco-compatible design solutions in a context in continuous transformation.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Module I - **Eco-efficiency of settlements and certification of ecological quality in environmental transformations**. The module delivers knowledge and methods aimed to address, control and manage design and programmatic processes concerned with innovative structures and ecological settlements.

Module II - **Planning and bio-ecological rehabilitation of the built environment**. This module investigates diagnostic tools and design methodologies for the built environment in order to rationalize and promote environmental factors that characterize built and natural contexts.

Module III - **Building systems, energy and bioclimatic performance of buildings**. The module attempts to explore, by applied technical physics, ways to improve the energy performance of buildings in order to achieve energy savings. Lectures are focused on advanced passive, active and hybrid systems.

Module IV - **Photovoltaic systems and architectural integration**. Issues concerning photovoltaic systems are fully examined in this module: from basic principles in the design and application of photovoltaic systems, to their integration in buildings and urban design and the related problem solving (critical analysis and classification of components and systems). The technological state of the art, development and market perspectives are also taken into account. Moreover, the module highlights the relationship and interaction between photovoltaic systems and other building integrated passive and active solar systems.

Module V - **Evaluation and control of buildings' environmental performance.** The core aim of the module is life cycle approach, both as a buildings' designing tool as well as an environmental evaluation method. Focus also on buildings' systems efficiency and passive air-conditioning, the course examines and sets out key criteria for using sustainable building materials and constructing systems in a LCA approach.

Module VI - **Building materials, innovative components and technological systems.** Processes of production and quality control to achieve eco-compatible built environments are the focus of this module that investigates the environmental performance of materials and components available on the market.

Module VII - **Eco-sustainable architectural technologies**. The module emphasizes the key role of the built environment as the main responsible for social sustainability.

Studio module: design dissertation. This trans-scalar and trans-disciplinary studio module is set up as the synthesis of the educational path. The course consists in developing a hands-on environmental project, at various scales of design (from master plan to the design of individual buildings) in strategically selected sites. For this project, students have to extensively analyse the context, provide preliminary and definitive design as well as present construction details. The assessment criteria focus explicitly on design and not only on technical aspects, and a high priority is given to architectural visual aesthetics and spatial planning.

STRENGTHS AND OPPORTUNITIES

Strengths:

- Active collaboration amongst professors from all thematic fields ensures integration between the contents of the various modules;
- The involvement of external specialists by initiative of the teaching staff is useful to verify the application in practice of the topics presented;
- The long period of training/practice at selected public office or companies, that includes the design dissertation, allows to verify how environmental issues are faced in practical work;
- The selected sites for the design dissertation and the relative issues involved are usually real case studies; project briefing and preliminary step are developed with potential public clients;
- Coursework and workshops encourage collaboration and cultural exchange among students;
- The restricted number of students admitted to the course allows calibrating educational contents to the level of knowledge and skill of the students and facilitates easier assessment.

Opportunities:

- Further effort to integrate theoretical knowledge and specialists' contribution to the development of the design dissertation could improve the students' capacity of managing the design process.

SOURCES AND REFERENCES

ITACA Department website: w3.uniroma1.it/itaca/
Academic Surveys and Feedback

POLYTECHNIC OF MILAN
FACULTY OF ARCHITECTURE AND SOCIETY

Bachelor in Environmental Architecture + Diploma in Architecture (5 years)[1]

Level: Undergraduate (BSc, 3 years) + Graduate (DipArch, 2 years)

Accrediting Body: Chambers of Architects, Heritage Conservators, Landscape Architects and Planners

Educational Aims: The main characteristic of the three-year Bachelor degree is the focus on architectural design which is developed at all the different scales and centred on the environmental quality and sustainability of the transformation processes of human habitats. Theoretical and practical analysis are considered indispensable to achieve: good knowledge of the ecological human habitat (energy, materials, information) and of new environmental sustainability legislation; good knowledge of morphological, typological and technological design from construction to urban spaces; good knowledge of economical aspects related to life-cycle and eco-compatibility of materials, systems and buildings; good knowledge of environmental control tools (thermal, visual, acoustic); and, awareness of historical and anthropological issues. In the following two years, the DipArch degree provides the students with knowledge and tools growing in complexity according to the social, economic, and environmental problems to solve in the design. The students can choose between seven curricula: Architecture and Urban design; Design and rehabilitation of existing buildings; Design of technological and structural constructions; Interior design; Landscape Architecture and environmental systems; Sustainable Architectural Design; Architecture (which includes courses taught in English). The course in Sustainable Architectural Design is characterized by the introduction in the student curriculum of innovative topics, abilities and experiences, including: environmentally friendly building technologies, assessment of energy aspects and other innovative issues which interact with other design subjects. The course is aimed to construct a solid theoretical and ethical position in relation to architectural design and the social, cultural and environmental context.

Outline Description of Course: The three-year bachelor degree programme runs across six semesters. Activities in each semester are centred upon a design-oriented studio, considered as a primary focus in the development of the educational curriculum. Project work is supported by lectures in technical studies, architectural sciences and humanities. Several of the design tutors are established professionals who effectively bring together research, technical and practical knowledge. Additional elective courses also accompany the design work, and are assessed through a combination of coursework, essays and examinations. Field trips, workshops, exchange programs and other educational activities provide the students with further opportunities to develop their profile according to their interests. The last two-year of the programme are developed in design studio and other monodisciplinary or integrated courses. There are also elective courses and several international practice opportunities. A fair amount of time is dedicated to the development of projects within workshops and courses, integrating different aspects in the design process.

Course Structure: The three-year Bachelor degree requires 180 ECTS, normally 60 ECTS in each year. The two-year Diploma degree consists of 120 credits, including 4 credits for external architectural practice.

<u>Bachelor of Science in Environmental Architecture (3 years)</u>

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
082491	Ecology (Mono-Disciplinary Course)	4	Autumn
082493	Basics of mathematics (Integrated Course) *Basics of mathematics A* *Basics of mathematics B*	8	Autumn
082349	Representation I (Integrated) *Bases and applications of descriptive geometry* *Survey tools*	12	Autumn
082492	History of architecture and human settlements (Mono)	8	Autumn
082497	Basics of technology (Integrated) *Technology of architecture* *Technology for buildings and environmental hygiene* *Science and technology of materials*	8	Spring
082363	Architectural Design Laboratory I *Architectural Design* *Analysis of urban morphology and building typologies*	14	Spring

[1] The information provided in this section is provisional and is to be considered only for the current academic year 2009/2010, since both the structure of the programme and the specific modules are undergoing a basic restructuring.

	Architectural composition		
	Architectural representation		
Credit Total	**54**		

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
082502	Environmental physics (mono-disciplinary)	8	Autumn
082503	History of contemporary architecture (mono-disciplinary)	8	Autumn
082504	Theory and design of buildings and structures (integrated)	8	Autumn
	Buildings Mechanics		
	Structural elements		
082364	Architectural Design Laboratory II	12	Autumn
	Landscape architecture		
	Architectural and urban composition		
	Environmental botany		
	Environmental hygiene		
082372	Urban Planning Laboratory	16	Spring
	Basics of urban planning		
	Territorial planning		
	Rural buildings and agricultural-forestry landscape		
	General arboriculture and tree cultivation		
082368	Architectural Structure Design Laboratory I	12	Spring
	Sustainable architecture technologies		
	Basics of technical analysis		
	Environmental technical physics		
Credit Total	**64**		

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
082508	Tools and models in environmental control (integrated)	8	Autumn
	Environmentally friendly building technologies		
	Design energetic performances estimation		
082511	Architectural Design Laboratory III	10	Autumn
	Architectural design		
	Architecture technology		
	Landscape architecture		
082391	Structural design (mono)	6	Spring
082388	Basics of building preservation (integrated)	6	Spring
	Constructive characters of historical buildings		
	Methods and techniques for project's analysis		
082378	Environmental economy and survey (integrated)	4	Spring
	Environmental and economic survey of projects		
	Environmental and economic survey of building rehabilitation		
084071	Optional thematic studio	8	Spring
Credit Total	**34**		

(*Optional Modules*) - Students must take 8 credits from this group:

083739	Environmental acoustics	4	Autumn
083355	Interior design	4	Autumn
083740	Technological culture and environment	4	Autumn
084027	Elements of transport and info mobility	4	Autumn
083743	History of the city and the built environment	4	Autumn
083744	Innovative representation tools of a project	4	Autumn
083746	Design and technologies in the contemporary buildings	4	Autumn
083741	Environmental law	4	Spring
083742	Methods and techniques of environmental design	4	Spring
083745	Urban design of public green areas	4	Spring
083747	Town planning	4	Spring
	Practice	8	
	Final work	4	
Credit Total	**180**		

Diploma in Architecture (2 years) – Specialisation in Design of sustainable architecture

Year 1 (Compulsory Modules)

Code	*Title*	*Credits*	*Taught*
083283	Economy (integrated)	8	Autumn

	Economy		
	Assessment		
083246	History of contemporary architecture (mono)	8	Autumn
083247	Contemporary architectural design theories and techniques	4	Autumn
083286	Architectural Design Laboratory I	16	Autumn
	Architectural design		
	Open spaces design		
	Environmental design		
083254	Environmental control in architecture planning (int.)	8	Spring
	Environmental technical physics		
	Architecture technology		
083228	Construction techniques (integrated)	6	Spring
	Construction techniques		
	Theory of structures		
	Mathematics for architecture		
083287	Sustainable Urban Design Laboratory	14	Spring
	Eco – urban planning		
	Nature of urban environment		
	Landscape ecology		
	Environmental design		
	Landscape geography		

(*Optional Modules*) - Students must take 4 credits (one module) from this group:

083880	Agronomy and green areas
083881	Interior exhibition design
083882	Interior design
083883	Landscape planning
087220	Structural rehabilitation and consolidation of historical buildings
083892	Economic assessment of urban transformations and policies
083886	Eco-sustainability in architectural design
083887	Aesthetics
083892	Design and rehabilitation of 20th century buildings
083889	Museography
083890	Museum design
083958	Design, construction and management of sporting infrastructures
083891	Lighting design project
083892	Scenography
087214	Transport systems
083895	History of architecture of the 20th century
083896	History and techniques of the building sector
083897	Green spaces design techniques
083894	History of science and technique
083898	System technologies
083899	Technology and process of cultural works
Credit Total	**68**

Year 2 (Compulsory Modules)

Code	*Title*	*Credits*	*Taught*
086275	Sustainable Building Laboratory	12	Autumn
	Building techniques		
	Architectural technology		
	Industrial design		
086277	Preservation and protection of environmental resources	12	Autumn
	Urban rehabilitation and landscape preservation		
	History of the city and territory		
086279	Urban law for the control of built environment	4	Spring
086280	Sustainable Architecture Design Laboratory	10	Spring
	Landscape architecture		
	Assessment		
	Architectural technology		
Credit Total	**38**		
	Practice	6	
	Final work	8	
Credit Total	**120**		

Learning Outcomes: The aim of the programme is to train a new generation of practitioners able to deal with the manifold issues that contemporary times impose on architectural design. Courses are designed to help students to develop a critical attitude and new skills in order to face the complexity and structural change of the architectural profession. In particular, operative and theoretical knowledge and design skills are finalized to solve problems concerning environmental sustainability and environmental feasibility of projects. The Bachelor in Environmental Architecture provides a curriculum that meets the Architects Registration Board prescription of qualification for Architect Junior, Section B. The Diploma in Architecture completes the curriculum for the qualification of Architect, Section A.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

At first year of the **BSc**, the **Basics of technology** integrated module gives students basic knowledge regarding the relations between the environmental context and the building system. It aims to introduce themes such as: the life-cycle of buildings, components and materials; the consistency between environmental needs and performances of materials, sub-systems and components; reduction strategies of environmental impacts imposed by energetic and material fluxes.

In the second year, the **Architectural structure design laboratory I**, with its module on in **Sustainable architecture technology***,* introduces the concepts of flexibility, reversibility and sustainability: the flexibility, for example, suggests a design approach, at typological level, that considers the continuous transformations and variations of the space and the succession of possible configurations. The reversibility suggests, at technological level, to adopt solutions compatible with the building components, materials and their life-cycle. Mandates of sustainability require the control of each technological and typological choice in the light of environmental and climatic aspects. Each student develops an individual project on a small residential building located in the Lombardy region, analyzing the context, legal and planning restrictions, and considering climatic and environmental indicators. The **Environmental technical physics** module provides students with the knowledge and tools for designing buildings undertaking analysis of comfort, energy conservation and environment. Starting from the basic concepts concerning thermo-hygrometric comfort, energy buildings' requirements, psychrometry, indoor air quality, the conditions of the project, the basic processes of climate, and the interactions between people, building and environment, the course provides students with simplified calculation methods for designing shells and systems controlling energy efficiency. The course describes different technological systems that use renewable and conventional energy sources in a framework that, giving priority to technical and economic aspects, promotes a design with lower environmental impact.

At third year, the **Architectural Design laboratory III**, with its module on **Architectural technology**, leads the students through project's experience giving the skills to manage the relationship between materials, building components, construction techniques, functional needs, legal issues and specificities of local environment. Within definition of the architectural project, environmental compatibility and sustainability are the main themes dealt with. The aim is to provide basic knowledge in order to control morphological, technological, functional and construction aspects especially with respect to environmental comfort, control of energetic consumption and compatibility with the life-cycle of building components.

The **Tools and models in the environmental control** module aims at illustrating theoretical and practical issues and gives competences and operative skills on projects management particularly focused on energetic consumption and reduction of environmental impacts. It is referred to a general perspective of environmental compatibility of the intervention choices. The course delivers methods, techniques and tools for the design relating to existing normative and procedures, and technological and available resources.

The aim of the **Environmental economy and survey** module is to provide principles and models for sustainable development, and their applications in the context of regional policies, with particular reference to issues related to the promotion and implementation of complex regional, national and community programs. It also provides operational capabilities in the evaluation of architectural projects within the framework of a multicriteria perspective, with particular reference to the approach "Green Building Challenge.

Amongst optional modules, in the first semester students can choose to attend the course in **Methods and techniques of environmental design.** It aims at illustrating the different environmental impacts in connection with alternative project choices. It gives some examples of life-cycle design, referring to availability of raw materials, management of the construction site and buildings and different possibility of materials' end of life. In the second semester, the elective **Environmental law** module deals with general rules in environmental law to plan and develop an eco-friendly architectural design. It also explains the criteria and strategies for guiding urban and territorial transformations to solutions attentive to environmental needs. At the end of the programme, the student can also choose to attend an **Optional thematic laboratory** in which he/she can investigate environmental sustainability themes in connection with rehabilitation and consolidation of buildings. The course gives innovative and advanced tools to test buildings' environmental performance, energy consumption and environmental impact reduction, according to European and national laws.

At first year of **DipArch**, in the semester-long **Architectural design laboratory**, the students can apply the knowledge acquired on contemporary architecture and design culture as well as technical and environmental design skills within their projects. This is targeted to develop awareness on the interrelationship between architectural, structural, constructional and environmental aspects.

The **Environmental control in architecture planning** module gives tools and control techniques to correctly plan the morphology and interior arrangement of buildings, the shell/structure system, some types of low energy systems in connection with the building energetic performances and its environmental comfort. In relation with the local context, the student can choose the right shape of the building, a good proportion between opaque and transparent envelope components according to their orientation, and can also define heat insulation and thermal mass and calculate annual energy requirements and summer comfort.

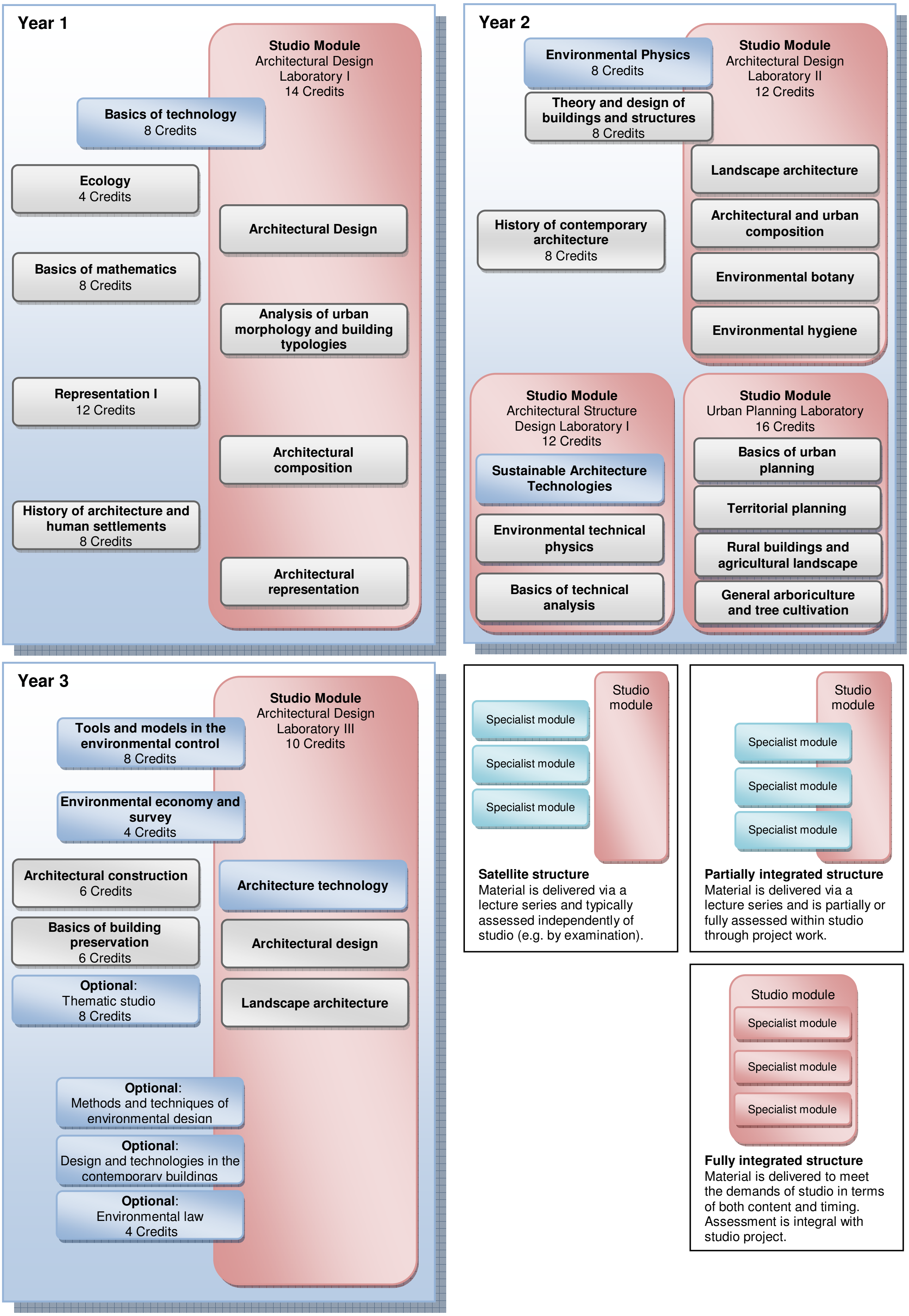
Themes of environmental design are well integrated also in the **Sustainable urban design laboratory.** Within transformations of urban spaces made through operations of subtraction, addition, replacement, volumetric growth and mixture of activities and spaces, the course aims to generate a unique project able to elaborate the complex problems of urban planning. Topics explored include functional contamination, sustainability and environmental performances, etc.

In the second semester of the first year of Diploma, students can choose to attend the optional module **Eco-sustainability in architectural design.** The course is specifically targeted at investigating the main eco-sustainable design subjects: the relationship between building and outside climate, different technologies for envelopes, passive solar systems, renewable energy sources, technological tools for building environmental control in connection with indoor comfort and climate building programme, etc.

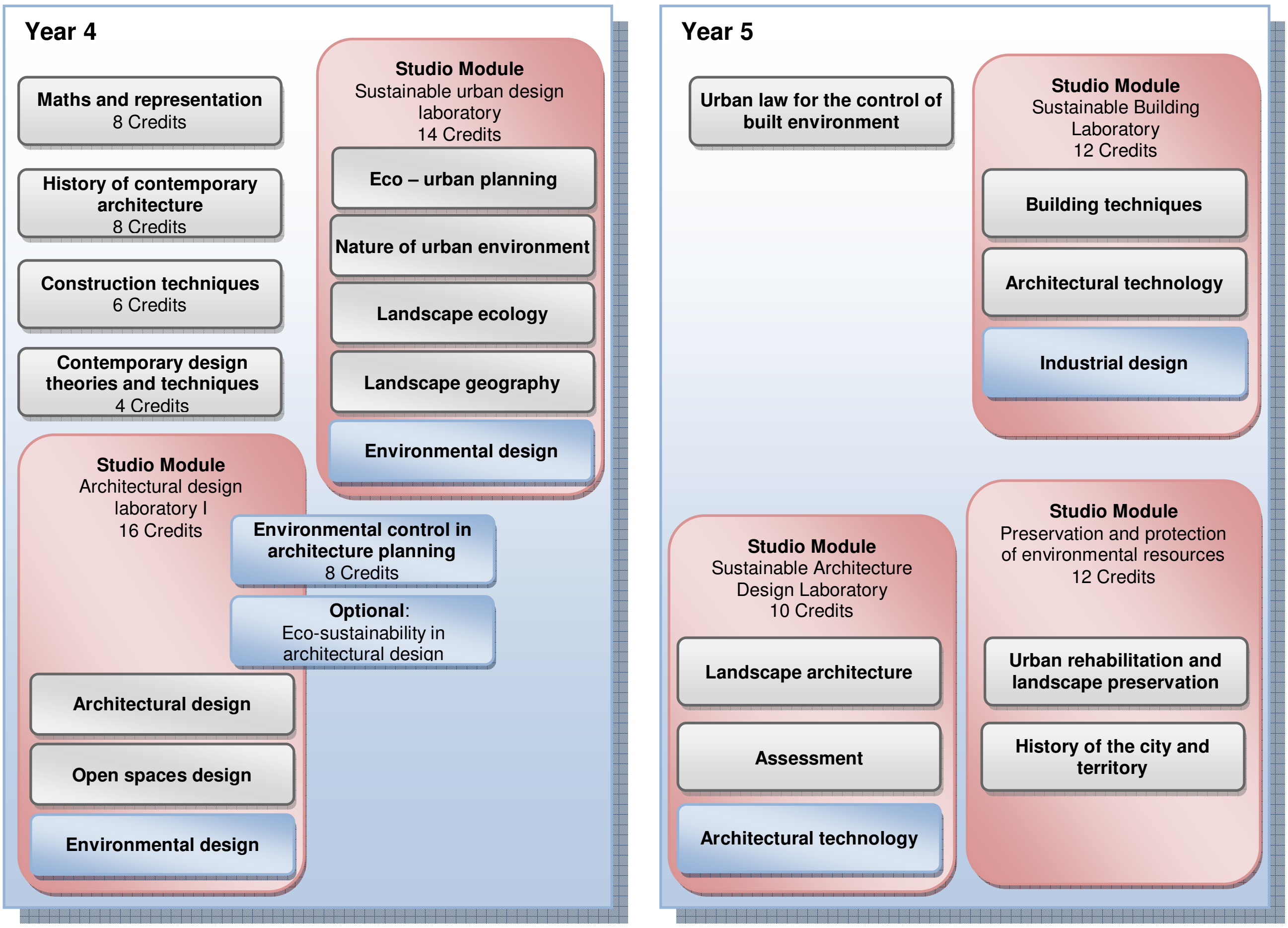
At second year, the **Sustainable building laboratory** gives the tools and techniques for designing through technological and constructional exercises: students are expected to explore some case studies of selected buildings with specific and particular innovative technologies in order to understand the relevance of the environmental systems employed and to choose the most efficient solutions for environmental performances.

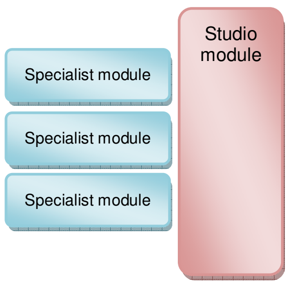
In the second semester, in the **Sustainable architecture design laboratory** students develop a research and project work which will be the main theme of their final Thesis: the project work is targeted at investigating the relationship among historical, morphological, typological and social, structural characteristics of the context and the new sustainable technologies with a view to the recent development of "cycle thinking".

Integration of Environmental Design with Studio - Bachelor in Environmental Architecture

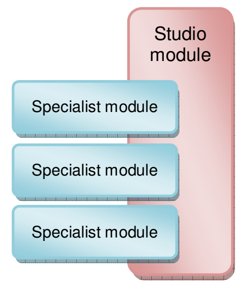


Integration of Environmental Design with Studio – Diploma in Architecture

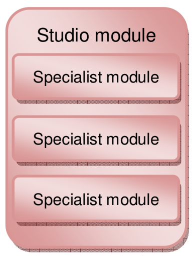




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Within the BSc and the Diploma degrees, themes of environmental design are fully integrated in the curriculum. Environmental knowledge is taught both in design laboratories and in compulsory or elective modules and, in design studios, it is fully integrated also in terms of delivery and assessment. The structure of the programme reveals a number of strengths and opportunities, namely:

Strengths:

- At the end of the course, the students are able to apply the resulting environmental knowledge within their design and use the skills acquired to solve architectural problems;
- Most of the students are enthusiastic in discovering that environmental characters of a place and sustainable technologies can be used as a driver for design and can produce beautiful buildings suitable to satisfy contemporary needs;
- At the end of the course, students show a great satisfaction in realizing that environmental knowledge gives them a good point of view to understand contemporary architectural, social and economic problems and the right tools to try to solve them within their projects;
- The time spent in architectural practice reinforces the importance of environmental design skills in the professional work;
- The presence of a new generation of tutors and researchers in environmental design within the academic team is a great asset, especially the involvement of several design tutors from the professional world, who effectively manage to bring together research, technical and practical knowledge.

Opportunities:

- “Learning by doing” is a didactic approach that can bring interesting results and can lead students to the professional experience;
- The ‘Polytechnic culture’ can supply basic interdisciplinary teachings (including ecology, building physics and technology) to be integrated into sustainable environmental design workshops.

SOURCES AND REFERENCES

Polytechnic of Milan, Faculty of Architecture and Society website: www.arch.polimi.it
Academic Surveys and Feedback

UNIVERSITY OF NAPLES FEDERICO II

FACULTY OF ARCHITECTURE

Bachelor of Science in Architecture (3 years) + Diploma in Architecture (2 years)[2]

Level: Undergraduate (BSc, 3 years) + Graduate (DipArch, 2 years)

Accrediting Body: Chambers of Architects, Heritage Conservators, Landscape Architects and Planners

Educational Aims: The three-year Bachelor degree aims to prepare graduates to collaborate to architectural design as Junior Architects within the competence allowed by current legislation. The degree programme provides students with the necessary basic skills for building design and construction. The degree allows students to develop knowledge and skills in architectural, technological, historical, urban, and construction subjects through interaction of both theory and practice. In the second year final laboratory, the degree gives to students the opportunity to choose in which field they want to specialise their curriculum: Sustainable architecture design; Survey representation and design of city transformation; Landscape architecture, and Restoration and architectural technology. The Diploma in Architecture is designed to form architects professional practical knowledge in the broad architectural field, with specific abilities and skills in architectural design. The DipArch is designed to create a balanced curriculum between different branches with the exception of urban and architectural design, building design and architectural technology that are considered the main themes developed. This approach is proved by a substantial superiority in terms of number of credits for modules that are in direct connection with architectural design. The whole knowledge provided deals constantly with sustainability and themes of environmental compatibility, especially in studio.

Outline Description of Course: The three-year degree Bachelor programme is developed along six semesters throughout design studios (laboratories), mono-disciplinary or integrated modules. Each design studio is combined with seminar modules to allow students to develop a particular specialism. The elective academics activities and modules and the final work laboratory complete the programme. Design-oriented studio is considered to have the main role in the educational experience: indeed, three architectural design laboratories are included in the programme, one building design laboratory, one final work and many other integrated or mono-disciplinary modules in direct connection with architectural design. The two-year DipArch degree is developed along four semesters and shows a substantial majority of design laboratories in comparison with mono-disciplinary and integrated modules (7 out of 10): a "learning by doing" approach is favoured to bring tangible results in integrating theoretical and practical knowledge and in developing consistent and inspired design.

Course Structure: The Bachelor degree is granted once 180 ECTS credits are gained along the three years of the program, normally 60 ECTS in each year. The two-year Diploma degree consists of 120 credits, including 3 credits for external architectural practice.

<u>Bachelor of Science in Architecture (3 years)</u>

Year 1 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Basics of mathematics and geometry I (Integrated)		Autumn
Mathematical analysis	3	
Analytical geometry	3	
Drawing, geometry and CAD (Integrated)		Full year
Drawing	5	Autumn
Bases and applications of descriptive geometry	5	
CAD	2	
History of architecture I (Mono)	6	Autumn
Basics of mathematics and geometry II (Integrated)		Spring
Mathematical analysis	4	
Analytical geometry	4	
Architectural Design Laboratory I		Full year
Theory and technique of architectural design	4	Autumn
Architectural and urban composition	6	
Morphological and typological characters	2	
Structural typology	2	
Informatics (Mono)	2	Spring
English (mono)	3	Spring

[2] The information provided in this section is provisional and is to be considered only for the current academic year 2009/2010, since both the structure of the programme and the specific modules are undergoing a basic restructuring.

Title	Credits	Taught
Practice	9	Spring
Credit Total 60		

Year 2 (*Compulsory Modules*)

Title	*Credits*	*Taught*
History of architecture II (Mono)	6	Autumn
Representation and CAD (Integrated)		Autumn
Architectural representation	4	
CAD	2	
Construction laboratory		Autumn
Architectural technology	6	
Building construction	2	
History of architecture	2	
Theory of structures (Mono)	8	Autumn
Environmental technical physics (Mono)	6	Autumn
Architectural design laboratory II		Spring
Architectural design	6	
Building distributive characters	2	
History of the city and territory	2	
Basics of urban design, planning and urban law (int.)		Full year
Basics of urban design	8	
Planning	4	
Urban law	2	
Credit Total 60		

Year 3 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural design laboratory III		Autumn
Architectural design	6	
Assessment	4	
Environmental technical physics	2	
Environmental design and building systems (Integrated)		Autumn
Environmental design	3	
Building systems design	3	
Interior design and industrial design (Integrated)		Spring
Industrial design	3	
Interior design and exhibition design	3	
Construction techniques (Mono)	6	Spring
Landscape architecture (Mono)	4	Spring
Basics of restoration (Mono)	5	Autumn
Final laboratory, student must choose one theme among:	9	Spring
Survey representation and design of city transformation		
Landscape architecture		
Restoration Architectural technology:		
Architectural technology		
Architectural design		
Ecology		
Building production management		
Workshops and practice	3	
Other activities	3	
Final work	6	
Credit Total 60		

Credit Total 180 Programme Credits

<u>**Diploma in Architecture (2 years)** – (Programme in Sustainable architecture design)</u>

Year 1 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural drawing (mono)	6	Autumn
Mathematics (mono)	2	Autumn
Science of constructions (mono)	6	Autumn
Urban planning and administrative law laboratory		Autumn
Urban design	6	
Administrative law	2	
Informatics	2	

Architectural design laboratory I		Spring
Architectural design	6	
History of architecture	2	
Environmental technical physics	4	
Architectural technology	2	
Environmental systems design laboratory		Spring
Architectural technology	6	
Landscape architecture	4	
Applicative ecology	2	
Cultural heritage law	2	
Workshop and practice	8	Spring
Credit Total 60		

Year 2 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Technique of constructions laboratory		Autumn
Technique of constructions	5	
Architectural design	5	
Technology of industrialized building process (integrated)		Autumn
Technique of constructions	3	
Industrial design	3	
Architectural restoration laboratory		Spring
Restoration	6	
History of architecture	4	
Architectural design	2	
Science of constructions	2	
Urban planning and feasibility control laboratory		Autumn
Urban and architectural composition	6	
Assessment	4	
Technique of constructions	2	
Architectural design final laboratory		Spring
Architectural design	4	
Working planning	3	
Credit Total 49		
Practice	3	
Final work	8	
Credit Total 120		

Learning Outcomes: At the end of the Bachelor / Diploma programme, students are able to design in connection with building and economic feasibility applying the knowledge and skill acquired in aesthetic, sustainable, economic and construction subjects to a reality in continuous evolution and to the needs of contemporary society. The Bachelor provides a curriculum that meets the Architects Registration Board prescription of qualification for Architect Junior, Section B. The Diploma in Architecture completes the curriculum for the qualification of Architect, Section A.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

In the second year of the **Bachelor**, the semester-long **Construction laboratory** includes two modules in **Building construction** and **Architectural technology**. The module in Architectural technology introduces students to the relationship between technological and environmental systems with regard to climate building programme and occupant needs, tools of environmental control, environmental resources and sustainable development. The module in **Building construction** aims to generate in students an awareness of design construction problems and a critical attitude with respect to the resources employed in environmental transformation processes. The course deals with building industrialization and industrial production, principles of environmental sustainability and the role of technology in the design process.

Concurrently, the semester-long **Environmental technical physics** module aim is to provide students with knowledge and tools on different technological systems to design buildings considering aspects relating to lower environmental impact.

At third year, the semester-long module in **Environmental design and building systems** is specially targeted towards developing a comprehensive understanding of methods and tools to govern natural, social and cultural environmental transformations in order to respond to contemporary sustainable living needs. It investigates the relationship between architecture and building site, in connection with themes of energy and materials supply, reduction of environmental impacts throughout the whole building life-cycle, resources recyclability and good energy building performances.

At the end of Bachelor degree, the semester-long **Final work laboratory,** especially in the course of Architectural technology, develops a deeper knowledge in sustainability and environmental design by specific seminar modules and tutorials.

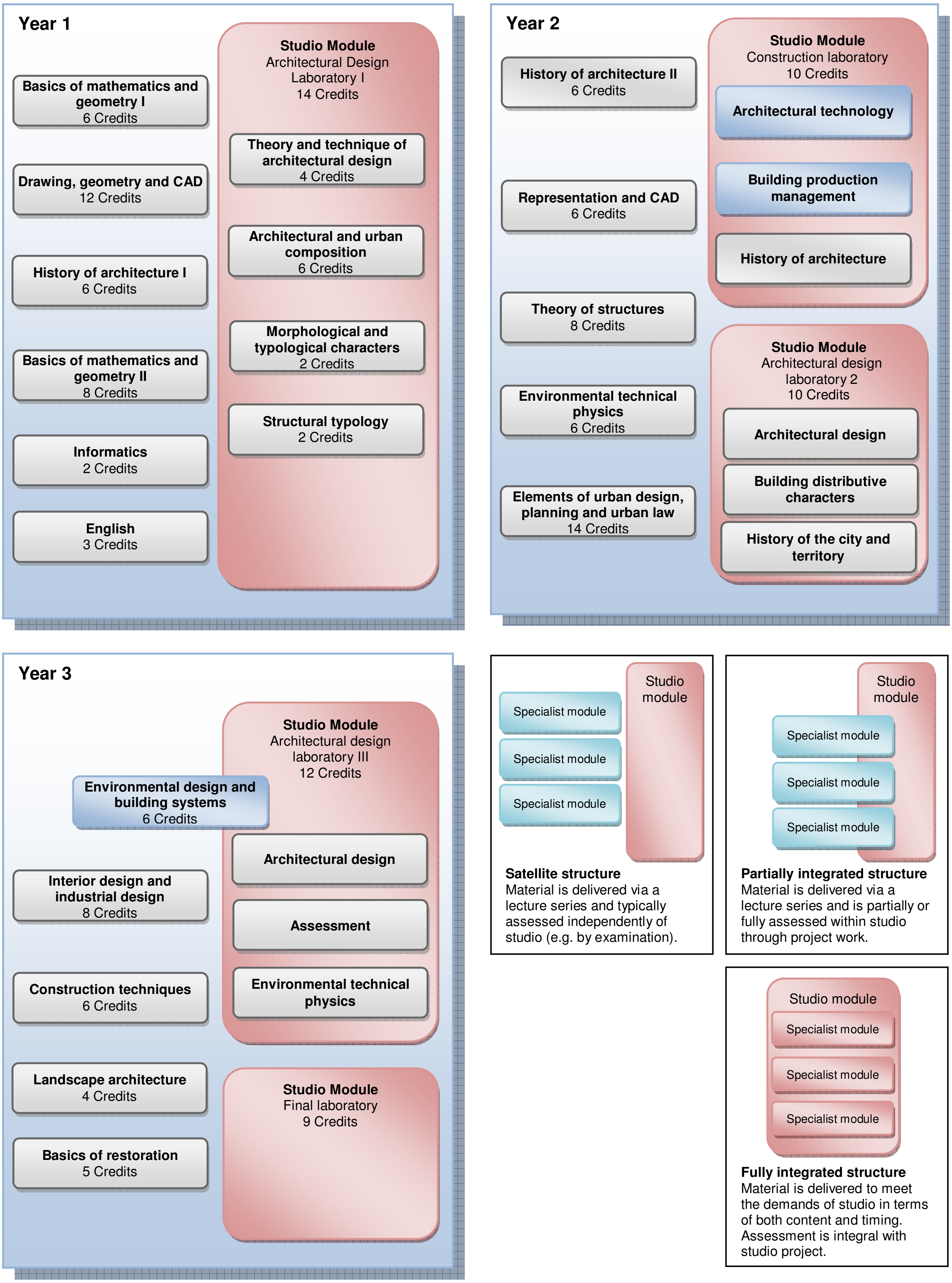
At the first year of **Diploma**, in the semester-long **Architectural design laboratory I**, the students develop theoretical and applied knowledge for architectural design and control of building performance with a particular view to the relationship between building and services, energetic urban systems, building rehabilitation and the general strategies of bioclimatic architecture.

The semester-long **Environmental systems design laboratory** aims to deliver design techniques through a close analysis of historical pre-existences, environmental and landscape characteristics, natural, ecological, social and cultural resources of the site.

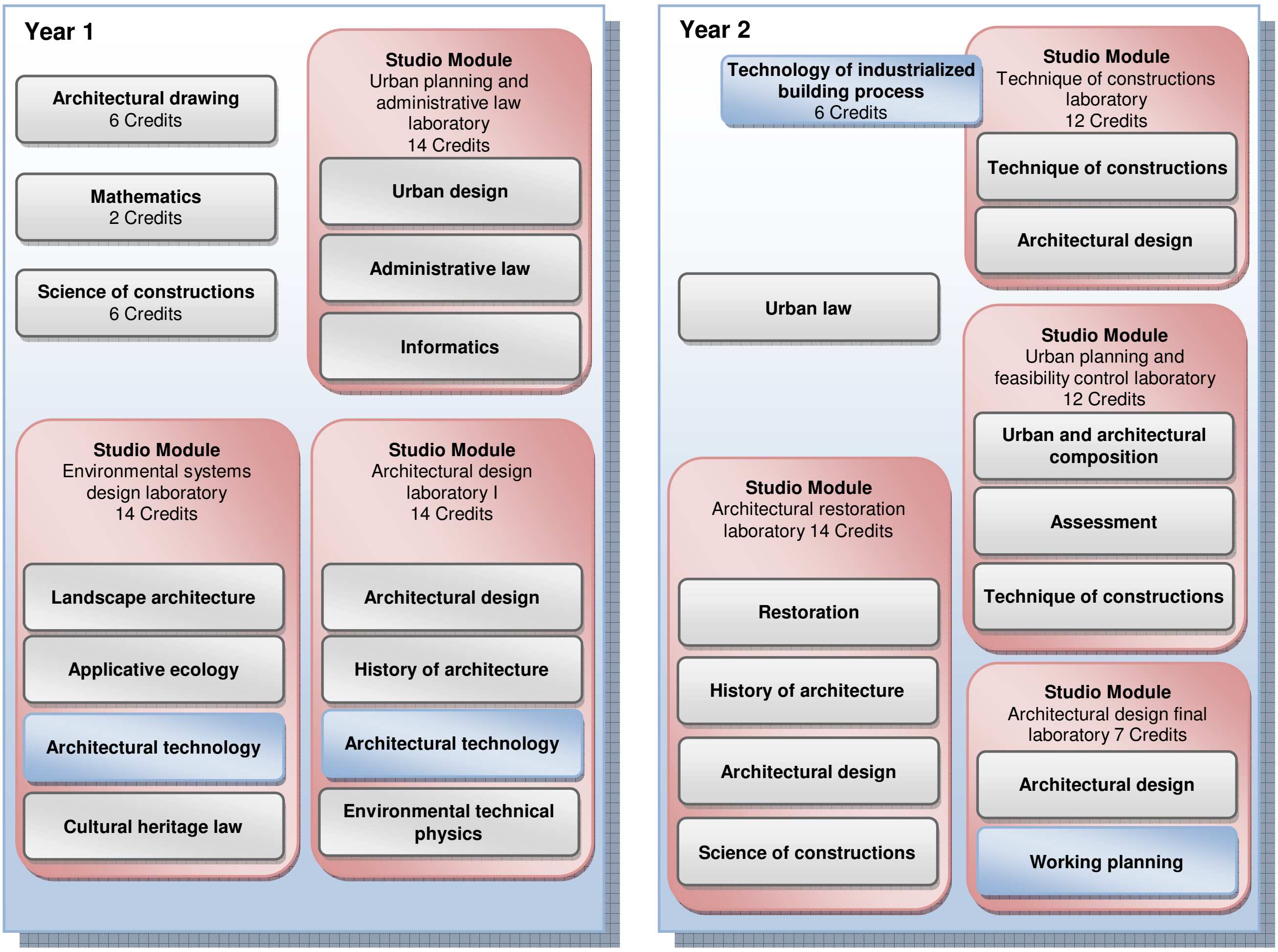
At the second year of Diploma, the semester-long **Technology of industrialized building process** module introduces the complexity of the building process. The aim is to develop technical awareness of design and ability to make choices dealing with all levels of the design process, including concerns of innovation and sustainability.

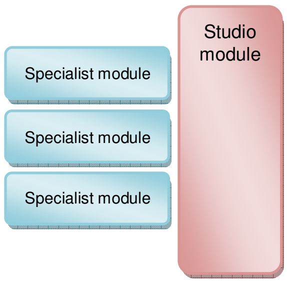
At the end of DipArch degree, the students can choose between two different laboratories: Architectural technology and Architectural design. The semester-long **Architectural design final work laboratory** enables students to analyse the architectural design process through practical work, testing, and theoretical and practical experimentation according to sustainable living requirements. In this studio, students develop a research and project work which defines the main theme of their final thesis.

Integration of Environmental Design with Studio – Bachelor of Science in Architecture

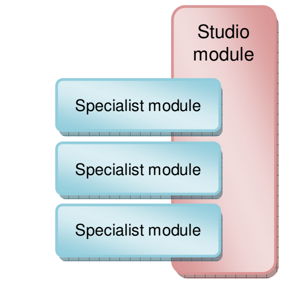


Integration of Environmental Design with Studio – Diploma in Architecture

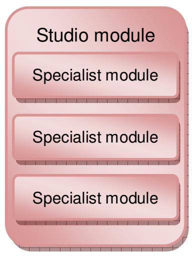




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Within the Bachelor degree, teaching of environmental design is partially implemented. During the three-year undergraduate programme, with exception of the modules *Environmental design and building systems* and *Environmental technical physics*, environmental knowledge and skills don't have specifically dedicated courses and information is provided mainly within seminar/lecture modules on this subject area. Furthermore, within design studios specific modules or lectures on sustainable design are not explicitly present. Within the DipArch, environmental design is partially integrated with design studios where seminar/lecture modules on this subject area are included. This structure reveals a number of strengths and opportunities, namely:

Strengths:

- The students that acquire knowledge in environmental design are satisfied to note the increase in the quality of their projects. The time spent in architectural practice reinforces the importance of environmental design skills in the professional work;
- The presence of a new generation of tutors and researchers in environmental design represents an asset for the implementation of the area.

Opportunities:

- The academic teams are really interested in integrating the modules contents with environmental and sustainability knowledge and skills;
- The Faculty of Architecture is working to improve and renovate the programmes in architecture to best meet the needs of contemporary society and the profession, particularly in relation to issues of environmental sustainability in building at all levels of design;
- The great interest shown by students in terms of the opportunities that environmental knowledge can give them as an advantage point of view to understand contemporary architectural, social and economical problems, providing them with the right tools to operate within their projects.

SOURCES AND REFERENCES

University of Naples "Federico II", Faculty of Architecture website: www.architettura.unina.it
Academic Surveys and Feedback

UNIVERSITY MEDITERRANEA OF REGGIO CALABRIA

FACULTY OF ARCHITECTURE

Diploma in Architecture (5 years)

Level: Graduate (DipArch, 5 years)

Accrediting Body: Chambers of Architects, Heritage Conservators, Landscape Architects and Planners

Educational Aims: The Diploma in Architecture degree is designed to allow students to develop specialist skills and good knowledge of the instruments related to architectural design, thus providing them with the competence needed to supervise the building process from an aesthetic, functional, technical and economical point of view. A historic education integrated with a scientific approach enables the students to deal with topical issues concerning contemporary architecture, including environmental sustainability.

Outline Description of Course: The Diploma degree is a five year-long programme (ten semesters). Academic activities are organized in: lectures in architectural sciences and humanities subjects to provide basic knowledge; applications and tests to guarantee a continual assessment; laboratory activities (studio) led by one or more teachers from different scientific areas so as to increase students abilities of analysis and synthesis of the various elements involved at all the levels of design; training courses to put students in immediate contact with the professional world and the building industry. At fifth year, students decide the field of specialization of their curriculum, choosing among three final laboratories: Architectural and Urban design; Analysis of architecture and the Mediterranean city; Design and Architectural production. The work developed during the final laboratory (design studio) culminates in the final thesis.

Course Structure: The Dip Arch course requires the achievement of 300 credits in five years, normally 60 ECTS in each year, including 16 credits for optional modules (8 in the fourth and 8 in the fifth year) and 4 credits for training activities.

Diploma in Architecture (5 years)

Year 1 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural composition I	8	Full year
History of ancient and medieval architecture	8	Autumn
Materials for architecture	10	Autumn
Basics of urban planning	4	Spring
Basics of mathematics I	8	Full year
Architectural drawing I	8	Full year
English	8	Spring
CAD	8	Full year
Credit Total 60		

Year 2 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural composition II	8	Full year
Architectural drawing II	8	Full year
Building system design	8	Full year
Technical physics	4	Full year
Basics of mathematics II	8	Full year
Statics	8	Full year
History of modern architecture	8	Full year
Urban planning	4	Full year
Optional module	4	
Credit Total 60		

Year 3 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural design laboratory I		Full year
Interior design	4	
Architectural design	8	
Working planning laboratory		Full year
Survey and professional practice	4	
Environmental technical physics	4	
Working planning	4	
Urban planning laboratory		Full year
Urban law	4	

Urban planning	8	
Mechanics of structures	8	Full year
History of contemporary architecture	8	Full year
Architectural and urban survey	8	Autumn
Credit Total 60		

Year 4 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural design laboratory II		Full year
Landscape architecture	4	
Architectural design	8	
Architectural restoration laboratory		Full year
Architectural restoration	8	
Restoration theory	4	
Construction laboratory		Full year
Systems	4	
Construction techniques	4	Full year
Architectural technology	4	Full year
Analysis and planning of the city and territory laboratory		Full year
Analysis of urban and territorial systems	4	
Urban and territorial planning	4	
Economic assessment of urban plan	4	
Construction techniques I	4	Full year
Optional modules	8	
Credit Total 60		

Year 5 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Final Laboratory (students choose one field of specialization)	24	Full year
Architectural and urban design		
Analysis of architecture and Mediterranean city		
Design and architectural production		
Energy and sustainability in project		
Working planning, validation and contracting		
Structural rehabilitation in seismic zone		
Rehabilitation technology and existing projects		
Economic assessment of the project		
Theory and project in architecture	8	Full year
Aesthetics	4	Full year
Economy of territory	4	Full year
Optional modules	8	
Credit Total 48		

Practice	4	
Final work	8	
Credit Total 300		

Learning Outcomes: The educational approach of the DipArch course ensures the achievement of creative abilities and professionalism connected with a reality in continuous evolution. The Diploma in Architecture aims to: provide ability to interpret cultural aspects of architectural research at various scales, also in connection with research done in other artistic and scientific disciplines; develop high quality projects at various scales: building, urban planning, environment and landscape, restoration, consolidation and architectural and urban renewal; organize and connect multiple abilities (structural, systems engineering, evaluation, energy conservation, normative and procedural, etc.) and support the production of significant architectural achievements. The DipArch course provides a curriculum that meets the Architects Registration Board prescription of qualifications for Architect, Section A.

EXECUTIVE SUMMARY – Environmental Design in the Academic Curriculum

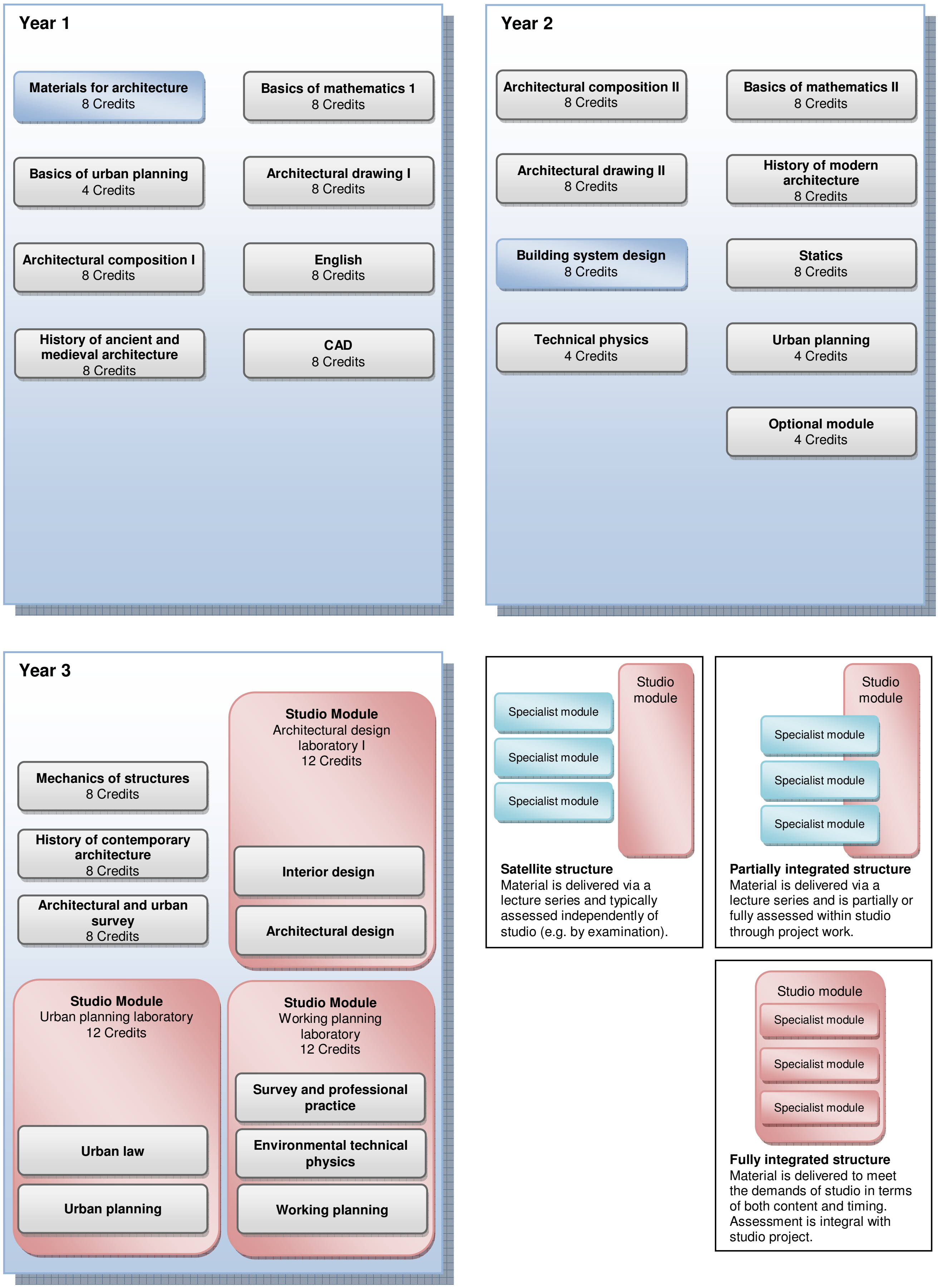
At first year, **Materials for architecture** is a semester-long module that introduces themes of environmental design and architectural science as an essential cognitive support for a correct use of these principles in the building industry, particularly with reference to themes of eco-sustainability.

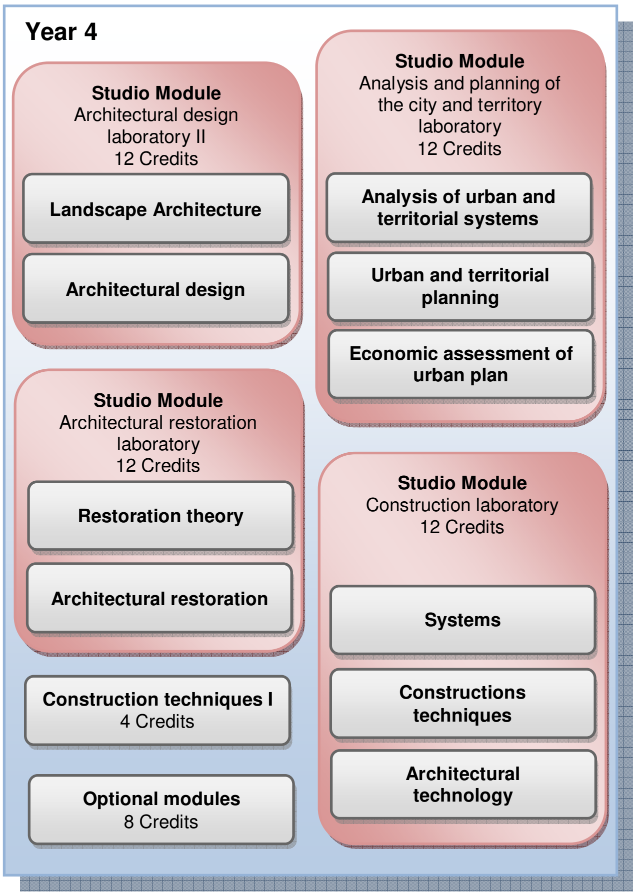
At second year, **Building system design** is a year-long module that aims to generate a new building culture, capable of re-establishing the connection between theory and practice and developing a comprehensive understanding of quality and energy/environmental sustainability in design. Amongst the contents of the module: functional programme as a condition of the project; building, environmental and technological rules; the main building technologies now in use. Throughout the design process, students deal with tests concerning suitable choices about energy efficiency, environmental sustainability and, in particular, energy self-sufficiency and reduction of environmental impact.

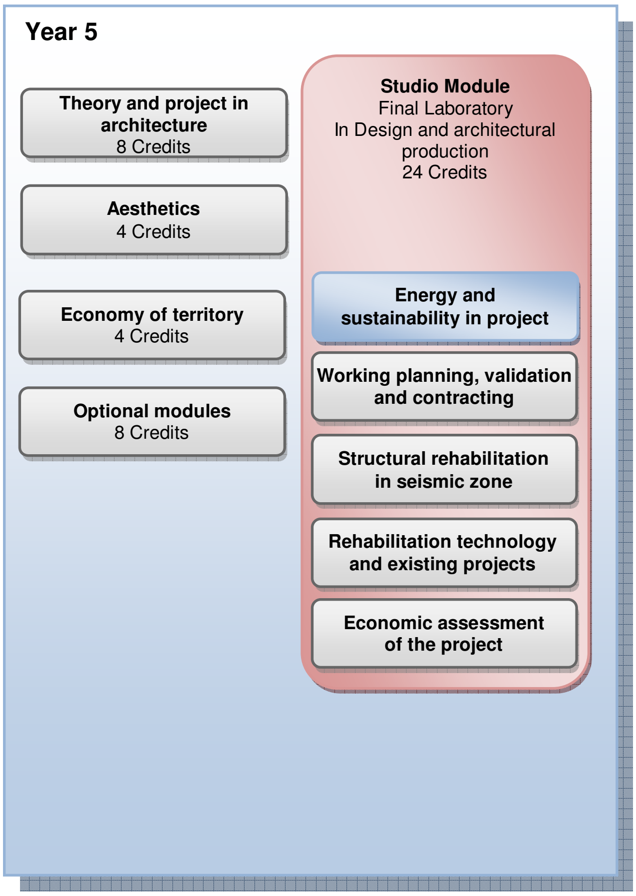
During the third year of the programme, the seminar course *Environmental technical physics*, integrated within the **Working planning laboratory**, is a theoretical and applied course that offers to students the basics knowledge of physics needed for the design of confined spaces, considered in relation to the external environment and to microclimate control. The course aims to provide tools for designing energy-efficient buildings, investigating in detail the environmental parameters that affect human comfort and the necessary competence required to control the variables that govern the thermal and visual environments.

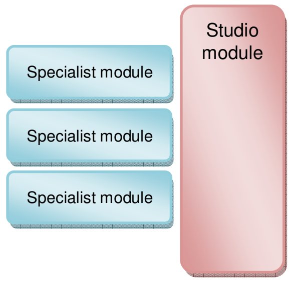
During the fifth year, the students can choose as their Final laboratory **Design and architectural production** that includes the modules of *Energy and sustainability in project* and *Rehabilitation technology and existing projects*. In this studio laboratory, students can explore themes of environmental sustainability acquiring knowledge and specific technological tools for controlling the building organism, with a particular focus on the behaviour of the occupant, design of energy efficient envelopes, systems performances and use of new renewable energies sources.

Integration of Environmental Design with studio – Diploma in Architecture

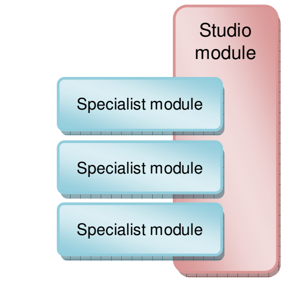




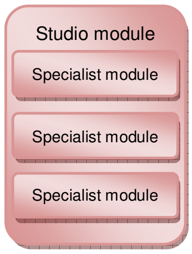




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

The DipArch degree is characterized by a rather unique structure. In the first and second year, there are not design laboratories, where usually it is possible to blend theoretical and practical knowledge and the students can apply the skills acquired from other specific courses on environmental design. Besides, there are only two compulsory modules that deal with sustainable design in an indirect way. At the end of the programme, in the fifth year students can investigate environmental themes developing their final design work. Amongst the strengths and opportunities:

Strengths:

- Technological disciplines, in particular Architectural technology and Technical physics, introduce themes of environmental sustainability from early on within the programme, so students can develop an expertise applying principles of energetic certification and economic-environmental evaluation of projects. These themes are dealt with in a deeper way in the final work laboratory;
- Sensitivity from the part of some professors to incorporate, as an essential requirement in the approach to the design project, the principles of sustainability.

Opportunities:

- The *manifesto* for the programme anticipates a future development in integrating environmental design in the whole curriculum. In particular, some modules that will consolidate the knowledge acquired are planned within the final design laboratories;
- It is important to require a correct knowledge of environmental design by all stakeholders involved in the building process. This is possible through an integrated design approach, with clear and easily applicable methodologies that facilitate the integration between different design phases.

SOURCES AND REFERENCES

University Mediterranea of Reggio Calabria, Faculty of Architecture website: http://www.architettura.unirc.it
Academic Surveys

UNIVERSITY OF FLORENCE
FACULTY OF ARCHITECTURE

Bachelor of Science in Architecture (3 years) + Diploma in Architecture (2 years)

Level: Undergraduate (BArch, 3 years) + Graduate (DipArch, 2 years)

Accrediting Body: Chambers of Architects, Heritage Conservators, Landscape Architects and Planners

Educational Aims: The three-year BSc degree is designed to allow students to develop basic skills and knowledge, thus providing them with the interpretative and critical competence needed to propose solutions consistent with environmental, social and cultural targets. The course specifically targets the understanding of individual psycho-physical well-being in indoor environments without waste of materials and energy and the acquisition of the skills necessary to allow a sustainable development also under a cultural profile. The DipArch provides the students with the qualifications required by the contemporary society and professional market, trying to develop a deep awareness of the complexity of architectural design at all levels. During the last year, students can choose among three different courses to define and specify their own curriculum: Architectural design; Urban planning; and Architectural and technological design. In particular, the DipArch in Architectural Design investigates the relationship among basic theoretical and practical knowledge, innovative technologies and the study of context. The analysis of local environment, traditional materials and building techniques, as well as contemporary constructional themes in connection with energy conservation and environmental needs, are combined as a driver for a design able to produce beautiful and inspiring results in all fields (architecture, urban planning, restoration and interior design).

Outline Description of Course: In the three years (six semesters) of the Bachelor degree, the arrangement of the modules follows a general criterion focused on the balanced progression through different academic fields always connected across among them. In the first two years, there are 11 mono-disciplinary and integrated modules mainly combined with studio, two for every year. In the last year, students can choose among elective modules and studio so as to specialise their curriculum. Students have also external architectural practice opportunities (7 ECTS credits). The two-year DipArch degree is structured in design studios and mono-disciplinary or integrated courses. There is the opportunity to choose among many elective modules and laboratories. A fair amount of time is dedicated to the development of projects within workshops and courses, integrating the different aspects in the project design process.

Course Structure: The 3-year degree is granted once 180 ECTS credits are gained by the students. The 2-year Diploma degree consists of 120 ECTS credits, including 8 credits for external architectural practice.

Bachelor of Science in Architecture (3 years)

Year 1 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural representation Laboratory		Full year
Basics of geometry	4	
Architectural drawing	4	
CAD	4	
History of Architecture I (mono)	8	Autumn
Material technology and constructional elements (integrated)		Autumn
Material technology and constructional elements	6	
Science of materials	2	
Basics of mathematics (integrated)		Full year
Geometry	5	
Mathematics	5	
Architectural design Laboratory I		Spring
Urban and architectural design	8	
Analysis of territory and human settlements	8	Spring
Basics of statics	4	Spring
Foreign language	2	Spring
Credit Total 64		

Year 2 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural survey laboratory		Autumn
Topographic survey and elements of photogrammetrics	4	
Architectural survey	4	
Environmental technical physics and systems (integrated)		Autumn
Technological systems	4	

Environmental technical physics	4	
Urban planning (mono)	6	Autumn
Science of constructions (mono)	8	Autumn
Architectural design laboratory II		Spring
Building constructions	4	
Architectural design	8	
History of Architecture II (mono)	8	Spring
Elements of architectural assessment and law (integrated)		Spring
Urban and building law	4	
Survey and professional practice	4	
Practice and workshop	2	Spring
Credit Total **60**		

Year 3 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Survey (integrated)		Autumn
Architectural survey	4	
Architectural photogrammetric survey	4	
Technological design and systems (integrated)		Autumn
Architectural technology	4	
Systems	4	
Assessment and professional practice	4	Autumn
Construction laboratory		Autumn
Constructional technique	6	
Constructional design	2	
Architectural design laboratory III		Spring
Architectural design	8	
Building distributive characters	4	
Credit Total **40**		

(*Optional Modules*) - Students must take 9 credits from this group

Architectural, materials and environment laboratory		Spring
Design of building elements	3	
Theory of contemporary architectural research	3	
Architectural thermo physics	3	
Historical building preservation laboratory		Spring
Constructional elements in historical building	3	
Restoration of architectural heritage	3	
Topography and photogrammetrics	3	
Theory of urban shape		Spring
Urban theories	3	
Urban design	3	
History of the city and territory	3	
Interior design laboratory		Autumn
Interior design	3	
Morphology of building elements	3	
Theories of contemporary architectural research	3	
Landscape architecture laboratory		Spring
Landscape architecture	3	
Architectural design for urban restoration	3	
History of urban planning	3	
History of criticism architectural and literature	3	Spring
Theory and history of restoration	3	Spring

Professional practice	7	
Final work	7	
Credit Total **180**		

Diploma in Architecture (2 years) – (Architectural Design Curriculum)

Year 1 (Compulsory Modules)

Title	*Credits*	*Taught*
Design and urban rehabilitation laboratory		Spring
Architectural design	8	
Interior design	4	
Materials' technologies	2	
Structure design laboratory		Autumn

Structure design	8	
Basics of mathematics	2	
Applicative mathematics	2	
Restoration laboratory		Spring
Restoration	8	
History of architecture (integrated)		Full year
History of the city and territory	4	
History of contemporary architecture	4	
Technological and environmental design laboratory		Autumn
Design technologies	8	
Techniques for environmental control	4	
Economic assessment of project	4	Spring
Credit Total 58		

Year 2 (Compulsory Modules)

Title	*Credits*	*Taught*
Architectural design laboratory	14	Autumn
Architectural design	8	
Building distributive characters	4	
Theories of structures	2	
Urban planning laboratory	12	Autumn
Urban planning	8	
Territorial planning	4	
Urban sociology	4	Autumn
Innovative representation tools	4	Spring
Credit Total 34		

(*Optional Modules*) - Students must take 8 credits from this group:

Garden’s art	4	Spring
Exhibition design and museology	4	Spring
Aesthetics	4	Spring
Environmental design	4	Spring

Practice	8	
Final work	12	
Credit Total 120		

Learning Outcomes: The aim of the programme is to train a new generation of professionals who can deal with the multiple and complex issues of contemporary perspectives in architectural design. Courses are designed to help students to develop operative and theoretical knowledge, design skills and a critical attitude in order to face the complexity and structural change of the architectural profession. The Bachelor of Science in Architecture provides a curriculum that meets the Architects Registration Board prescription of qualification for Architect Junior, Section B. The Diploma in Architecture completes the curriculum for the qualification of Architect, Section A.

EXECUTIVE SUMMARY – Environmental Design in the Academic Curriculum

At the first year of the **Bachelor** degree, the semester-long integrated course **Material technology and constructional elements** introduces the students to the use and characteristics of building materials and to the main role of technology in architectural design. This represents the first step in teaching the correct way to use materials and technologies during the design at different scale. The aim is to develop a critical and responsible attitude in choosing materials and techniques according to their performances, the characteristic of the building site and issues of environmental sustainability.

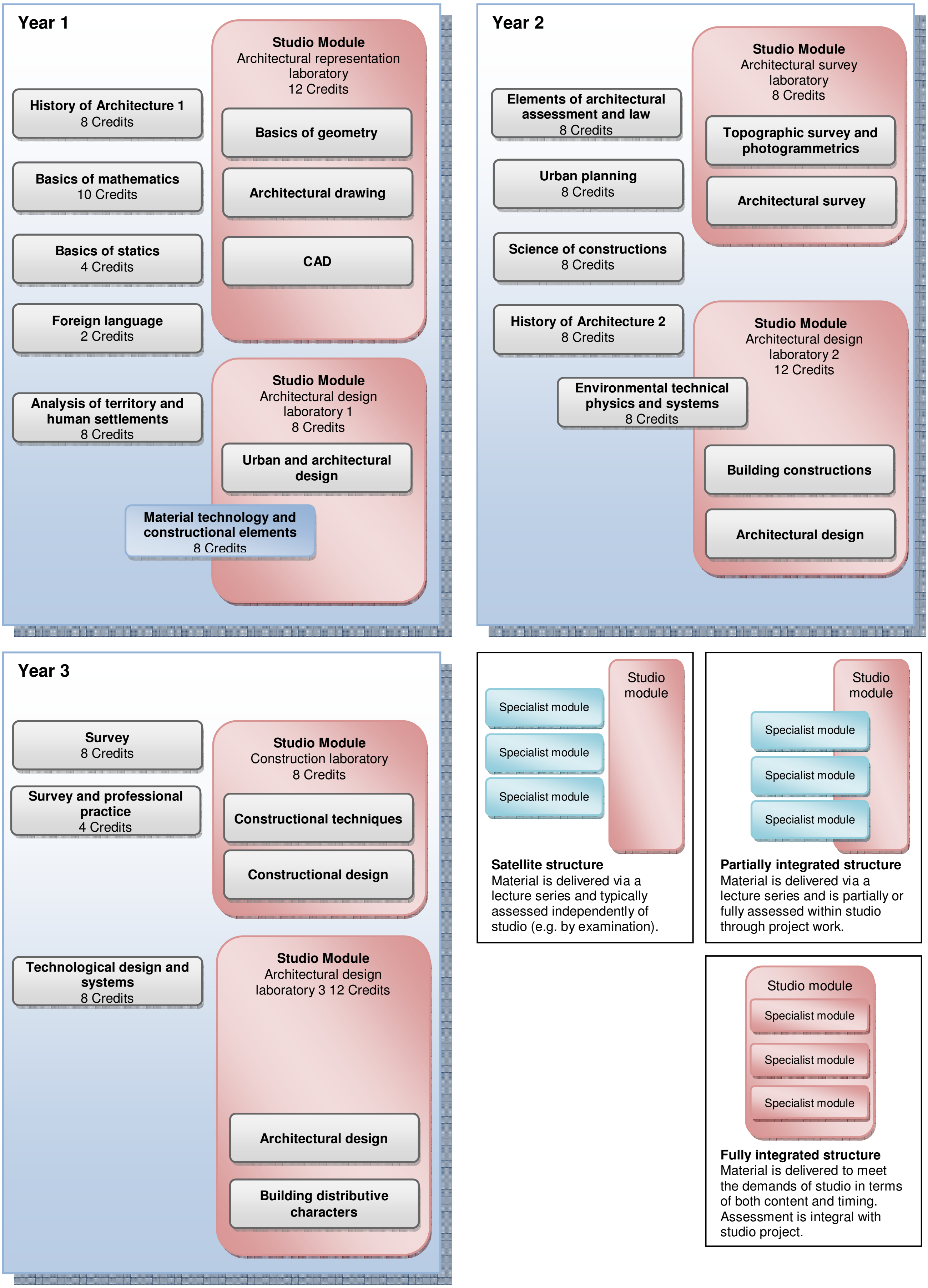
At the third year of the Bachelor, the elective **Architecture, materials and environment laboratory** starts from the idea that the building industry is one of the most important fields in which it is possible to reduce the environmental impact of human activities, in the view to realize a sustainable growth. Technological innovation in architecture (including the re-interpretation of traditional technologies) can effectively satisfy sustainability issues particularly in developing architectural aspects such as: energy efficiency in the buildings' life-cycle (construction, use, maintenance, restoration, demolition, recycling); use of renewable energy sources; efficiency in the use of resources (renewable raw materials, local materials, recyclable materials); efficiency in the use of water; indoor environmental comfort, flexibility, adaptability and durability during the life cycle of buildings; aesthetics and respect of local traditions and culture. Therefore, the laboratory aims to give students critical and practical tools to correctly develop an individual project inspired to environmental design criteria. The research and design work made during this laboratory supports the development of the final project.

In the final thesis of the undergraduate degree, students can develop knowledge and tools and specialise their curriculum in the field of environmental design.

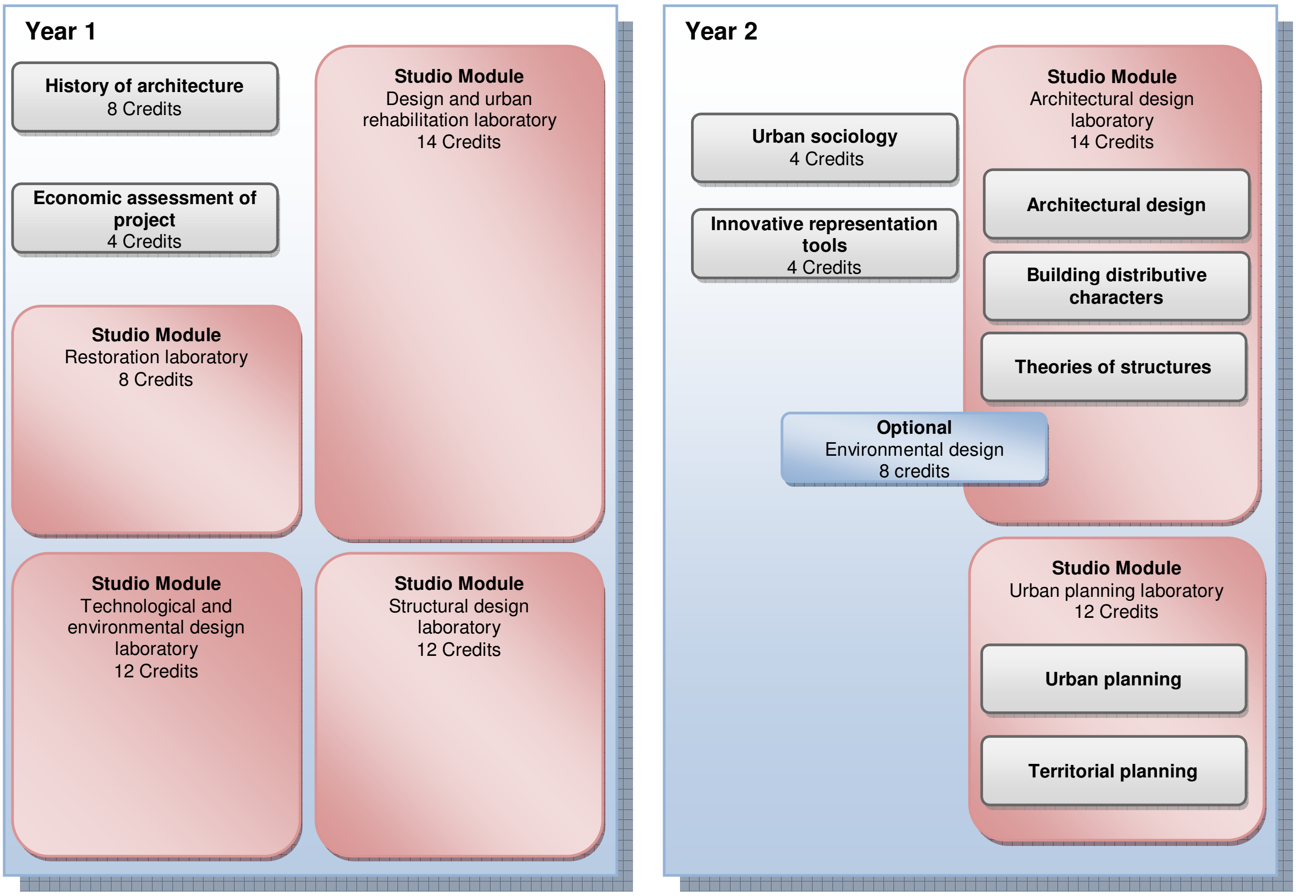
At first year of the **DipArch**, the **Technological and environmental design laboratory** develops many themes and subjects discussed during the previous three years, with a particular focus on energy conscious design and tools for economic evaluation of renewable energy systems. Moreover, the module deals with current, important issues such as the energetic national and international situation, sustainability of buildings and energy certification in the light of the new national and regional laws. The academic programme includes workshops, visits to building and individual practice.

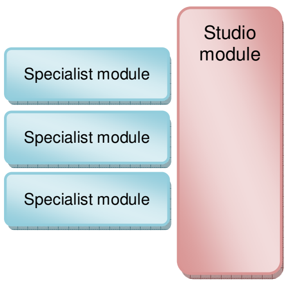
At the second year of the DipArch, students can choose an elective semester-long module in **Environmental Design**. The course aims to provide a sufficient knowledge of the issues concerned with environmental sustainability with regard to buildings life-cycle. Architectural design plays a main role in the environmental sustainability of buildings throughout their life-cycle, therefore the module provides tools to support environmental design, including strategies of eco-design, bioclimatic design and life-cycle planning. Students explore a case study of a building using appropriate software in order to evaluate its performance in connection with eco-design issues.

Integration of Environmental Design with Studio - Bachelor of Science in Architecture



Integration of Environmental Design with Studio - Diploma in Architecture





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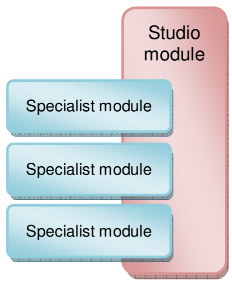

Partially integrated structure
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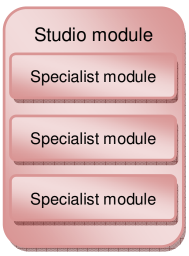


Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Within the Bachelor degree, themes of environmental design are not developed homogeneously throughout the three-year structure of the course. In the first year, they are introduced in the course *Material technology and constructional elements*, although there is not direct relationship with design studio. In the second year, there are no laboratories or modules dealing directly with environmental sustainability, whilst at third year level, students can develop knowledge and tools and specialize their curriculum in environmental design only within the elective *Architecture, materials and environment laboratory* and in the final thesis laboratory. Throughout the DipArch, environmental design is partially integrated, even if modules and laboratories embedding sustainable environmental design are mainly optional elective courses.

Strengths:
- The technological environmental approach in studio design provides students with the ability to design spaces responsive to human needs and to the natural and built surroundings.

Opportunities:
- To create awareness and understanding in environmental design it would be instructive and useful, as a teaching method, to apply the acquired design skills at different stages and levels of the design process

SOURCES AND REFERENCES

University of Florence, Faculty of Architecture website: www.arch.unifi.it/mdswitch.html
Academic Surveys and Feedback

UNIVERSITY OF FERRARA
FACULTY OF ARCHITECTURE

Diploma in Architecture (5 years)

Level: Graduate (DipArch, 5 years)

Accrediting Body: Chambers of Architects, Heritage Conservators, Landscape Architects and Planners

Educational Aims: The DipArch degree provides the students with the ability to understand the relations between man and architectural creations and between architectural creations and the environmental context, as well as the capacity to acquire the necessary knowledge to adapt buildings and spaces to human needs. Furthermore, the DipArch course is designed to allow the students to acquire specialist knowledge in physics and technologies and also to conceive the function of the buildings in order to make them comfortable and sheltered from environmental factors.

Outline Description of Course: The teaching programme is organized in three periods. The first part (first and second year) is designed to generate a basic education; the second part (third and fourth year) is focused on scientific-technical and professional education; the third part (fifth year) is devoted to the preparation of the final thesis. The DipArch course includes, in a well-balanced way, theoretical and practical, aesthetic and technical studies, maintaining at the centre the architectural design project.

Course Structure: The DipArch degree requires the achievement of 300 credits in five years, including 3 credits for formative experience and workshops.

Diploma in Architecture (5 years)

Year 1 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Materials and building elements design	9	Autumn
Mathematics (integrated)		Autumn
Mathematics	6	
Applications of mathematics	4	
Architectural drawing (integrated)		Autumn
Architectural drawing	5	
Descriptive geometry	4	
Architectural design laboratory I		Spring
Architectural composition	7	
Materials and building elements design	2	
Architectural drawing	2	
Technical physics and systems		Spring
Technical physics	5	
Systems	4	
History of contemporary architecture (integrated)		Spring
History of contemporary architecture	7	
History of contemporary art	2	
Architectural survey		Spring
Architectural survey	5	
Representation tools	4	
Credit Total 66		

Year 2 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Morphological and typological characters (mono)	9	Autumn
Architectural construction laboratory I		Autumn
Architectural technology	7	
Civil assessment and economy	2	
Statics	2	
Urban planning (integrated)		Autumn
Urban planning	5	
Geography	4	
Representation tools (integrated)		Autumn
Representation tools	5	
Architectural survey	4	
Architectural design laboratory II		Spring
Architectural composition	7	
Environmental design	2	

Title	Credits	Taught
Analysis of urban morphology and building typologies	2	
Statics (mono)		Spring
History of ancient and medieval architecture (integrated)		Spring
History of ancient and medieval architecture	7	
History of ancient and medieval art	2	

Credit Total 67

Year 3 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Environmental design (integrated)		Autumn
Technical physics	5	
Environmental design	4	
Science of constructions (mono)	9	Autumn
Restoration (integrated)		Autumn
Theory and history of restoration	5	
Basics of architectural restoration	4	
English	6	Autumn
Architectural design laboratory III		Spring
Architectural design	7	
Aesthetics	2	
Theory and technique of architectural design	2	
Urban planning laboratory		Spring
Urban planning	7	
History of urban planning	2	
Urban and territorial analysis tools	2	

Credit Total 55

Year 4 (*Compulsory Modules*)

Title	*Credits*	*Taught*
History of modern architecture (integrated)		Autumn
History of modern architecture	7	
History of modern art	2	
Historical building restoration laboratory		Autumn
Architectural restoration	7	
Petrology and petrography	2	
Technology of materials and applicative chemistry	2	
Urban management (mono)	6	Autumn
Construction techniques (integrated)		Autumn
Construction techniques	7	
Geotechnical studies	2	
Architectural construction laboratory II		Spring
Building systems design	7	
Structure design	2	
Systems	2	
Architectural design laboratory IV		Spring
Architectural composition	7	
Economic assessment of projects	2	
Landscape architecture	2	

Credit Total 57

Year 5 (*Compulsory Modules*) [3]

Title	*Credits*	*Taught*
Assessment and economy		Autumn
Assessment	7	
Applicative economy	3	
Administrative law	6	Autumn
Final Laboratory, student can choose to attend:	7	Full year

A. Architectural design
B. Restoration
C. Urban planning
D. Environmental design

[3] The Diploma in Architecture (five years) is a programme whose new structure has been introduced during the academic year 2007\2008. Therefore, at present there is specific information only from the first to the fourth year of the programme. Information about the fifth year is included basing on the previous structure of the Diploma in Architecture, due to the many similarities shown by the two programmes.

(*Optional Modules*) - Students must take 27 credits from this group[4]:		
Exhibition design	4	
Architectural design: construction studies	4	
Landscape architecture	4	
Materials in historical building	8	
Environmental design	4	
Construction in seismic zone	4	
Building energy control	8	
Practice and workshop	3	
Final work	9	Spring
Credit Total 55		

Credit Total 300

Learning Outcomes: The DipArch degree allows students to develop appropriate knowledge of history of architecture, construction, urban planning, architectural restoration and also of theoretical-scientific and methodological-practical aspects of mathematics and other sciences as well as of other activities of environmental transformation in order to enable graduates to use this knowledge to identify and solve in an innovative manner complex problems or questions that require an interdisciplinary approach. The DipArch degree provides a curriculum that meets the Association of Architects, Landscape architects and Planners prescription of qualification for Architect, section A.

EXECUTIVE SUMMARY – Environmental Design in the Academic Curriculum

At the first year of the **DipArch** degree, the semester-long module in **Materials and building elements design** introduces students to materials properties and traditional as well as innovative components available for buildings. The module provides the tools to evaluate the most suitable choices during the complex process of design. The elements, studied with specific attention to the typical requirements they must accomplish, are also investigated according to environmental sustainability issues. The course includes lectures, seminars and assisted exercises focalized on the application to simple cases of the knowledge provided.

Concurrently, the **Architectural Design Laboratory I** offers the ability to sense and measure the architectural space, and provides logical principles of architectural composition in relation to the proper relationship between form, structure and distribution. It introduces the concept of architecture on a human scale, in order to satisfy the requirements (functional, spatial, structural) and the perceptive comfort of the inhabitant; a crucial aspect is represented by the investigation of the relationship between man, building and environment.

At second year, the semester-long **Architectural construction I**, which includes the module *Architectural Technology,* introduces students to design tools, methodologies of environmental control and the traditional and innovative techniques that define the design work of architecture based on the principles of performance and sustainability.

In the second-year semester long **Architectural Design Laboratory II**, with the integrated module *Environmental Design,* students are guided in understanding the congruence between the choices that characterize the different phases of the design and the general theme underlying each project. The work is developed at different architectural scales, from an urban analysis which implies a reflection on the city, to the constructive one, in its technical and representation aspects. The course addresses the theme of the building as a complex system of relationships between place, history, types, articulation of interior spaces, materials and construction technologies. The training project focuses on the design of a product whose degree of complexity is defined by the ability to integrate housing, office spaces and services open to the public. The theme of the project is investigated in its different aspects ranging from the technical-normative and typological point of view, to the issues of urban nature and environmental awareness. In the process of formalizing the design, special attention is devoted to the study and definition of characters and material representation of the artefact in relation to the specific characteristics identified in the context where the design exercise takes place.

At the third year of DipArch, the semester-long course **Environmental Design** aims to develop the students' understanding of the built environment as a set of relationships between natural and artificial components that determine the profiles of the space at the building scale to form a self-conscious design, aimed at

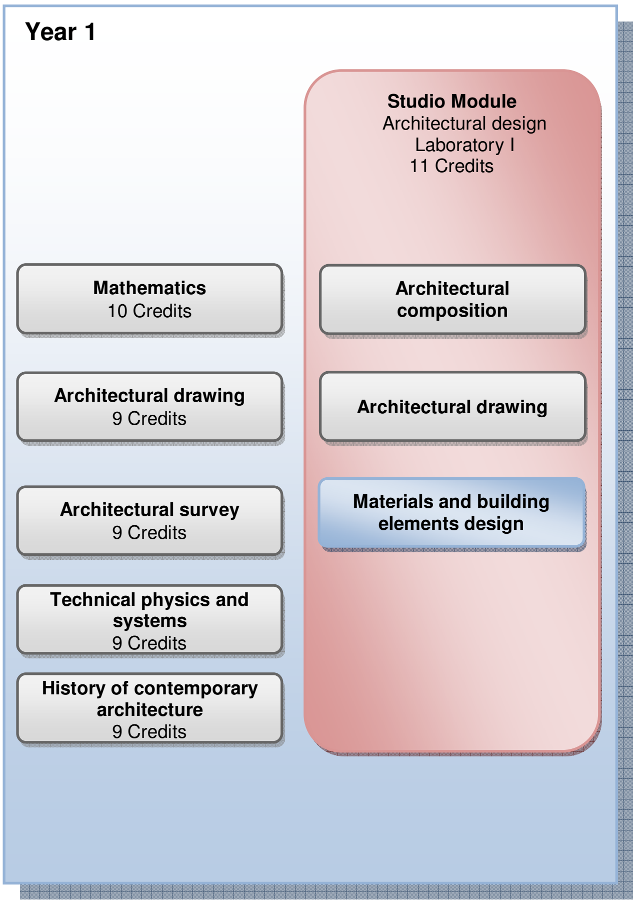
[4] There is a slight discrepancy between the new and old programmes in the number of credits awarded for optional modules

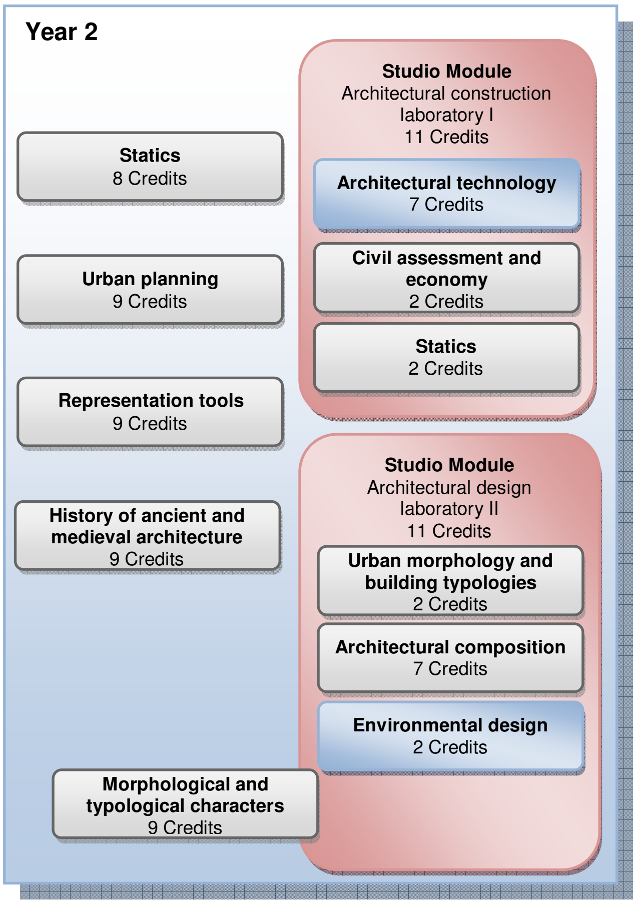
defining a new relationship between environment and development through a technological culture of the project. Further objective is the acquisition of a design sensitivity capable to deal with issues of sustainability and environmental well-being, as well as technological skill development issues related to the theme of energy efficiency.

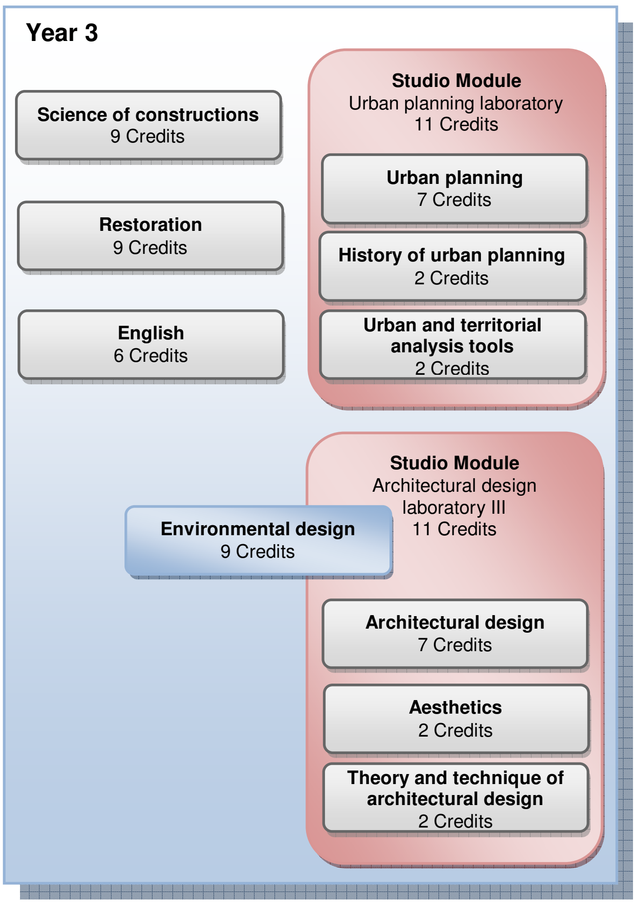
At fifth year level, students can choose to attend one among four different **Final Thesis laboratories**: Architectural Design; Environmental design; Restoration; and, Urban planning. The laboratory in Environmental design aims to guide the students through a deep analysis of tools to control and manage the building construction process, and to guarantee the continuity and the consistency between architectural choices and technological solutions.

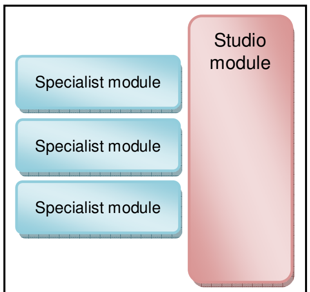
Students can choose to attend the elective module in **Environmental design**. The module examines the relationship between elements of the context, traditional and innovative technologies and environmental requirements. It provides a series of lectures that gradually introduce the problems concerning energetic indicators in building design at the different scales of application. Each student develops an individual research and design work to investigate environmental design in connection with climatic zone, human well-being, quality of life, and control of building energetic performances. Students can also choose to attend the elective module **Building energy control**. The course focuses on the energy performance of buildings. A procedure for the evaluation of the energy requirement of buildings is presented, taking into account outdoor climatic and local conditions as well as indoor climatic requirements and cost-effectiveness. A procedure coherent with the Directive 2002/91/EC of the European Parliament and of the Council, 16 December 2002, on the energy performance of buildings is presented. New technologies are also presented, with particular reference to their efficiency, their costs, and potentials in terms of energy and environmental benefits. Guidelines for the evaluation of primary energy saving strategies via the adoption of effective technologies and/or their combination within hybrid systems (traditional services plus new technologies) are shown. Systems powered by renewable energies are carefully analysed: solar thermal systems, photovoltaic systems, small wind power plants, geothermal systems, etc. A report on new technologies is illustrated (i.e. fuel cells, gas heat pump, solar concentrators). Energy retrofit strategies for historical and/or listed buildings are also discussed. Building integration of new technologies is considered one of the most important topics in the course. In particular, semitransparent photovoltaic systems are investigated to outline their great potential in architecture.

Integration of Environmental Design with studio – Diploma in Architecture









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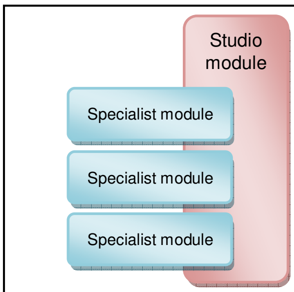

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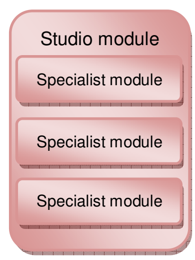

Fully integrated structure
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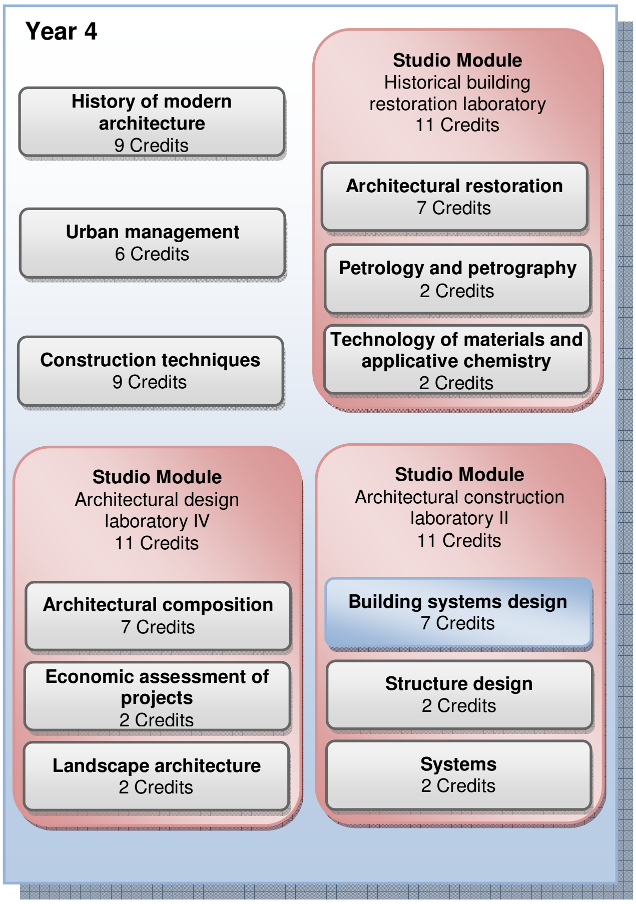
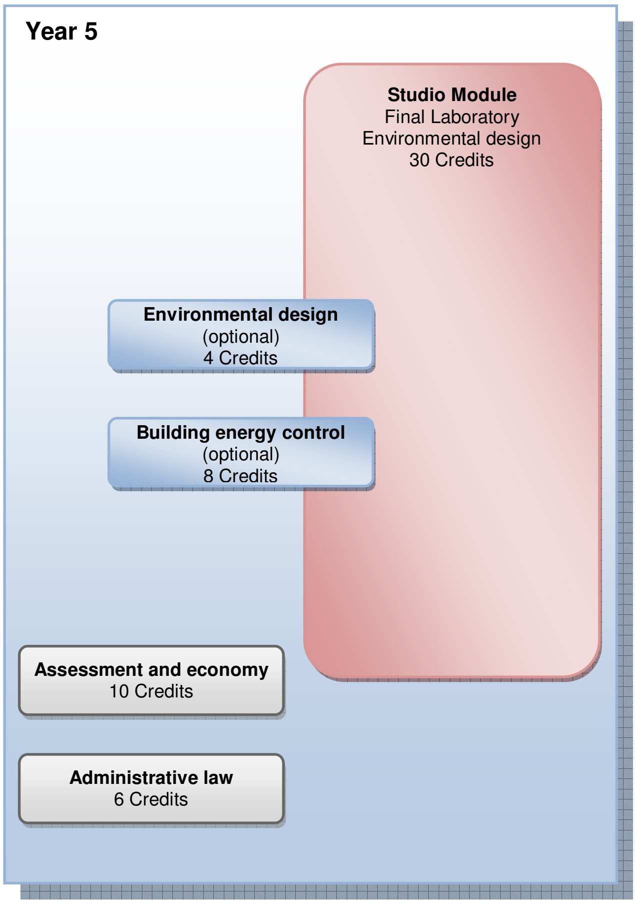
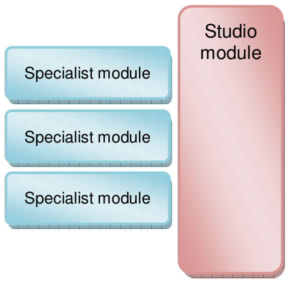
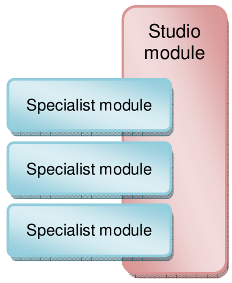


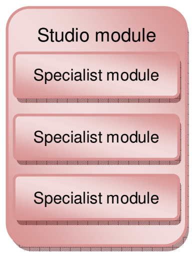




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Within the DipArch degree, environmental design is partially integrated. During the first three years, with the exception of the seminar module *Environmental design*, included in the Architectural design laboratory II, environmental knowledge and skills don't have specifically dedicated modules, and information is provided only partially within seminars and lectures on the subject area. At fourth and fifth year, environmental design is not integrated with design studio with the exception of the final laboratory in Environmental Design. This structure reveals a number of strengths and opportunities, namely:

Strengths:

- Some modules' tutors strongly encourage students to pursue the investigation of themes of sustainable environmental design during their studies, so as to make them conscious of the importance of the subject.

Opportunities:

- There is a pressing demand from the professional market and from institutions to give full answers to the problems of environmental sustainability;
- Students' interest towards the challenges of environmental sustainability;
- Implementation of environmental sustainability would provide stronger feedback in the development of design strategies involving innovative experiences and traditional ones. The integration of different kinds of knowledge can help students to find their own approach;
- Starting from the very beginning, students have to learn the environmental needs as a part of their design approach and not just relate them to a specific academic field. The implications of sustainability are larger than simply "energy matters" and should include possibly all courses.

SOURCES AND REFERENCES

University of Ferrara, Faculty of Architecture website: www.unife.it/architettura/lm.architettura.html
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Chamber of Architects, Heritage Conservators, Landscape Architects and Planners
(Ordine degli Architetti, Pianificatori Paesaggisti e Conservatori - Ordine Architetti PPC)

The Italian network of Chamber of Architects is organized on a provincial basis with numerous sections in several geographic areas throughout the country. It is the supreme body for the defence of the profession and it was established in 1925 (*R.D.* n.2537, 23.10.1925). Since then, the Chamber promotes the culture of design and performs a range of institutional functions such as:

- Keep the Register of Architects and carry out all the related technical services;
- Supervise and maintain discipline among members through disciplinary actions;
- Repress the misuse of the 'Architect' title and the unlawful exercise of the profession;
- Issue opinions on subjects related to the profession of architecture.

Furthermore, several Chambers - such as the Rome Province Chamber - provide support in the form of events, publications, training courses and organize training seminars and programmes in order to prepare architects for the national state examinations.

The Chamber of Architects assumed its present name with the reform occurred in 2001 (DPR 328/2001) that included Heritage Conservators, Landscape Architects, Planners, Junior Architects and Junior Planners. At the same moment, two sections were established: section A (Architects, Heritage Conservators, Landscape Architects and Planners) and section B (Junior Architects and Junior Planners).

Conditions for Professional Qualification

The dates for the national **State Examination** (Law 8th December 1956 n. 1378 and DPR 328/2001) are announced each year by order of the University and Research Ministry that is published in the Republic Official Journal. The Evaluation Commissions, appointed by decree of the Minister of Education, are composed of a chairman and a member chosen among university professors with or without tenure or retired, and other members selected from groups of three candidates designated by the Chambers of competences or Professional Boards. The State Examination takes place at Universities.

The structure of the State examination, as required by the DPR 328/2001, is different according to the degree obtained by the applicant/graduate.

To obtain the title of "Architect" in section A, with academic qualification titles obtained in Italy, the applicant must be in possession of a five-year degree that meets the requirements of the European Directive 85/384/CEE, such as the Diploma in Architecture or Diploma of Civil Engineer (cat. 4/S), and has to pass the state examination related to this section and field, which is articulated as follows:

- a practical test concerning a civil construction design or a design at the urban scale (e.g., masterplan);
- a written examination that explains the structural and constructional details of the design proposed and/or the basic principles on which the urban design proposal has been formulated;
- a written examination that focus on basic knowledge in architectural issues;
- an oral examination on the work performed for the practical test and that focuses on topics derived from the written examinations as well as legislation and professional ethics.

Section B members applying to obtain the title of "Architect" in section A are dispensed from the practical test concerning the topics previously assessed.

To obtain the title of "Junior Architect", section B, with academic qualification titles obtained in Italy, the applicant must be in possession of a three-year degree, such as the BArch in Architectural Sciences or in Construction Engineering (cat. 4) and Civil and Environmental Engineering (cat. 8), and has to pass the state examination related to this section and field, which is articulated as follows:

- a practical test concerning a design representation of an existing project or a design survey, and a design representation of an architectural detail;
- a written examination concerning the practical test and including economic-quantitative estimation;
- a written examination concerning an essay or a design test on topics that characterized the training path;
- an oral examination that focuses on topics of the written examination described above as well as legislation and professional ethics.

To obtain the titles of “Architect” in section A and/or “Junior Architect”, section B, with qualification (BArch or DipArch) obtained in the European Union, applicants must follow a procedure of approval for the titles by the Educational and Research Ministry (*DL* 9/11/2007 N. 206), before holding the exams.

To obtain the titles of “Architect” in section A and/or “Junior Architect”, section B, with qualification (BArch or DipArch) obtained in Non European Union Countries, applicants must follow a procedure of approval for the titles and the courses obtained. Furthermore, they have to comply with immigration regulations (*D.lgs.* 286/98, *DPR* 394/99, *DPR* 334/04, *art.*16 *Disp. Prel. Cod. Civ*).

Prescription on Qualifications

Selected Excerpts (full document on http://www.architettiroma.it/fpdb/notizie/luglio2009/11480-all475-09.pdf)

Preamble

“*The profession of Architect is an expression of culture and technique which includes social duties; historically, the society has given credit to the architect’s role in the physical transformation of the territory, in the enhancement and conservation of landscapes (natural and urban), historic and artistic heritage, and in the planning of cities and territories.*

The Architect, with his work of understanding and translating the needs of individuals, social groups and authorities regarding spatial planning, contributes to the achievement and preservation of values of general interests, as guaranteed by the laws implementing the Constitution and according to the UE and international rules

The Architect works to satisfy the needs of his Client, providing him with the know-how and the necessary technical assistance; he transforms spaces taking into consideration the cultural and architectural heritage, trying to preserve natural balances and protecting people’s safety and quality of life.

[…]

The Architect, given his social role, has to constantly train and keep himself up to date improving his knowledge in particular within the fields of his activity, including environmental, economical, social and cultural issues.

The goal of the Code of Ethics is to guarantee the correct conduct of the profession as well as the proper satisfaction of the tasks given to the Architect by the society.

[…]

The Code of Ethics protects the dignity of the Architects in terms of heritage to be preserved in order to guarantee a proper relationship with the Client and to keep the social trust in his professional title”.

SOURCES AND REFERENCES

Chamber of Architects of Rome website: www.architettiroma.it

Lithuania

VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

FACULTY OF ARCHITECTURE

Bachelor of Architecture (4 years) + Master of Architecture (2 years)

Level: Undergraduate (Bachelor of Architecture, 4 years) + Graduate (Master of Architecture, 2 years)

Educational Aims: The study of architecture at Vilnius Gediminas Technical University comprises two cycles: the Bachelor of Architecture degree, which involves four years of full-time studies dedicated to general education and the development of professional skills, and the Master of Architecture, which is a degree awarded following two further years of study devoted to achieving professional qualification combining artistic and analytical skills. Students can also combine the two cycles to qualify in only five years.

Outline Description of Course: The study programme combines compulsory and optional study modules allowing students to pursue individual interests from early on.

Course Structure: The academic year is divided into two semesters each of about 20 weeks of duration. On the five year programme, each year consists of 40 credits. Each credit represents a total of 40 study hours (including lectures, practical work and student project work). The 4-year Bachelor of Architecture programme comprises a total of 160 credits and the two-year Master is composed of 80 credits. When the two cycles are combined into a five-year professional degree they total 200 credits (which correspond to 300 ECTS).

<u>Bachelor of Architecture (4 years)</u>

Semester 1 (20 weeks)

Code	*Title*	*Credits*	*ECTS*
ARAGB01701	Drawing	2.0	3.0
ARAGB01721	Background of Architectural Graphics	4.0	6.0
ARAPB01706	History of Art	2.0	3.0
ARAPB01707	Fundamentals of Composition	4.0	6.0
FMIGB01702	Descriptive Geometry	3.0	4.5
FMMMB01704	Mathematics 1	3.0	4.5
HIKKB01701	Physical Training 1	2.0	3.0
Option (one of the following)			
HIHSB01700	Philosophy	2.0	3.00
HIHSB01709	Philosophy of Technology	2.0	3.00

Semester 2 (23 weeks)

Code	*Title*	*Credits*	*ECTS*
APGDB02746	Surveying	2.0	3.0
ARAGB02702	Drawing	2.0	3.0
ARAGB02712	Practice of Drawing	2.0	3.0
ARARB02701	Volumetric Spatial Composition	3.0	4.5
ARARB02702	Design of Single Family House	6.0	9.0
ARARB02703	Practice of Architectural Measuring	2.0	3.0
ARPKB02701	Low Rise Buildings Structures	2.0	3.0
STSMB02701	Architectural materials science	2.0	3.0
Option (one of the following)			
HIKAB02713	German Language	2.0	3.0
HIKAB02714	French Language	2.0	3.0
HIKAB02717	English for Foreigners	2.0	3.0
HIKAB02720	English Language	2.0	3.0

Semester 3 (20 weeks)

Code	*Title*	*Credits*	*ECTS*
ARAGB03717	Drawing	2.0	3.0
ARAPB03708	History of Architecture 1	3.0	4.5
ARARB03704	Typology of Buildings	3.0	4.5
ARARB03705	Composition: Scale in Architecture	2.0	3.0
ARPKB03702	Computer-aided Design Basics	2.0	3.0
ARURB03701	Project of Leisure Centre	6.0	9.0
Option (one of the following)			
ARAPB03717	Architecture and Psychology	2.0	3.0
HIHSB03766	Psychology	2.0	3.0

Semester 4 (21 weeks)

Code	*Title*	*Credits*	*ECTS*
APSVB04750	Building Services	2.0	3.0
ARAGB04722	Sculpture and Painting	2.0	3.0
ARAPB04709	History of Architecture 2	2.0	3.0
ARARB04706	Project: Multi-storey Building (Complex Design)	7.0	10.5
ARARB04707	Composition: Tectonics in Architecture	2.0	3.0
ARPKB04704	Multi-storey buildings and special structures	2.0	3.0
ARURB04702	Practice of Urban Analysis	2.0	3.0
Option (one of the following)			
ARAPB04718	Ethics of Architect	2.0	3.0
HIHSB04703	Ethics	2.0	3.0

Semester 5 (20 weeks)

Code	*Title*	*Credits*	*ECTS*
ARAPB05710	History of Lithuanian Architecture	2.0	3.0
ARAPB05711	Analysis of Buildings Composition	2.0	3.0
ARAPB05712	Ethnoculture	2.0	3.0
ARARB05708	Design of Public Building	6.0	9.0
ARPKB05705	Building physics	2.0	3.0
ARURB05703	Fundamentals of Town Planning and Urban Sociology	2.0	3.0
STKMB05701	Applied Mechanics	2.0	3.0
Option (one of the following)			
ARAGB06007	Art 5 (drawing. sculpture. painting. architectural graphics)	2.0	3.0
ARURB05710	Structural and Compositional Organization of Cities	2.0	3.0
FMIGB05703	Computer-Aided Modelling in Architecture	2.0	3.0

Semester 6 (24 weeks)

Code	*Title*	*Credits*	*ECTS*
APMSB06717	Engineering Equipment of Territories	2.0	3.0
ARAGB06719	Language of Contemporary Arts and Architecture	2.0	3.0
ARAPB06713	Urban Composition	2.0	3.0
ARURB06704	Development Project of the Small Town	6.0	9.0
ARURB06705	Basics of the Landscape Architecture	2.0	3.0
VVTEB06702	Construction and Territory Planning Law	2.0	3.0
Option (one of the following)			
ARARB06709	Design Production Practice	8.0	12.0
ARURB06706	Design Production Practice	8.0	12.0

Semester 7 (20 weeks)

Code	*Title*	*Credits*	*ECTS*
ARAPB07714	Contemporary Architecture	3.0	4.5
ARAPB07715	History of Urban Design	2.0	3.0
VVIEB07730	Economics of Construction and Cities' Planning	2.0	3.0
VVSEB07730	Management	2.0	3.0
Option (one of the following)			
ARARB07710	Renovation Design of an Architectural Object	7.0	10.5
ARURB07707	Regeneration Project of the Urban and Residential Structures	7.0	10.5
Option (collect the 4 credits from the following)			
ARAPB07719	Architectural Studies	2.0	3.0
FMIGB07701	Computer-Aided Visualization Methods in Architecture	4.0	6.0
HIHSB07712	Cultural Studies	2.0	3.0

Semester 8 (20 weeks)

Code	*Title*	*Credits*	*ECTS*
ARAPB08716	Protection of Monuments and Regeneration	2.0	3.0
ARARB08711	Interior Design	4.0	6.0
HILKB08704	Speciality Language Culture	2.0	3.0
Option (one of the following)			
ARARB08712	Final Work	12.0	18.0
ARURB08708	Final Project	12.0	18.0

Master of Architecture (2 years)

Semester 1 (20 weeks)

Code	*Title*	*Credits*	*ECTS*
Study Programme: Renovation of Buildings			
ARAPM01702	Basics of Architectural Scientific Research	4.0	6.00
ARPKM01700	Building renovation: warm techniques	4.0	6.00
ARPKM01701	Research work 1	2.0	3.00
ARPKM01702	Renovation of construction	6.0 (1.0)	9.00
ARURM01712	Analysis of Architectural and Urban Structures	4.0 (1.0)	6.00
Study Programme: Architecture of Buildings			
ARAPM01702	Basics of Architectural Scientific Research	4.0	6.00
ARAPM01703	Architectural Semiotics	4.0	6.00
ARARM01701	Architecture of the Buildings: Context and Concept	6.0 (3.0)	9.00
ARARM01706	Research Work 1	2.0	3.00
ARURM01712	Analysis of Architectural and Urban Structures	4.0 (1.0)	6.00
Study Programme: Urban Planning			
ARAPM01702	Basics of Architectural Scientific Research	4.0	6.00
ARURM01712	Analysis of Architectural and Urban Structures	4.0 (1.0)	6.00
ARURM01719	Research Work 1	2.0	3.00
ARURM01721	Physical Resources and Landscape Protection	4.0	6.0
ARURM01723	Urban Structure: Context and Development Alternatives	6.0 (3.0)	9.0
Study Programme: Architecture of Urban Complexes			
ARAPM01702	Basics of Architectural Scientific Research	4.0	6.0
ARURM01711	Artistic Principles of Urban Design and Town Planning	4.0	6.0
ARURM01712	Analysis of Architectural and Urban Structures	4.0 (1.0)	6.0
ARURM01713	Research Work 1	2.0	3.0
ARURM01722	Urban Complex in Regenerating Town Environment	6.0 (3.0)	9.0

Semester 2 (20 weeks)

Code	*Title*	*Credits*	*ECTS*
Study Programme: Renovation of Buildings			
ARARM02702	Architectural Renovation	4.0 (2.0)	6.0
ARPKM02702	Research work 2	2.0	3.0
ARPKM02703	Building renovation and conversion	6.0 (3.0)	9.0
ARURM02931	Ecological Architecture	4.0	6.0
Free choice obligatory course		4.0	6.0
Study Programme: Architecture of Buildings			
ARARM02702	Architectural Renovation	4.0 (2.0)	6.0
ARARM02703	Architecture of the Buildings: Complexity and Tectonics	6.0 (3.0)	9.0
ARARM02707	Research Work 2	2.0	3.0
ARURM02931	Ecological Architecture	4.0	6.0
Free choice obligatory course		4.0	6.0
Study Programme: Urban Planning			
ARARM02702	Architectural Renovation	4.0 (2.0)	6.0
ARURM02724	Urban Structure of the City: Spatial and Layout Development	6.0 (3.0)	9.0
ARURM02725	Research Work 2	2.0	3.0
ARURM02931	Ecological Architecture	4.0	6.0
Option (collect 4credits from the following)			
ARAPM02718	Philosophy of Art	4.0	6.0
ARAPM02727	Theory of City Culture	3.0	4.5
ARARM02709	New Technologies in Architecture	4.0	6.0
ARPKM02705	Computer aided design	4.0	6.0
ARURM02720	Computer Urban Analysis (of GIS Base)	4.0	6.0
Study Programme: Architecture of Urban Complexes			
ARARM02702	Architectural Renovation	4.0	6.0
ARURM02714	Urban Complex in Redeveloped Town Environment	6.0	9.0
ARURM02715	Research Work 2	2.0	3.0
ARURM02931	Ecological Architecture	4.0	6.0
Free choice obligatory course		4.0	6.0

Semester 3 (20 weeks)

Code	*Title*	*Credits*	*ECTS*
Study Programme: Renovation of Buildings			
ARAPM03712	Contemporary Culture & Mass Media	4.0	6.0
ARAPM03722	Protection of Cultural Heritage	4.0	6.0
ARPKM03703	Research work 3	3.0	4.5
ARPKM03705	Process of Renovation	6.0	9.0
ARPKM03706	Renovation of buildings: acoustics and lighting	3.0	4.5
Study Programme: Architectural Design			
ARAPM03712	Contemporary Culture & Mass Media	4.0	6.0
ARAPM03722	Protection of Cultural Heritage	4.0	6.0
ARARM03704	Architectural Programme, Research, Design	6.0	9.0
ARARM03705	Contemporary Art Expression in Architecture	3.0	4.5
ARARM03708	Research Work 3	3.0	4.5
Study Programme: Urban Planning			
ARAPM03712	Contemporary Culture & Mass Media	4.0	6.0
ARAPM03722	Protection of Immovable Cultural Heritage	4.0	6.0
ARURM03710	Composition of Urban Landscape	4.0	6.0
ARURM03726	Reconstruction of Central Part of the City	5.0	7.5
ARURM03727	Research Work 3	3.0	4.5
Study Programme: Architecture of Urban Complexes			
ARAPM03712	Objects of Contemporary Culture and Mass Media	4.0	6.0
ARAPM03722	Protection of Immovable Cultural Heritage	4.0	6.0
ARURM03710	Composition of Urban Landscape	4.0	6.0
ARURM03716	Spatial and Volume Concept of Urban Complex	5.0	7.5
ARURM03717	Research Work 3	3.0	4.5

Semester 4 (20 weeks)

Code	*Title*	*Credits*	*ECTS*
Study Programme: Renovation of Buildings			
ARPKM04709	Master's Thesis	20.0	30.0
Study Programme: Architectural Design			
ARARM04710	Master's Thesis	20.0	30.0
Study Programme: Urban Planning			
ARURM04718	Master's Thesis	20.0	30.0
Study Programme: Architecture of Urban Complexes			
ARURM04728	Master's Thesis	20.0	30.0

Learning Outcomes: The Bachelor of Architecture and the Master of Architecture courses are designed in order to develop students' artistic and intellectual skills. Aesthetic values and abilities for spatial organization are formed. Knowledge is acquired in building construction and the engineering of buildings. Architecture is viewed in the context of regional and urban planning. The topics of ecology, economics, law and sociology are introduced as part of the programme.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

The module **Ecological Architecture** is taught in the first year of the Master course, i.e. the 2nd semester of second cycle of studies, as a compulsory component of the course which is common to all the study programmes on offer. The module is assessed by examination and corresponds to 4 credits and 6.0 ECTS. The aim of this module is to provide understanding of the principles of sustainable urban development and ecological planning, architectural and engineering means of ecological building, passive and active means of using solar energy with overview of built projects.

STRENGTHS AND OPPORTUNITIES

Strengths:

- Introduction to Ecological Architecture in the first year of the second cycle in all four of the options offered by the Master course;
- Students are expected to sit examinations at the end of each semester as an incentive for getting a good background on the subject.

Opportunities:

- A number of undergraduate modules can be used to introduce important environmental principles. For example, fundamental principles could be introduced as part of the "design of single family house" in the second semester integrating theory with design;
- Linking the module Ecological Architecture with studio projects or design thesis work.

SOURCES AND REFERENCES

Department of Architecture website: www.ak.ar.vgtu.lt/en/50707/Subdivisions
Academic Surveys and Feedback

Netherlands

TECHNICAL UNIVERSITY OF DELFT
FACULTY OF ARCHITECTURE

Bachelor in Architecture + Master in Architectural Engineering/Building Technology

Level: Undergraduate (BSc Hons, 3 years) + Graduate (MSc, 2 years)

Accrediting Body: Stichting Bureau Architectenregister (SBA)

Educational Aims: The Faculty of Architecture at the Technical University of Delft makes significant contributions to finding solutions for pressing social issues, both nationally and internationally. The Faculty provides Bachelor, Master and PhD programmes to students who go on to become high achievers in the international context. These programmes impart the precepts of architectural design as a core competence, and structural engineering and management skills as additional capacities. In addition, TU Delft conducts unrivalled and innovative research in the field of design, engineering and processes in order for graduates of its programmes to transfer this knowledge to clients, designers, suppliers and those on the actual building site, whether they are working for government agencies, institutions or businesses.

Outline Description of Course: TU Delft offers three-year Bachelor of Science (BSc) programmes, focusing on mathematics, mechanics and physics. Students attend lectures and apply what they learn in projects. Right from the start, they work in a team on assignments under the supervision of lecturers. A test or project concludes the Bachelor programme. The key issue in the three-year Bachelor of Science in Architecture degree programme is learning how to design. In addition, students take courses to improve their technical skills and specialist knowledge. This includes subjects like history of architecture, real estate management, informatics, structural design and mechanics. Considerable attention is also given to social issues. In addition to the regular degree programme, in the fifth semester students also take a minor (a cohesive package of optional subjects) at TU Delft, another Dutch university or abroad. After gaining their Bachelor's degree, students can transfer to a following two-year Master (MSc) degree programme.

Course Structure: Each year or session of study consists of 60 credits, normally 30 in each semester. Each module has a credit value. 10 credits are designed to require around 100 hours of student work, including taught and contact time, assessment work and 'student-centred learning'. The Bachelor's degree programme in Architecture takes three years and 180 credits. The programme is organized into semesters; each semester has a central theme and is split into two quarters, one for theoretical knowledge and one for design. All the study components form part of one learning trajectory. Students conclude the Bachelor's degree with a design and a final project. In the first year, students acquire basic knowledge, learn to design on a small scale and develop a scientific way of thinking. On the basis of the results achieved and study projects completed, and following an interview, students receive a mandatory recommendation as to whether they should continue their studies or not. In the second year, the complexity of the design assignments increases. Other tasks are also presented. Students apply more knowledge in their work, thus enabling them to design in a more in-depth manner. The fifth semester consists of the minor (a cohesive package of optional subjects). Students can extend their knowledge by taking subjects at another faculty or university (in the Netherlands or abroad). They can also study one area in greater depth within the faculty or select an internship. In the sixth semester, students complete the Bachelor's programme with a complex design and a final project focused on one of the four tracks on offer. After completing their Bachelor, students can enrol in a Master course. Within the MSc degree programme in Architecture, Urbanism & Building Sciences, they can choose from four Master Tracks: Architecture, Urbanism, Building Technology, Real Estate & Housing.

Bachelor of Science in Architecture (3 years)

Semester 1

Code	*Title*	*Credits*	*Taught*
BK1000	Design Project 1: House and Settlement	10	P1
BK1010	Basic Architectural Concepts and Building Typology 1	2	P1&2
BK1020	Urban Fundamentals 1	2	P1&2
BK1030	History of Architecture, Art & Urbanism 1	2	P1&2
BK1041	Technology 1a, Applied Mechanics 1	3	P2
BK1042	Technology 1b, Climate Design 1	3	P2
BK1043	Technology 1c, Constructions 1	2	P2
BK1050	Briefing and Feasibility 1	2	P2
BK1080	Hand Drawing 1	2	P1&2
BK1090	Form Studies 1	2	P1&2
Credit Total	**30**		

Semester 2

Code	*Title*	*Credits*	*Taught*
BK2000	Design Project 2: Building and Construction	10	P3
BK2010	Basic Architectural Concepts and Building Typology 2	2	P4
BK2020	Urban Fundamentals 2	2	P3&4
BK2030	History of Architecture, Art and Urbanism 2	2	P4
BK2041	Technology 2b, Materials Science	2	P3
BK2042	Technology 2a, Climate Design 2	2	P4
BK2050	Design and Construction Management 1	2	P4
BK2060	Research Methodology 1	2	P4
BK2070	Informatics 1	2	P3&4
BK2080	Hand Drawing 2	2	P3&4
BK2090	Form Studies 2	2	P3&4
Credit Total	**30**		

Semester 3

Code	*Title*	*Credits*	*Taught*
BK3000	Design Project 3: City and Housing Construction	10	P2-P4
BK3010	Basic Architectural Concepts and Building Typology 3	2	P1-P3
BK3020	Urban Fundamentals 3	2	P1-P3
BK3030	History of Architecture, Art and Urbanism 3	2	P1&2-P3/P4
BK3041	Technology 3, Materials Science	3	P1-P3
BK2050	Programme and Attainability 2	4	P1-P3
BK2060	Research Methodology 2	2	P1-P3
BK2065	Alpha/Gamma Module	3	P1-P3
BK2070	Informatics 2	2	P2-P4
Credit Total	**30**		

Semester 4

Code	*Title*	*Credits*	*Taught*
BK4000	Design Project 4: Small Public Building	10	P2-P4
BK4010	Basic Architectural Concepts and Building Typology 4	3	P1-P3
BK4041	Technology 4a, Materials Science	3	P1-P3
BK4042	Technology 4b, Construction and Climate Design 3, Lectures	3	P1&2-P3/P4
BK4043	Technology 4b, Construction and Climate Design 3, Exercise	3	P1-P3
BK2050	Design and Construction Management 2	3	P1-P3
BK2070	Informatics 3	2	P1-P3
WI2160BK	Statistics for Architecture	3	P1-P3
Credit Total	**30**		

Semester 5 *(Electives modules)*

Code	*Title*	*Credits*
BK6070	Work placement and reflection	15
BK6110	Management game	5
BK6801	Imaging and Materialization Modelling Exercise	2,5
BK6802	Light style Modelling Exercise	2,5
BK6803	De Tirade Modelling Exercise	2,5
BK6804	Colour and Space	2,5
BK6805	Scale Model Exercise he Presentation Model	5
BK6806	Design Sketch and Concept Drawing Exercise	2,5
BK6807	Documentation and Analysis Drawing Exercise	2,5
BK6808	Man and Measure in Architecture Drawing Exercise	2,5
BK6809	Drawing Exercise Image and Reality	2,5
BK6810_a	Audiovisual Production: Film	5
BK6810_b	Audiovisual Production: Photographic	5
BK6811	Presentation training	2,5
BK6812	Multimedia Applications	5
BK6A010 A	Different View: Light constructions: wood	10
BK6A020	History of the Dutch Landscape, Town Planning and Architecture	5
BK6A021	Tectonics	5
BK6A030	Hyper body: Exercise in Non-standard and Interactive Architecture	10
BK6A060	A Different View: Hybrid Building 1 - New Architects Data	10
BK6A061	A Different View: Retail Design	10
BK6A062	A Different View: Building with Light	10
BK6A063	A Different View: Decorum	10
BK6A070	Workshop: Basic Architectural Concepts - OEUVRES	5
BK6B030	Introduction to Scripting and Programming	5

BK6R010	Design and Evaluation	5
BK6R050	Briefing, Design and Project Management	10
BK6U110	Experimental Project (Landscape Architecture) The Assembly Landscape	10
BK6U111	Experimental Project (Urban Development Design) Logical and Intuitive City	10
BK6U112	Experimental Project (Spatial Planning/Urban Management)	10
BK6U113	History, Theory and Practice of the Design of the Town Plan	5
BK6U120	Thesis on Landscape Architecture Composition Techniques/Urban Design Methods	

Semester 6

Code	*Title*	*Credits*
BK6000	Design Project 5: Land Development	10
BK6000-A	Design Project 5: Architecture	10
BK6000-B	Design Project 5: Construction Technology	10
BK6000-R	Design Project 5: Real Estate & Housing	10
BK6000-Rmit	Design Project 5: Remit	10
BK6000-U	Design Project 5: Urbanism	10
BK6010	Basic Architectural Concepts and Building Typology 5	3
BK6020	Basic Urban Concepts	2
BK6030	Architecture Excursion -, urban planning- and art history	1
BK6040	Technology 5	6
BK6050	Real Estate Management	4
BK6060	Research Methodology 3	4
Credit Total	**30**	

Minors

BK-Mi-082-09 Imagination

BK7100 Image and movement 1: visualization, communication and presentation in an architectural context	10
BK7110 Image and movement 2: a study into sketch and concept, documentation and analyses, man and measure	10
BK7120 Image and movement 3: digital application of presentation and representation through 3D models	15

BK-Mi-083-09 Urban Design in the Delta

Code	*Title*	*Credits*
BK7200	Urban Design Methods and Theories	3
BK7210	Landscape and Water	3
BK7230	History of the Dutch Landscape, Town Planning and Architecture	3
BK7240	Visualization in Urban Design	3
BK7261	Design Project: Spatial planning	6
BK7270	Design Project: Urban and Regional Planning: analysis and case	9
BK7250	Building with Water	3
SPM2720	Spatial Development and Public Facilities	4

BK-Mi-103-09 City Landscapes

BK7600	Atelier City Landscapes: garden, park, landscape in the city edge	15
BK7610	Excursions plants, soil, water in the Dutch Netherlands	5
BK7620	City Edge analysis (Stadsrandanalyse)	5
BK7630	Lecture series, garden, park, landscape from city to land	5

BK-Mi-122-09 The Beauty of things

BK7700	Design	15
BK7710	Lecture series	5
BK7720	Workshop	5
BK7730	Analysis/Planning Maps	5

BK-Mi-123-09 House of the future

BK7800	Project house of the future	15
BK7810	Analysis and module study	7,5
BK7820	Image-Forming and presentation	7,5

BK-Mi-124-09 Interactive Environments

BK7900	Design and prototyping studio	15
BK7910	Workshops & lectures	6
IO3870	Interacting society	3
IO3871	Hardware and software tinkering	3
IO3872	Interaction design strategies	3

IO-Mi-073-09 Minor Sustainable Design

This minor is hosted by the Faculty of Industrial Design.

WM-Mi-136-09 Sustainable Future Campus

Electives

Code	*Title*	*Credits*
AR0030	Windlab / Dream and Realisation	13
AR0050	Design Informatics Study	10
AR0051	Online Digital Portfolio	6
AR0055	Design Explorers	3
AR0083	Sustainable Development Programme (TIDO)	3
AR0084	Sustainable Design, Time Based (TIDO)	12
AR0102	Research & Design, Workshop	3
AR0161	Lecture Series	4
AR0162	Design Project	12
AR0163	Seminar 1: Research by drawing	3
AR0164	Seminar 2: Dutch landscape architecture	3
AR0165	Workshop 1: Plan Analysis	4
AR0166	Workshop 2: Landscape components	4
AR0180	Literature Study on Selected REH Topics	4
AR0183	Literature Study on Selected REH Topics	6
AR0184	Literature Study on Selected REH Topics	3
AR0190	Urban Sustainability (TiDO)	2
AR0205	Form and Presentations. Evocative, professional project presentation	9
AR0211	The Bus/Tram Shelter	6
AR0221	Image, Motion and Experience	6
AR0230	mEYEcity Delft	5
AR0231	mEYExpo	6
AR0240	High Rise Buildings, the Architectural Concept	3
AR0265	New Towns on the frontier of geopolitics	10
AR0291	Light Architecture	6
AR0305	Urban Body: Exploring	3
AR0310	Architectural Body	12
AR0315	Material	3
AR0325	Urban Body: Mapping the Urban, Social and Cultural Texture	6
AR0335	Urban Body: Transformations	6
AR0361	History of the Great Metropolises - Lectures	3
AR0362	History of the Great Metropolises - Excursion/Project	6
AR0400	Globalisation: Research on the Urban Impact	3
AR0405	Urban Planning: Design Problem Definition, Quick Scan Analysis	3
AR0410	Globalisation: Workshop and Theoretical Underpinning	6
AR0415	Urban Planning: Design Oriented Research	6
AR0420	Globalisation: Design by Strategy	6
AR0425	Urban Planning: Design by Strategy	6
AR0430	Location Development	9
AR0475	Space Customizer	6
AR0480	Special Project AM Public Building: Public Realm	12
AR0485	City in Literature	6
AR0491	Photography techniques for Intervention and Restoration	6
AR0531	Smart & Bioclimatic Design	6
AR0532	Smart & Bioclimatic Design Theory	3
AR0551	Urban Design: People, Pedestrians and Public Spaces	3
AR0552	Urban Design: Mobility and Networks	6
AR0553	Urban Design: New Metropolis	6
AR0660	Special Project Interior Architecture	12
AR0670	Architecture and Dwelling: 'After VINEX', the Urban Context and the Design of Suburb Housing	12
AR0675	Architecture and Dwelling: The Green House	12
AR0681	Design Project Remit: Modification -Intervention-Transformation	12
AR0700	Design Studio MSc 1: Architectonic Design for a Hybrid building in the Dutch City	12
AR0720	Design project MSc 1 Architecture & Modernity: The Housing Design	12
AR0720^W1	Design Project MSc 1 Arch & Modern., LIVING +: Buildings with Mixed Programs Next to Living	12
AR0720^W2	The Housing Design: Architecture and Modernity Dwelling, The Housing Ensemble SML	12
AR0740	Tools for Architectural Design & Composition	15
AR0771	Beyond 3D Computer Visualization	6
AR0780	Media Lessons	3
AR0790	Film and Architecture I	3
AR0791	Film and Architecture II	3
AR0795	Decoration	6
AR0821	The Future Envelope	3

AR0832	Design Project: BADD Office Building	12
AR0850	Architectural Studies I: Non-Standard Architecture in practice	12
AR0855	Architectural Studies II: Non-Standard Architecture in practice	12
AR0875	Design Project: GLADD; The Future Dutch Royal Palace	15
AR0880	Real Estate Valuation	7
AR0885	Design Project: MADD	15
AR0890	Reframe / Reload / Redesign: Redesign of City and Land	5
AR0891	Smart Architecture	7
AR0895	Van Gezel tot Meester	24
AR0913	Capita Selecta Architecture	3
AR0923	Literature Study Capita Selecta BT -	3
AR0924	Literature Study Capita Selecta BT -	4
AR0925	Literature Study Capita Selecta BT -	6
AR0940	Methodological Program 3c	3
AR0945	Architectural Practice	3
AR0960	Stand Up Architecture	15
AR2810	Philosophy of the Image and Architecture	3
AR2Rp111	Workshop High Rise Buildings	12
AR3R060	Elective Methodological Program 3b	4

Master of Science in Architectural Engineering (2 years)

Semester 1

Code	*Title*	*Credits*
AR1B010	Structural Mechanics I	4
AR1B030	Computer Aided Design	4
AR1B040	Product Development	1
AR1B050	Materials Science	4
AR1B070	Building Physics I	5
AR1B081	Product Design	8
AR1B090	Production Technique	2
AR1B100	Methodology	2
Credit Total	**30**	

Semester 2

Code	*Title*	*Credits*
AR2B010	Structural Mechanics II	2
AR2B020	Construction Design	2
AR2B030	Building Law	1
AR2B040	Structural Design	2
AR2B060	Building Design	4
AR2B071	Building Physics II	2
AR2B080	Climate Design	2
	Electives Architectural Engineering	15
Credit Total	**30**	

Semester 3

Code	*Title*	*Credits*
AR3Ae010	Design Research Studio	12
AR3Ae020	Design Theory	3
AR3Ae030	History Thesis	6
AR3Ae040	Graduation Project Preparation	9
Credit Total	**30**	

Semester 4

Code	*Title*	*Credits*
AR4Ae010	Laboratory of Building Design	30
Credit Total	**30**	

Master of Science in Building Technology (2 years)

Semester 1

Code	*Title*	*Credits*
AR1B010	Structural Mechanics I	4
AR1B030	Computer Aided Design	4
AR1B040	Product Development	1
AR1B050	Materials Science	4
AR1B071	Building Physics I	5

AR1B081	Product Design	8
AR1B090	Production Technique	2
AR1B100	Methodology	2
Credit Total	**30**	

Semester 2

Code	*Title*	*Credits*
AR2B010	Structural Mechanics II	2
AR2B020	Construction Design	2
AR2B030	Building Law	1
AR2B040	Structural Design	2
AR2B060	Building Design	4
AR2B070	Building Physics II	2
AR2B080	Climate Design	2
	Electives Building Technology	15
Credit Total	**30**	

Semester 3

Code	*Title*	*Credits*
AR3B010	Graduate Project Preparation	15
AR3B300	Climate Design and Research	15
Credit Total	**30**	

Semester 4

Code	*Title*	*Credits*
AR4B300	Laboratory of Research and Design	30
Credit Total	**30**	

MSc 2 Free Electives (15 ECTS)

Code	*Title*	*Credits*
AR0030	Windlab / Dream and Realization	13
AR0050	Design Informatics Study	10
AR0055	Design Explorers	3
AR0500	Architectonic: Design	12
AR0510	Architectonic: Research	12
AR0531	Smart & Bioclimatic Design	6
AR0771	Beyond 3D Computer Visualization	6
AR0923	Literature Study Capita Selecta BT -	3
AR0924	Literature Study Capita Selecta BT -	4
AR0925	Literature Study Capita Selecta BT -	6
AR0950	Façade Symposium	15
AR0960	Stand Up Architecture	15

Learning Outcomes: Combining technological aptitude, context and creativity, the Faculty of Architecture aims to fulfil its mission across its entire professional field. Across its academic programmes, TU Delft aims to consolidate and profit from its superb international academic reputation as a leading design school; to become a national platform for the innovation of design, engineering and processes; and, to provide a central platform for discussion on current social issues relating to its fields of expertise.

EXECUTIVE SUMMARY – Environmental Design in the Academic Curriculum

A number of courses in the structure of the Bachelor degree have a focus on environmental sustainability. **BK1042 Technology 1b, Climate Design 1** explores specific aspects of climate-design for structures in relation to integral designs. By focusing on projects where integral climate design features prominently, interrelated subjects can be worked out in greater detail. The lectures examine the conditions that divisions are required to satisfy and the various types of energy transfers through the facade which act as a buffer between the indoor and outdoor climate. The extent to which such transfers are controlled also determines the supplementary facilities – in the form of climate control – that are required for a comfortable indoor climate. Student acquire an overview and understanding of how the different aspects of Building Physics work - heat, moisture, light and air - and how these influence the indoor climate and energy consumption in the context of the architectural design. They gain knowledge on the role that these aspects play in relation to sustainable construction and learn to formulate the necessary questions in relation to these aspects when developing the design, so as to be able to implement them as an integral component of the process. Students also become familiar with the fundamental principles of heat and moisture transfer in building elements and spaces, so as to describe and quantify these principles and analyze and assess potential thermal and damp problems in the context of stationary situations. The module also teaches how to set up a heat balance for a building with limited complexity, formulate a simple energy consumption calculation and develop the ventilation/heating system in relation to the architectural context. Students become familiar with the basic variables which play a role in assessing daylight and artificial light and the basic concepts of visual comfort, and are capable of implementing these within a design situation, determining the influence of a design based on the amount of sunlight that buildings and urban locations receive.

BK2042 Technology 2a, Climate Design 2 analyses a number of issues related to the built environment. Primarily, the module investigates the field of acoustics and the role it plays in buildings. For a good protection from noise, buildings require construction of good separations. A special attention must be given to connections because they influence the sound insulation. A main concern is to hinder the noise from roads, trains, airplanes and noises generated from surrounding neighbours. Acoustical problems in meeting rooms and conference halls relate to the difficulty of clear sound recognition for optimal communication. In high rise buildings, there are also other concerns related to wind resistance. The urban planning of an area is therefore very important. The same applies to the influence of pavement, solar access and ventilation possibilities. Fire safe buildings also demand for safe fire rated and fire resistant escape ways, exits, partition and constructions. Upon completion of this module, students gain knowledge on how to eliminate sound diffusion between spaces through sound absorption or insulation, integrating these strategies within design and spatial forming using different construction details; also, they learn the different noise generating sources and how noise diffuse and penetrate within buildings and around the building outdoors. In addition, students gain expertise on wind obstruction in urban and building contexts and how to improve the wind flow in and around buildings by extending natural ventilation opportunities in addition to ground pavement and sound absorbing solutions. Ultimately, the module teaches how to design fire safe buildings.

BK4042 Technology 4b, Construction and Climate Design provides knowledge about structural and standing constructions, building construction, climate installations and artificial lighting; this course is a prerequisite for BK4043 and BK4000 (Design Project 4: Small Public Building). Students learn to handle building designs with high complexity, specifically focusing on structural construction design and selection of construction elements and dimensioning. The module introduces different types of wall composition for indoor and outdoor walls and focuses on the design of climatic responsive light construction buildings, taking in consideration the thermal resistance and energy and climate basic concepts and strategies.

BK4043 Technology 4b, Construction and Climate Design builds on the previous module, and students apply their knowledge exploring in depth structural constructions design in light of architectural concepts and selection of construction systems looking at function and architectonic design and structural loads.

Amongst elective modules, **AR0083 - Sustainable Development Programme** offers a number of lectures on general and specific topics. Knowledge is acquired on environmental law, environmental planning, environmental design and ecology. The knowledge is used in discussions, research and design. The course is concluded by a written test consisting of 3 parts (two exams and an essay) and a take-home examination.

AR0084 - Sustainable Design, Time Based (AR0190 included) conducts both design and design-driven research. The design occurs within the framework of different timescales (3 months, 30 years, 200 years) and different scales of intervention (detail, building block, neighbourhood, region). The student chooses his or her own design-related research area and develops for this specific area (timescale & size) climate and time adaptive solutions. This results in a design for the different scales with focus on the building block scale. Design and research teachers assist the exercise during tutorials. The character of the assistance can be described as workshop-like. The course starts with a workshop week with films, discussion and thematic lectures. During the course, several excursions will be organized showing examples of sustainable solutions. The final-products are designs and a research report, both of which are assessed by a design instructor and a research tutor. The assessment is also based on interim testing and an oral presentation. In addition, a logbook must be kept with findings and the progress. All the products must be submitted at the presentation.

AR0190 - Urban Sustainability applies a maximization method focusing on design, where environmental themes provide structure for that design. Based on the design brief for a neighbourhood (approx. 2000 houses with facilities) and the available location, a workshop is held in which several environmental themes are maximized. Assessment is based on three presentations and a final-product. The result is a design for a district, neighbourhood and/or block with oral presentation and written commentary.

AR0891 - Smart Architecture focuses on both context-driven and concept-driven design. The context is a sustainable development of the built environment, ‘Smart solutions’ represents the concept. Here, being smart implies being innovative, inspiring and optimistic. Smart Architecture documents and analyzes projects that conform to this definition. During the course, research is done concerning sustainable concepts and technologies Students who successfully complete the course are able to analyse and document sustainability issues using research methods in relation to constructional and architectural practice; learn how to formulate alternative solution trajectories for sustainability issues; are able to identify the implications of found alternative solutions on both the short and the long term, on other scale levels and on alternative systems; and, are able to weigh these solution trajectories and their implications against each-other.

AR0102 - Research & Design, Workshop forms part of the interdisciplinary elective subjects Research & Design for Sustainable Development, whose central themes are sustainable development, sustainable building and sustainable urban development. Students learn to analyse construction-related sustainability issues with the aid of various techniques and to weigh solutions and their implications against alternatives.

AR0531 Smart & Bioclimatic Design and **AR0532 Smart & Bioclimatic Design Theory** are based on a design approach that deploys local characteristics intelligently into the design of buildings and urban plans, in order to make these more sustainable. AR0531 teaches students the elementary knowledge and skills for smart & bioclimatic design through self-directed learning. Conversely, AR0532 teaches students the elementary knowledge and skills for smart & bioclimatic design through a series of lectures. The courses offer lectures on smart & bioclimatic architecture and urban planning, sustainable technology and elementary building physics. A lot of attention is paid to examples from practice, and climate design researchers present their latest findings. Students acquire insight into and knowledge of physical aspects of the climate design of a building and of the possibilities and techniques to apply specific environmental features and the local climate in design. In addition, students gain the skill to integrate the mentioned possibilities and techniques in the architectural or urban concept and to conduct individual research into a topic chosen by them.

Within the Master of Science degree programme “Architecture, Urbanism & Building Sciences”, students can choose from four Master Tracks. **Architecture**: Architecture concerns the form and function of buildings, renovation and designs. Attention is also given to the history of architecture and urbanism. **Urbanism**: Urbanism focuses on urban design, urban expansion, landscape architecture and spatial planning. Attention is given not only to the design of the Netherlands but also to dealing with transformations at city or district level. **Building Technology**: The focus of Building Technology is on the technical aspects of the field. This includes subjects such as use of materials, product development, installations, building physics and environmental technology. **Real Estate & Housing**: Real Estate & Housing deals with the logistical aspects of architecture and urbanism, such as planning, implementation and management.

Master of Science in Architectural Engineering - Within the eleven specialisations of the Master track “Architecture” there is one with direct relation with environmental design, namely **Architectural Engineering**. In the Architectural Engineering programme, students are trained to become architectural engineers; upon the successful conclusion of this track, the graduate is eligible for official certification as a licensed architect. The programme covers spatial, functional, compositional, structural and climatic considerations. The essence of Architectural Engineering is the linkage between thermal quality, facade, utilities, structural elements and function on the one hand, and understanding and exploring space on the other. Architecture and engineering are inextricably linked. Architecture is more than just a visual language, and engineering can enrich and deepen an idea or a concept. Exploring technical possibilities and making technical innovations can be the source of architectural innovation – and vice versa. Building engineering is increasingly important in the design process. In practice, many building projects are characterised by great aspirations coupled with low budgets. What is crucial is to intelligently and innovatively apply materials, systems and structures. And in addition, to face current challenges, it is necessary to take proper account of sustainability and energy consumption while also meeting ever higher demands for comfort and convenience. Education and research focuses on the application of fundamentals of physics in the built environment as a whole, including the building, building components and constructions. Specific focus is given to the principles of building physics underlying environmental control in buildings (thermal climate, sound, light, etc.), climate-separation systems and partitions in buildings. Urban building physics also covers the effects of wind and urban noise.

Master of Science in Building Technology - The study domain of Building Technology is integrated with design. Both new-build and the technical transformation of existing buildings belong to this domain, including aspects of sustainability and life cycle. The programme offers to students instruction in innovative construction systems and (design) methods. In particular, the MSc focuses on the coordination and integration of supporting, partitioning and climate and comfort functions based on applied mechanics, materials science and physics. The programme also contributes to the interaction between building technology and architecture through the technical assembly, arrangement and composition of construction materials, construction products and construction components in sets of construction parts clustered into a structure and building.

Amongst modules offered at Master level, in **AR1B071 Building Physics I** students are asked to calculate elementary heat transfers and sound propagation for their own façade designs. They gain knowledge of the heat transfers within construction elements and from the surface of those elements to the environment, as well as of the effect of design decisions on these heat transfers, and hence on the occurrence of (surface) condensation. The module provides skills in the responsible use of software that can be used to simulate the 3D heat transfer in stationary construction elements, as well as know-how in improving the thermal performance of the construction elements analysed with the aid of such software. Also, the teaching includes knowledge of sound propagation in single-walled structures and cavity-wall buildings and through ventilation apertures, with particular emphasis on the transmission of external noise through a façade. The course finally introduces the methods to measure the acoustic performance of various standard divisions in a laboratory configuration and the acoustic calculation of the student's own façade design with the aid of existing software plus the generation of alternatives if the design in question proves acoustically inadequate.

AR1B071 Building Physics II focuses on design and verification of the building physics (energy, temperatures, ventilation and lighting) of students' design. The course includes study of the energy demands in relation to the thermal dynamical behaviour of buildings and to ventilation in buildings, and analysis of daylighting and artificial lighting in the design. Upon completion of the module, students gain knowledge of the effects of day- and artificial lighting on the illuminance levels, energy demand and comfort in a room, and expertise in the dynamic behaviour and energy demand of buildings in relation to building services

AR1B080 Climate Design analyses development of climate design in building services in a sustainable context. The module increases the students' integrated architectonic, constructive and building services design skills for a multifunctional building. The requirements for completion of the module include: an A1-drawing with the starting points and the main issues of the physical aspects of the building and a research report (10 pages) with the most important results of the design and research process. Only basic calculations are required: heating and cooling load, amount of fresh air, size of ducts, capacities, etc. The knowledge gained from previous building physics courses is a prerequisite for the completion of the module. The quality of the design produced is evaluated with (indications of) the following parameters: thermal comfort, energy consumption, air quality, investment and maintenance costs, innovative approach.

In **AR3B300 Climate Design and Research**, the first component of the course focuses on supervised self study on indoor comfort, the associated physiological concepts, the impact of building services and their opportunities, and the basics of research into sustainability. In the second component, an existing building is assessed on indoor comfort. Although, in theory, the architect aims to design the best possible building, this does not necessarily mean that the best indoor comfort is realised in practice. Therefore, the building is analysed (i.e. measured) on a number of aspects including building physics, building services and climate design. The third component looks at improving the indoor comfort of the building. If no part of the building fails to meet the current requirements regarding comfort, a different (and possibly cheaper) solution is designed and presented, or alternatively a solution is designed that is more closely related to the original.

AR3B300 Windlab / Dream and Realisation introduces the theme of aerodynamics using new CFD (computational dynamic software) to visualize the behaviour of buildings. The design studio focuses on the design of a small scale building on the TU-Campus. Simulation, wind tunnel testing and in-situ measurements are part of the contents of the course so that students can visualize the impact of their building proposal on the urban context, wind comfort and air quality, visualize the pressure differences around the building necessary to design a system for natural ventilation, and analyse wind pressures so as to minimize the wind loading to design a lighter structure.

Integration of Environmental Design with Studio (Bachelor in Architecture only):

Semester1

Basic Architectural Concepts - Typology
10 Credits

Urban Fundamentals
2 Credits

History of Architecture, Art & Urbanism
2 Credits

Technology 1a, Applied Mechanics
3 Credits

Technology 1b, Climate Design
3 Credits

Technology 1c, Constructions
2 Credits

Briefing and Feasibility
2 Credits

Hand Drawing 1
2 Credits

Form Studies 1
2 Credits

Studio Module

Design Project 1: House and Settlement
10 Credits

Semester 2

Basic Architectural Concepts - Typology
2 Credits

Urban Fundamentals
2 Credits

History of Architecture, Art & Urbanism
2 Credits

Technology 2b, Applied Mechanics
2 Credits

Technology 2a, Climate Design
2 Credits

Design and Construction Management 1
2 Credits

Research Methodology 1
2 Credits

Informatics 1
2 Credits

Hand Drawing 2
2 Credits

Form Studies 1
2 Credits

Studio Module

Design Project 2: Building and Construction
10 Credits

Semester3

Basic Architectural Concepts - Typology
2 Credits

Urban Fundamentals
2 Credits

History of Architecture, Art & Urbanism
2 Credits

Technology 3, Material Sciences
2 Credits

Alpha/Gamma Module
3 Credits

Programme and Attainability
4 Credits

Research Methodology 1
2 Credits

Informatics 2
2 Credits

Studio Module

Design Project 3: City and Housing Construction
10 Credits

Semester4

Basic Architectural Concepts - Typology
2 Credits

Design and Construction Management
3 Credits

Technology 4a, Material Sciences
2 Credits

Technology 4b, Constr. and Climate Design
3 Credits

Technology 4b, Constr. and Climate Design
3 Credits

Statics for Architecture
3 Credits

Informatics 3
2 Credits

Studio Module

Design Project 2: Small Public Building
10 Credits

Semester5

Electives
30 Credits

Semester6

Internship
30 Credits

STRENGTHS AND OPPORTUNITIES

Strengths:

- The focus of the School is on design. The idea of integration and multi-disciplinary design is an asset for TU-Delft graduates. The faculty's has a superb international academic reputation as a leading design school. The school also provides a diverse and very wide variety of courses and specialisations;
- The possibility for students to complete the study with the TiDO certificate (a certificate that shows that student has focused on sustainability during his or her Master and final thesis) is a strong asset. The Architectural Engineering and Building Technologies MSc programs provide very advanced education in the field of environmental design. There is a strong emphasis in these programs on creative integration of sustainable environmental design in architectural design.

SOURCES AND REFERENCES

TU Delft Faculty of Architecture website: www.bk.tudelft.nl
Academic Surveys and Feedback

TECHNICAL UNIVERSITY OF EINDHOVEN
FACULTY OF ARCHITECTURE

Bachelor of Architecture (3 years)

Level: Undergraduate (BArch, 3 years)

Accrediting Body: Stichting Bureau Architectenregister (SBA)

Educational Aims: The program of the Bachelor is focused around the scientific preparation of the student, equipping him/her with a broad building and architectural knowledge and proficiency, and with the acquaintance of professional skills that are required in architectural practice. Practical and technical components of the design get introduced and integrated within multidisciplinary projects. Often the design projects are simulating scientific and professional design questions that graduates will meet in the real world. At every year of the programme, there is room for students to make their own choices for a study profile, with a minor, elective courses and specialisation in the Master ABP. Students can choose between a short minor or extended minor. Also, they can choose various free minors approved by the examination commission.

Outline Description of Course: In the first year, all students follow the same educational programme (foundation) based on projects, compulsory courses and portfolio. During the second and third year, students can develop their individual study programme and choose a profile based on their kinship with building science and architectural design. There are four profiles that are offered: Architecture - Technology; Technology - Management; Management - Urban Design; Urban Design - Architecture. Based on the selection, the student follows compulsory courses, electives and his own chosen study profile including design projects, portfolio and minor programs. The last project of the Bachelor is multidisciplinary so as to give to the students the possibilities to prove their capabilities and knowledge to work in a team.

COURSE STRUCTURE: The Bachelor program is compulsory for all students and is based on 43 ECTS for course work per year. There is one ECTS for the personal design portfolio and 16 ECTS for studio work including Bachelor project 1 and 2. The courses are based on scientific grounding in architectural design and building sciences. The Bachelor is based on a broad program with a common basis for all students. The certificate with all passed exams allows the access to a graduate Master course, such as those offered by the TU/e Architecture, Building and Planning (ABP) Department.

Bachelor of Architecture (3 years)

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
2DB80	Calculus 1	3	Autumn
7M060	Computer aided design college	1	Autumn
7NN01	Design Studio 1	8	Autumn
7P040	Constructive Design 1	3	Autumn
7P060	Static Constructions (mech.1)	2	Autumn
7T070	Building Technology and Design	3	Autumn
7U060	Reseal Estate Management	3	Autumn
7W018	Research Methodologies, course	1	Autumn
7W022	Research Methodologies, exercise	2	Autumn
7X010	Architectural Design	3	Autumn
7X014	Hand Drawing	1	Autumn
2DB90	Calculus 2	3	Spring
7M065	Computer aided design exercise	2	Spring
7N003	Practical building technology/urban planning	3	Spring
7NN02	Design Studio 2	8	Spring
7P070	Structural stresses in Construction Forms (mech. 2)	2	Spring
7R060	Technical Performance Design	3	Spring
7S005	Building Physics Design 1, Course	2	Spring
7S001	Building Physics Design 1, Exercise	1	Spring
7S020	Material Science 1	2	Spring
7W080	Urban Planning	3	Spring
7PF10	Portfolio 1	1	Spring
Credit Total	**60**		

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
7..03	Semester project 3	12	Autumn
7S420	Building Physics Design 2, Course	2	Autumn

7S425	Building Physics Design 2, Exercise	1	Autumn
7P125	Construction Design and Materials	3	Autumn
7W220	Urban Design	3	Autumn
7T255	Building Technology in concept and detail	3	Autumn
7..04	Semester Project 4	12	Spring
2S410	Statistics 1	2	Spring
7M254	Design and presentation with ICT	3	Spring
7P160	Static Constructions (mech.3)	2	Spring
7X200	History of Architecture	3	Spring
7PF20	Portfolio 2	1	Spring

(*Elective Modules*)

Code	*Title*	*Credits*	*Taught*
7S100	Material Science 2TM	2	Autumn
7S320	Integrated buildings Installations AT, TM, TM(bs)	3	Autumn
7U212	Real Estate Development	2	Autumn
7W230	Urban Planning SA, MS	4	Autumn
7X210	Primary elements AT, SA	3	Autumn
4B260	Heating and Electricity TM-bs	3	Spring
7T233	Details Design 2 AT, TM,SA	3	Spring
2DB60	Finishing AT, SA	3	Spring
2DB35	Differential equation and matrixes TM	3	Spring
7W210	Urban Management MS	3	Spring
2DB45	Statistics 2 MS	3	Spring
4B420	Thermodynamics	3	Spring
Credit Total	**59**		

Profiles:
AT Architecture and Technology
SA Urban Planning and Architecture
MS Management and Urban Planning
TM Technology and Management
TM (bs) Technology and Management, variant Building Services

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
7..05	Minor Project	12	Autumn
	Minor Courses	15	Autumn
	Academic Forming	3	Autumn
7N950	Multidisciplinary Project	12	Spring
0A140	Building Law	2	Spring
7-	Research Methodologies	3	Spring
7X300	Philosophy	3	Spring
7-code	Construction economy and costing	3	Spring
7R300	Construction Management	2	Spring
7X272	Fine Arts and Architecture	2	Spring
7Z150	Sustainable Buildings	3	Spring
7PF30	Portfolio 3	1	Spring
Total 61			

(*Electives Modules*) - Climatic Design

7MP10	Minor project Climatic Design	12	Autumn
7Y420	Climatic Design	3	Autumn
4B440	Thermodynamics	3	Autumn
7Y110	Electrical energy requirements for building systems	3	Autumn
7Y210	Basic Architectural Concepts in Climatic Design	3	Autumn
7S410	Building Performance simulation	2	Autumn
7S801	Computational Building Physics and Systems	1	Autumn

Free minor:

7P570 Wood constructions 2	2	Autumn
7W532 Landscape and green in the city	2	Autumn

Learning Outcomes: Students are introduced to building science knowledge and to the methods and techniques to work under the supervision of an experienced professional. Upon completion of the course, the students: become oriented in the domain of building science, form a picture of their own qualities and kinship in this field, and develop an individual thinking and procedural design.

Integration of Environmental Design with Studio – Bachelor of Architecture

Year 1- Foundation

Calculus 1
3 Credits

Computer aided design college
1 Credit

Constructive Design 1
3 Credits

Structures (mech.1)
2 Credits

Building Technical Design
3 Credits

Real Estate Managment
3 Credits

Research Methodologies
3 Credits

Material Science 1
2 credits

Architectural Design
3 Credits

Hand Drawing
1 Credit

Studio Modules
Studio Work 1
8 Credits
Studio Work 2
8 Credits

Urban Planning
3 Credits

Calculus 2
3 Credits

Computer aided design excercises
2 Credits

Practical Building Lab
3 Credits

Structural Loads in Construction Forms (mech2)
2 Credits

Technical Design
3 Credits

Building Physics Design
3 Credits

Portfolio 1
1 Credit

Year 2

Building Physics Design
3 Credits

Construction Design and Materials
3 Credits

Urban Design
3 Credits

Building Technology in concept and detail
3 Credits

Statistics 1
2 Credits

Design and presentation with ICT
3 Credits

Static Constructions (mech.3)
2 Credits

History of Architecture
3 Credits

Portfolio 2
1 Credit

Studio Modules

Semester project 3
12 Credits

Semester project 4
12 Credits

(**Elective Modules**)

Integrated buildings Installations
3 Credits
Heating and Electricity
3 Credits
Thermodynamics
3 Credits

Year 3

Building Law
2 Credits

Research Methologoies
3 Credits

Philosophy
3 Credits

Sustainable Construction
3 Credits

Construction economy and costing
3 Credits

Construction Management
2 Credits

Fine Arts and Architecture
2 credits

Portfolio 3
1 Credit

Studio Modules
Minor project (electives):
Climatic Design
12 Credits

Multidisciplinary project
12 Credits

(Electives Minor)
Climatic Design

Thermodynamics
3 Credits

Climatic Design
3 Credits

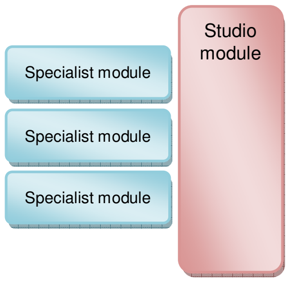
Basic Electrical Installations
3 Credits

Basic Architectural Concepts and Climatic technologies
3 Credits

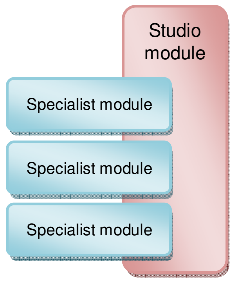
Building Performance Simulation
2 Credits

Computational Building Physics and Systems
1 Credit

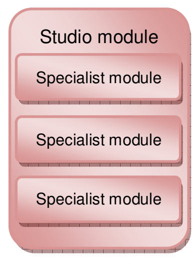
(Electives Minor):
Free minor
Wood constructions
2 Credits



Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

TECHNICAL UNIVERSITY EINDHOVEN
FACULTY OF ARCHITECTURE

Master of Science - Architecture, Building and Planning Department (ABP)

Level: Graduate (MSc, 2 years)

Accrediting Body: Stichting Bureau Architectenregister (SBA)

Educational Aims: Within the project-driven education offered in the Architecture, Building and Planning (ABP) Master courses, the emphasis is placed on developing a design orientation in the student, whereas designing is an activity aimed at generating solutions to problems of a complex nature. In this learning process, analysis and synthesis are indivisibly linked. Analysis is associated with scientific method and techniques; synthesis is based on the scientific approach to design processes and modelling in general. Education in the Architecture, Building, and Planning (ABP) Department is research-driven and design-oriented. Research and design activities are interwoven in the program of education. The student is taught to approach relevant architectural problems in a constant interaction between analysis and synthesis. This means that the education is not, a priori, aimed at training the student for a specific profession. In the context of a specific provision of architectural disciplines, the student is taught to be able to take a radical approach to problems and innovations (research) and to be able to develop integral solutions (design).

Outline Description of Course: The ABP courses at the TU/e are characterized by their interdisciplinary nature. In the various specializations of the Master courses, the student is given the opportunity to follow subjects in other Groups within and outside the Department. In this way, the students are able to learn from within their own discipline to understand the problems of other disciplines. During the study, each student is given the responsibility for his/her own learning process. For this purpose, the use of a 'student portfolio' is introduced. In the ABP Master courses, every student is allocated a mentor for the development of his portfolio. Each Master specialization offers a certain amount of space for elective course elements, which can be used for taking subject courses or, for example, for setting up a work placement project.

Course Structure: The ABP provides 8 different Master degrees: Architecture; Building Technology; Construction Technology; Design and Decision Support Systems; Physics of the Built Environment; Real Estate Management and Development; Structural Design; Urban Design and Planning. The course elements of each Master program are divided into compulsory and elective elements. Elective elements are available only in the Master level part of the TU/e curriculum. Furthermore, the elective elements must be selected with the approval of the Examination Committee. The elective elements form part of the student portfolio. These regulations on combined study/graduation relate to all possible combinations of Master Specializations in the ABP courses. The basis of these regulations is that a student registers for a main specialization but also takes all compulsory elements of a second specialization (where, in principle, the room for elective course elements is used to complete part of the obligations of the other specialization). In this case it is unavoidable that extra ECTS credits must be earned for the combined study.

Master of Science in Architecture (2 years)

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
7PF03	Master's Portfolio (completion in 2.A)		
7X600	Strategies & places	6	Autumn
7XS15	Master's project 1 architecture	14	Autumn
7XS25	Master's project 2	14	Spring
7X811	Methodology in Architectural history and theory	3	Autumn
7X500	Production & parts	6	Spring
7X700	Philosophy and Architecture	3	Spring
Credit Total	**46**		

(*Elective Modules*) 21 credits on the 1st and 2nd year

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
7X545	Master's project	9	Autumn
7PF03	Master's Portfolio	3	Autumn
7XX41	Learning portfolio 4, ARCH	4	Autumn
7XX37	Final project Architecture	37	Spring
Credit Total	**53**		

(*Elective Modules*) 21 credits on the 1st and 2nd year
In Architecture

7X655	Morphology	3
7X865	Seminar	6
7X886	Theory of Architecture 1: contemporary theory	3
7X900	Architectural analysis	6
7XX07	Hand drawing: Panamarenko (in Dutch)	3
7X660	Product presentation	2
7X840	The art of writing on Architecture	2
7X651	Form study B (in Dutch)	3

Or in other Master specialties:
Building Technology, Construction Technology, Design and Decision support Systems, Physics of the built environment, Real Estate Management and Development, Structural Design, Urban Design and Planning.

Master of Science in Physics of the Built Environment (2 years)

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
7PF03	Master's Portfolio (completion in 2.A)		
7S532	Heat and moisture transfer in building envelopes	5	Autumn
7S650	Structure-borne sound in buildings	2	Autumn
7S750	State of the art in building performance simulation	3	Autumn
7S801	Computational building physics and systems using Matlab	1	Autumn
7S815	Design of sustainable energy systems for the built environment	3	Autumn
7S892	CFD for building engineering	3	Autumn
7SS15	Master's project 1 PBE (research, design, consultancy)	14	Autumn
7S612	Room acoustics	3	Spring
7S620	Durability aspects of building materials	3	Spring
7S630	Lighting technology	2	Spring
7S632	Lighting technology, exercises	1	Spring
7SS25	Master's project 2 PBE (research, design, consultancy)	14	Spring

(*Elective Modules*) 18 credits on the 1st and 2nd year

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
7PF03	Master's Portfolio	3	Autumn
7S545	Master's project PBE (preparation of final graduation project)	9	Autumn
7SS41	Learning portfolio 4, PBE	4	Autumn
7SS37	Final project PBE (start in quarter 2)	37	Spring

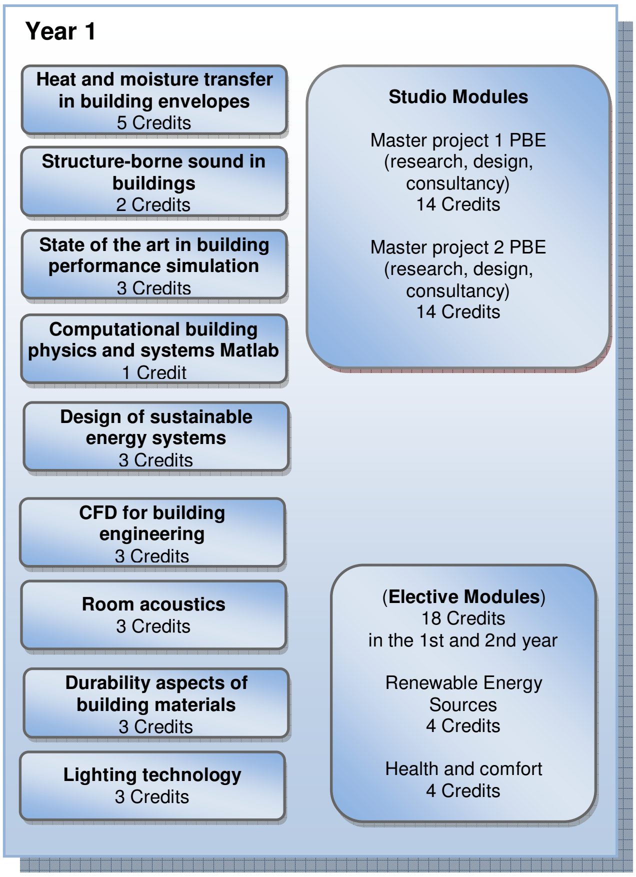
(Elective Modules) 18 credits on the 1st and 2nd year

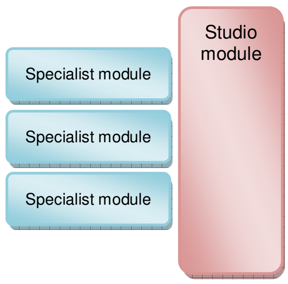
- In Physics of the Built Environment

0T400	Academic skills in English 1	3
0T500	Academic skills in English 2	3
7N500	Practical Building Lab	3
7Y900	Health and comfort	4
7Y910	Robotics and home automation	3
7S812	Measurement (excursion)	3
7S820	Basic building performance simulation	2
3B470	Physical transport phenomena	3
4P510	Renewable Energy Sources	3
4A320	System analysis	3
4A250	Signal analysis	3
0P421	Perception	3
7Y700	Sustainable building systems modelling	3
7S810	Computational modelling for building physics and systems	3

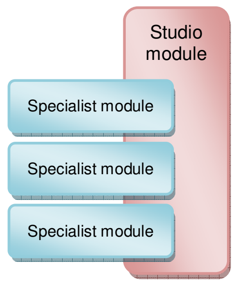
Learning Outcomes: The MSc programmes provide a research-driven education that allows the students to gather knowledge independently, and develop insight and skills in order to apply the acquired competence in research projects and activities, as well as in the profession. Most of the courses related to sustainable environmental design are part of the Master in "Physics of the Built Environment". Nevertheless, these courses are available to all Masters as electives modules (21 credits in the Architecture Master).

Integration of Environmental Design with Studio – MSc in Physics of the Built Environment

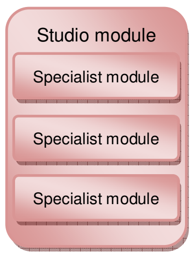




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Strengths:

- Sustainable environmental design should be an important aspect in a series of requirements (e.g., economics, aesthetics, technique, well-being etcetera) a good design can only be achieved if all requirements are equal important (so sustainable environmental design may not be more important than other criteria): multidisciplinary design is essential;
- This collaborative and inter-disciplinary approach represents one of the main features of the curriculum at TU/e. In this aspect, elective Minors and Masters can provide a comprehensive approach in sustainable environmental design.

SOURCES AND REFERENCES

TU Eindhoven website: www.tue.nl/nl/
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Stichting Bureau Architectenregister (SBA)

In the Netherlands, the professional titles of architect, urban designer, landscape architect and interior designer are protected by the Architects Title Act of 1987. Only those who are registered in the Architects Register are entitled to use one of these titles.

The *Stichting Bureau Architectenregister* (SBA) in The Hague is the authority established by the Act to maintain the Register. The SBA is also designated by the Act to as the Competent Authority in the Netherlands for the application of the European Directive of 7 September 2005 on the mutual recognition of professional qualifications.

The SBA was founded in 1988 by the Minister of Housing. The objective of the SBA is to implement the current legislation on the title of architect. In January 2009, there were 13,182 professionals registered with the SBA in the Netherlands. More than three quarters of these were registered under the title of architect. Interior designer, urban planners and landscape architects were respectively 13.7%, 5.6% and 5.3% of the registry. Besides managing the professional registers, the SBA performs the following tasks:

- The recognition of foreign diplomas in the fields of architecture, urbanism, landscape architecture and interior design;
- Organizing examinations for architects, urban planners, landscape architects and interior designers;
- Providing information about legal requirements concerning the profession regulated by the Architects Title Act in the Netherlands;
- As competent authority for the implementation and application of the European Directive on the recognition of professional qualifications, provide declarations, certificates and other information in the fields of architecture, urbanism, landscape architecture and interior design;
- Establish quality policies relating to appropriate continuing training for architects;
- Act against the illegal use of the protected titles.

Criteria for Registration

Applicants for registration must hold a Diploma as specified in the Architects Title Act.

A period of practical training experience in addition to the diploma is not (yet) a requirement for registration. Holders of a diploma in architecture who followed their study in a EU Member State other than the Netherlands or in Liechtenstein, Norway or Switzerland can also be registered as an architect if their diploma is mentioned in Annex V or Annex VI of the EU Directive on the recognition of professional qualifications.

Diplomas in architecture issued in other countries must first be assessed and recognised by the SBA before registration is possible. Holders of a diploma in urban design/urbanism, landscape architecture or interior design who followed their study in country different than the Netherlands can be registered as such if their professional qualification is assessed and recognized by the SBA.

SOURCES AND REFERENCES

SBA website: www.architectenregister.nl

Portugal

UNIVERSIDADE LUSÍADA DE LISBOA
LICENCIATURA EM ARQUITECTURA

Diploma in Architecture (5 years)

Level: Graduate (DipArch, 5 years)

Accrediting Body: Ordem dos Arquitectos Portugueses (Portuguese Order of Architects)

Educational Aims: The aims of the School of Architecture at the University Luisiada of Lisbon consist in experimenting with different tendencies regarding thinking and practice of architecture in order to qualify students for their future practice under the perspective of construction and rehabilitation of the built environment and urban heritage. In-depth study and research is guaranteed by the existence of specialized courses and Masters. All students should be able to: work with principles, concepts and theories central to the profession; master the use of equipment and technical skills; meet codes and standards set by governing bodies and professional societies; integrate and apply knowledge and skills to solve specific problems; employ strong graphic communication skills to communicate ideas visually; utilize digital technologies for effective presentation.

Outline Description of Course: The School of Architecture at the University Luisiada of Lisboa has been adapting a curricular structure following the Bologna process, with a programme based in two cycles. The full degree consists of 300 credits and every year is made up of 60 credits divided between a number of curricular units, although not based on an arithmetical division by the number of units delivered. The number of credits of each curricular unit is directly related to its time load in the educational annual structure.

Course Structure: Each year or session of studies consists of 60 credits.

Diploma in Architecture (5 years)

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Duration*
1301	Architecture I	30	Full year
1302	Introduction to Design	5.5	Semester
1303	Design of Nature	5.5	Semester
1304	Geometry	3.5	Semester
1305	Design Geometry	3.5	Semester
1306	Introduction to the History of Art	2	Semester
1307	History of Contemporary Art	2	Semester
1308	Mathematics	4	Semester
1309	Introduction to Digital Technologies	4	Semester

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Duration*
1310	Architecture II	30	Full year
1311	Fundamentals of Communication Design	5.5	Semester
1312	Communication Design	5.5	Semester
1313	History of Modern Art	2	Semester
1314	Compared History of Art	2	Semester
1315	2D Technologies	2	Semester
1316	3D Technologies	2	Semester
1317	Buildings Materials	3.5	Semester
1318	Applied Materials	3.5	Semester
1319	Ergonomics	2	Semester
1320	Applied Ergonomics	2	Semester

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Duration*
1321	Architectural Design I	30	Full Year
1322	Buildings	3.5	Semester
1323	Constructive Systems	3.5	Semester
1324	Statistics	3.5	Semester
1325	Structures	3.5	Semester
1326	Inclusive Design	2	Semester
1327	Ergonomic Colour	2	Semester
1328	Introduction to the Theory of Architecture	2	Semester
1329	Theory of Architecture	2	Semester
1330	History of Architecture	2	Semester

1331	History of Urban Architecture	2	Semester
1332	Physical Geography	2	Semester
1333	Environment and Sustainability	2	Semester

Year 4 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Duration*
1334	Architectural Design II	30	Full year
1335	Installations	3.5	Semester
1336	Infrastructures	3.5	Semester
1337	Structural Conception	3.5	Semester
1338	Structural Measurement	3.5	Semester
1339	History of Portuguese Medieval Architecture	2	Semester
1340	History of Modern Portuguese and Contemporary Architecture	2	Semester
1341	Human Geography	2	Semester
1342	City and Landscape	2	Semester
1343	Urban Design	2	Semester
1344	Regional Planning	2	Semester
1345	Design Economy	2	Semester
1346	Urban Sociology	2	Semester

Year 5 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Duration*
1347	Architectural Design III	41	Full Year
1348	Ethics, Deontology and Legislation	4	Full Year
1349	Final Project	15	

Learning Outcomes: The School of Architecture of the University Luisiada of Lisboa provides opportunities for students to acquire the knowledge and skills necessary to pursue a professional position or graduate/professional training in architecture. The cycle of integrated studies conducive to the graduation in Architecture provides the student with the following skills:

- Knowledge and level of understanding that constitute the base for the development and application of architectural contents, including the research context;
- To be able to apply knowledge and comprehension skills acquired so that students can approach their professional work developing their vocational area;
- To be able to apply their knowledge and capacity of understanding and resolution of problems in new situations in multidisciplinary contexts related to their work area;
- Aptitude to integrate knowledge, work with complex questions, develop solutions and deliver opinions in situations of limited or incomplete information, including reflections on the implications and ethical and social responsibilities of those solutions and reasons;
- To be able to communicate the conclusions and knowledge in a clear way without ambiguities;
- Competence to continue learning along their professional life, both in an orientated and autonomous way.

EXECUTIVE SUMMARY – Environmental Design in the Academic Curriculum

Although within the curricular studies at the School of Architecture, sustainable environmental design is not a core part of the academic programme, the following modules are interesting from the point of view of environmental sustainability:

Buildings is a semester-long module of the third year. One of its general aims is to help students to understand architecture as constructed heritage with a greater and better quality life cycle. As a specific objective, the course aims to motivate students and their skills' development so they can analyze the constructive profile of ancient buildings. This way, the course tries to sensitize students for their possible intervention on the current market with a very significant number of buildings going through recovery and restoration, and to understand the sustainable construction as an area of inherent and transverse knowledge to the architectural production. Within its competences, the module seeks for the student to acquire relative knowledge of the characteristics of the civil construction and its integration in the area of sustainable construction in order to reduce excessive consumption of natural resources and primary energies as well as the production of waste.

Physical Geography, at third year level, deals with the relation between human intervention and the physical frame in which it is developed. It allows the student to reflect on the new paradigms of the human development and the responsibilities of the architect and town planner in this new frame. Throughout the course, the students understand the importance of the physical location through its geographical conditioners independently of the scale employed, recognizing the relevance of the physical geography in the process. The module marks a few specific objectives as the student understands the importance of the conditioners of the territorial morphology and the climate in land occupation, at the same time as they learn how to use instruments and methods for a sustainable architecture (cartographic and physiographic elements and understanding of the concepts of scale, observation and representation). The students' skills related to the utilization and control of geomorphology in architecture and urban planning are improved; the existing relation between climate and energy efficiency is also studied. Moreover, terms and notions of control of the physical geography are defined, identifying, treating and organizing the information for the production of architectural projects

Environment and Sustainability is a semester-long module of the third year, which tries to integrate the dynamics of territorial transformation in agreement with the paradigm of sustainable development, and to understand the importance of the problematic status of landscape and environmental quality in architectural and urban projects, developing a sense of collective citizenship. Students are expected to understand the reach of the concept of sustainable development, use the fundamental references of landscape ecology and to identify the main environmental risks of land occupation. Some of the skills developed through this module consist in the student's ability to define the concept of sustainable development, identifying the signs of change in the paradigm of the socio-economic development, recognizing the main environmental problems and using the basic references of landscape ecology and urban development.

Urban Design, during the fourth year, deals with the following issues within its environmental program: Urban landscape. Introduction to the concept of global landscape; The components of the cultural landscape; Biophysical components of the natural landscape in an urban context; and, Definition of criteria for the suitability for building: ecological bases of the urban project and the importance of the urban ecological structures.

Urban Sociology, at fourth year level, has the general aims of recognizing sociology through its concepts, theories and methods like an instrument for understanding the relations between social agents and the urban space, and integrating these dynamics in urban projects as a way to qualify the architectural intervention. The specific aims of the modules are: to systematize the sociological analysis on the space and the territory; to understand the social implications of the economic and urban transformations; to look for architectural and urban answers to the metropolitan social problems. Upon completion of the course, students will be able to sharpen their critical sense and ability to reflect on social transformations; to promote a productive discussion on urban space actors; to integrate public participation and social analysis in the design process in a creative way; to develop strategies and methodologies of specific analysis for social-urban contexts.

STRENGTHS AND OPPORTUNITIES

The integration of environmental design within architectural design modules in this Faculty of Architecture is rather sparse. However, the academic staff includes a group of teachers who guarantees a curricular line of environmental character for the students, through subjects like physical geography or urban sociology.

Strengths:

- The programme consists of obligatory modules, so all the students receive the same training. Environmental modules are not in conflict with other specialist modules;
- Students are highly motivated and they are currently demanding environment, sustainability and ecology contents in their educational curriculum;
- The main strength consists in the existence of a curricular unit whose main topic is related to environment and sustainability. To other extent, there is a group of curricular units pointing to sustainability, such as social and human sciences, which deals with the environment, sustainability, sociology, economy, urbanism and geography.

Opportunities:

- Primary and Secondary Education in Portugal finds the environment, sustainability and ecology as an opportunity and not as an obligation. This attitude should be extended to universities and higher education levels;
- There is a curricular line with very motivated teachers who are trying to improve the curriculum;
- The current European regulations support all kinds of teaching improvements related to the introduction of energy and environmental issues in architecture, even though it is not demanded by these regulations.

SOURCES AND REFERENCES

Lusiada University of Lisbon website:
http://www.lis.ulusiada.pt/old/cursos/bolonha/ciclos_2009_2010/arquitectura/1_ciclo/default.htm

UNIVERSIDADE DA BEIRA

FACUDADE ENGENHARIA

DEPARTAMENTO: ENGENHARIA CIVIL E ARQUITECTURA

Diploma in Architecture (5 years)

Level: Graduate (DipArch, 5 years)

Accrediting Body: Ordem dos Arquitectos Portugueses (Portuguese Order of Architects)

Educational Aims: The aims of the programme in Architecture at the Universidade da Beira consist primarily in: implementing an innovative methodology of learning, with self study resources, research seminars and the follow-up of qualified teachers; valuing the information about construction technology; reinforcing the practical experimental component of architecture; articulating the conception, design and execution of projects; and, improving specific training on construction, durability, construction pathologies and environmental comfort.

Outline Description of Course: The Faculty of Engineering is adapting to the Bologna process adopting a new format of Masters and Bachelors degree. This adaptation fulfils the following requirements: the full two-cycle degree consists of 300 credits; every year is made up of 300 credits to divide, yet not arithmetically, between the number of curricular units; the number of credits of each curricular unit is directly related to its hour load in the educational annual structure. The full degree requires 5 years from entry to completion of the program. The first four years consist of obligatory modules distributed over two semesters. In the fifth year, each semester has a workload of 30 credits spread over 3 obligatory modules and two free-choice modules, and just an architectural design module in the second semester.

Course Structure: Each year or session of study consists of 60 credits.

<u>Diploma in Architecture (5 years)</u>

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
6826	Drawing I (i)	6	Autumn
6827	Geometry I	5	Autumn
6828	Art History	5	Autumn
6829	Mathematics	5	Autumn
6830	Architectural Design I (i)	9	Autumn
6831	Drawing I (ii)	6	Spring
6832	Geometry II	5	Spring
6833	Building Materials	5	Spring
6834	Architectural Design I (ii)	9	Spring
6835	Theory of Architecture I	5	Spring
Credit Total	**60**		

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
6836	Anthropology	5	Autumn
6837	Drawing II (i)	6	Autumn
6838	History of Architecture I	5	Autumn
6839	Architectural Design II (i)	9	Autumn
6840	Theory of Architecture II	5	Autumn
6841	Drawing II (ii)	6	Spring
6842	Geo-Dynamics	5	Spring
6843	History of Architecture II	5	Spring
6844	Architectural Design II (ii)	9	Spring
6845	Theory of Architecture III	5	Spring
Credit Total	**60**		

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
6846	Construction	5	Autumn
6847	Materials and Resistance	5	Autumn
6848	Soil Mechanics I	5	Autumn
6849	History of Architecture III	5	Autumn
6850	Architectural Design III (i)	10	Autumn
6851	Structures	5	Spring

6852	Construction Physics	5	Spring
6853	Human Geography	5	Spring
6854	Architectural Design III (ii)	10	Spring
6855	Installations	5	Spring
Credit Total	**60**		

Year 4 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
6856	Quantitative Methods	5	Autumn
6857	Urban Design	5	Autumn
6858	Architectural Design IV (i)	10	Autumn
6859	Geographical Information Systems	5	Autumn
6860	Sociology	5	Autumn
6861	Economy and Management	5	Spring
6862	Perception and Image	5	Spring
6863	Urban Planning	5	Spring
6864	Architectural Design IV (ii)	10	Spring
6865	Heritage Interventions Works	5	Spring

Year 5 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
6866	Law	5	Autumn
6867	Aesthetics and Criticism	5	Autumn
6874	Architectural Design V (i)	10	Autumn
6875	Final Architectural Design	30	Spring
8065	*Elective Group I* (5/1)	5	Autumn
8066	*Elective Group II* (5/1)	5	Autumn
Credit Total	**60**		

(*Elective Modules*)

Group I (5/1)

6868	Home automation	5	Autumn
6869	Rural Habitat	5	Autumn
6870	Sustainable Construction	5	Autumn

Group II (5/1)

6871	Environmental Planning	5	Autumn
6872	Landscape	5	Autumn
6873	Ergonomics	5	Autumn

Learning Outcomes: Graduates in Architecture will be responsible for the harmonious integration of human activities upon the territory, valuing both built heritage and the environment. They will be able to work in the following areas: construction, urban design, architectural design, consultancy management and direction of projects, coordination and evaluation of architectural projects, etc.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Throughout the degree, environmental integration in architectural design modules is very briefly implemented in the first and the fifth year; the program mentions issues of environmental sustainability superficially without deepening. However, throughout the educational program there are some other humanity and scientific modules which approach, from different points of view, the environmental themes.

Geo Dynamics, in the spring semester of year 2, identifies external and internal geo-dynamic processes of the planet.

Construction Physics, in the spring semester of the third year, deals specifically with acoustics and thermal behaviour of buildings. Concurrently, **Human Geography** analyses cities, networks and urban systems, the interpretation of the consequences of the different models of spatial organization on the comprehension of the impacts of human activities on the territory.

In year four, **GIS (Geographic Information System)** attempts to understand and identify different types of spatial models, their advantages and limitations and what types of architectural operations are possible to realise in them. Simultaneously, in the autumn semester, **Sociology** deals with different sociological aspects and implications of architecture.

However, it is not until the fifth year that some elective modules are given as offer to the students, some of which are completely focused on the sustainability of the architectural project:

In the elective module **Sustainable Construction**, to be taken in the autumn semester of the fifth year, the students acquire skills over the planning, use of waste and rationalization of construction steps, in order to be capable of developing a rehabilitation and maintenance plan of the constructed environment and to take part in the selection of sustainable construction systems. The students develop some knowledge of the requirements and conditions for sustainable construction, as well as the life cycle of construction materials. The module program includes elements from the basic concepts to the systems of sustainable construction, passing through design and sustainable evaluation of buildings, strategies for saving and energy efficiency, and the recycling of solid, industrial, or construction wastes.

Planning and Environment aims to sensitize the students to the main environmental problems in the construction, dismantlement and rehabilitation of urban infrastructure equipment, as well as the application of development plans, specifically those regarding water, air and soil pollution and social and economic environments. Also, training on processes and technologies is provided to help mitigate environmental impacts, promote environmental rehabilitation of degraded areas and the development of management and sustainable evaluation systems. The module tries to provide the basic tools and describe the main variables in the design, putting students in touch with national planning politics. The students develop the skill to analyse and understand institutions, regulations, and the territorial management instruments, over an analysis of the specific plans. They also receive theoretical and practical training on methodologies.

Rural Habitat is an elective module that aims to define the relationships with the natural heritage of rural areas, and the eco-tourism "phenomenon" as a solution that will lead to their revitalization. The programme also focuses on recognizing the importance of rural sustainable development.

STRENGTHS AND OPPORTUNITIES

Within the degree, there are some modules whose knowledge and skills are important for the student's environmental training. This structure reveals a number of strengths and opportunities, namely:

Strengths:

- Though the degree does not present a specific environmental integration in architectural design units, there are other modules that investigate several important topics for environmental architecture training and, in the last year, subjects of specifically environmental content are offered;
- Students are highly motivated and they are currently demanding environmental, sustainability and ecological contents in their educational curriculum;
- There are modules that specifically target environment and sustainability in architecture. Likewise, there is a group of curricular units pointing to sustainability such as sociology or human geography, which includes environment, sustainability, sociology, economy and urban planning.
- Enthusiasm shown on many occasions by most of the students towards environmental sustainability.

Opportunities:

- The Civil Engineering and Architecture Department award great importance to support services to learning, as well as to the practical component of the education. This department possesses well equipped laboratories which cover all the scientific areas present in the proposed curriculum;
- The Centre for Construction, Materials and Technologies (C-MADE) is a newly formed research Centre of the Universidade da Beira Interior (UBI), developing fundamental and applied research in the fields of materials and building technologies. C-MADE research activities focus on the development of prototypes of new building products and solutions that are long-lasting, have better mechanical behaviour, and are examined for environmental sustainability and energy efficiency as well as for pollution control;
- C-MADE is constituted by a small group of researchers with diverse knowledge, skills and competences on scientific research, which gives it a multidisciplinary nature. Although this centre was recently constituted (July 2007), its members have experience of working together in common projects in the past few years. Centralising its scientific production in the fields of materials and building sciences, C-MADE evaluates its results bearing in mind technical and economical viability, innovation and sustainability, design and architectural value, as well as industrial benefits, needs and demands of the construction and architectural markets and also without neglecting energy conservation and environmental impacts;
- The development of C-MADE research is guaranteed by projects of a multidisciplinary team with elements of the engineering faculty and having the collaboration of other national and international centres as well as industry;
- The results of different projects, their implementation and/or technology transfer are promoted and followed up by C-MADE in cooperation with different entities in the domains of management, economy, design and industrial production.

SOURCES AND REFERENCES

Department of Civil Engineering and Architecture website: www.ubi.pt/Curso.aspx?CodigoCurso=72

UNIVERSIDADE DO PORTO
FACULDADE DE ARQUITECTURA

Diploma in Architecture (6 years)

Level: Graduate (DipArch, 5 years + Internship + Final Degree Project)

Accrediting Body: Ordem dos Arquitectos Portugueses (Portuguese Order of Architects)

Educational Aims: The Faculty of Architecture of Oporto, an organic unit of the University of Oporto, is a centre for the creation, transmission and diffusion of disciplinary knowledge in the area of architecture, construction and urban studies. The Faculty holds scientific, pedagogical, administrative and financial autonomy under the terms of the law, the statutes of the University of Oporto and its own statutes. The teaching of Architecture is a difficult and exciting undertaking, in its interpretation as the conception and construction of an object or a city in its most sublime form, and in a way that satisfies both the physical and psychic needs of man, individually and socially. According to what Vitruvius wrote of the training for an architect around 19 centuries ago, the teaching programme is aimed at providing the graduate with the following skills: he should know how to write and draw, be trained in geometry and have some knowledge of optics, have learned arithmetic and know a great deal about history, have studied philosophy, know some music and have some notions of medicine, law and astrology. The concern of the Faculty of Architecture consists in the exciting and difficult training of this specialist/generalist allowing for the apparent contradiction of creativity and the capacity for intelligent analysis. In its mission, the Faculty benefits of the experience of the University and that of a prestigious College, both of which are represented in the founding committee.

Outline Description of Course: The global teaching load of the degree in Architecture at the University of Oporto adds up to 300 credits, an internship and a Final Degree Project. Each academic year has a total of 60 credits. Once all the credits established by the teaching program are completed, the student must pass an internship and an exam of the Final Project. The minimum period of study for this degree is five years plus the internship and the final year exam. The core modules are developed through two cycles and elective modules are located in the 5th and 6th years. The School of Architecture of Oporto also offers postgraduate modules that provide the further possibility of obtaining a doctorate in recognition of the development of research and academic work. Amongst these: MSc in Architecture; MSc of Intervention Methodologies in Architectural Heritage; MSc in Urban Planning and Environment.

Course Structure: In order to fulfil its curricular requirements, the Faculty organizes its human resources and materials by means of the structuring of courses and scientific areas, which prepare their own syllabuses, research and development units, and a unit for the provision of services to the community. The scientific areas are the following: Architecture; Design; Construction Technologies; Urban Planning.

<u>Diploma in Architecture (6 years)</u>

Year 1 (*Compulsory Modules*)

Title	*Credits*	*Duration*
Space Anthropology	4	Full year
Drawing	16	Full year
Geometry	12	Full year
Architectural Design	20	Full year
General Theory of Space Organization	8	Full year
Credit Total	**60**	

Year 2 (*Compulsory Modules*)

Title	*Credits*	*Duration*
Architectural Drawing	8	Full year
Geography	4	Full year
History of Ancient and Medieval Architecture	8	Full year
Introduction to the Building Systems	12	Full year
Methods and Language of Contemporary Architecture	8	Full year
Architectural Design II	20	Full year
Credit Total	**60**	

Year 3 (*Compulsory Modules*)

Title	*Credits*	*Duration*
Computer Design	8	Full year
Habitable Space and Housing Forms	8	Full year
History of Modern Architecture	8	Full year

Architectural Design III	20	Full year
Materials and Construction Systems	12	Full year
Contemporary Urban Planning	4	Full year
Credit Total	**60**	

Year 4 (*Compulsory Modules*)

Title	*Credits*	*Duration*
Public Spaces and Equipment Shapes	8	Full year
Inhabit Space and Housing Forms	4	Full year
History of Portuguese Architecture	4	Full year
Urban Planning	4	Full year
Architectural Design IV	20	Full year
Structures	8	Full year
Environmental Control	6	Autumn
Installations and Networks	6	Spring
Credit Total	**60**	

Year 5 (*Compulsory Modules*)

Title	*Credits*	*Duration*
Urban Economy	4	Full year
History of Contemporary Architecture	8	Full year
Architectural Design	20	Full year
Urban Forms and Territory	8	Full year
Pathology Building	6	Autumn
Infrastructures and Urban Networks	6	Spring
(*Elective Modules*)		
Urban Ecology	8	Full year
History of Visual Arts	8	Full year
Landscaping	8	Full year
Computer Drawing	8	Full year
History of Portuguese City	4	Autumn
History of Aesthetics	4	Autumn
Contemporary Aesthetics	4	Spring
History of the City Porto	4	Spring
Credit Total	**60**	

Year 6 (*Compulsory Modules*)

Title	*Credits*	*Duration*
Work Placement	-	Full year
Final Project	-	Full year
(*Elective Modules*)		
Culture and Habitation	-	Full year
Architectural Analysis	-	Full year
Studies of History of Cities	-	Full year
Urban Planning	-	Full year
Sustainable Architecture	-	Full year

Learning Outcomes: The curriculum is designed in accordance with Decree-Law 74/2006 of 24 March and the principles set out by the Ordem dos Arquitectos Portugueses (Portugal National Chamber of Architects). It aims to train young future architects aware of issues in Architecture and in the Tropical-Equatorial territory, in the context of Lusofonia, where the University is located. It is therefore expected that the trained young architects will acquire the following skills:

- They should be sufficiently equipped to be able to design and develop an architectural design project, taking into consideration the various elements and constraints specified. From the selection and survey of the site, development and handling of the conceptual model - after interpreting the program and the legal-framework system - to the organization and completion of the process - in relation to specialization, span and finishing charts, contract specifications, measurements and budget estimates, technical work assistance, etc. They will also be expected to have control over the various phases, the complexity of the works, the inherent responsibilities and costs and inherent negotiating capabilities.
- They will be able to handle various construction systems, according to their project options, to know how and when to obtain technical information and integrate it in a consistent manner, into the project.

- They will have solid and reliable knowledge of the History and Theory of Architecture, expressive ideas on the conditioning that the culture, economy, history, and geography of the territories and communities confer to the project perspective, particularly with respect to the Portuguese and Lusofonia territory.
- They will know how to work with urban territory of different dimensions and scopes: buildings, complexes, detailed planning, the land subdivision project, and the urban-development plan.
- They will understand the various domains of the architect's practice, in addition to designing buildings: rehabilitation of buildings and sites; urban management and legal resources for project licensing; architectural critical observation; management and preparation of works; architectural instruction; participation in cross-discipline teams in Land Use Plans, Environmental Impact Studies, Building evaluation processes, Architectural Tender Jury Panels, integration processes of the other Architectural Trades and in the City, and in the physical management of the running of cities and other human settlements.
- They will have knowledge of the use and pathologies of some materials, as well as old, vernacular, and contemporary structures, and also safety systems, heating and acoustic framework of buildings, particularly in the Portuguese and Lusofonia territory.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum:

Amongst the modules on offer, **Environmental Control** is a 4th year elective module (6 credits) that aims to describe the most significant demands inherent to environmental control. It aims to convey knowledge of the basic principles and fundamental parameters of the most important aspects (heating, ventilation, acoustics, etc.) from the architect's perspective, in such a way that students are able to discuss them with the specialists dealing with these elements. The module is taught in theoretical and practical lectures, based on the fundamental concepts of fire prevention, thermo-hygrometric and acoustic environmental control, current regulations and construction practice, in order to guarantee good quality in the design and works with regard to environmental control requirements.

Landscaping is a 5th year elective module (8 credits) whose aims are to introduce the students to some of the specific themes of the topic with special reference to the planning and management of the landscape as a lively, dynamic and vulnerable element, which is liable to transformation as a result of the inclusion of activities, services and structures in the land that cause an impact on its metabolism and form.

Urban Ecology is an elective module offered at 5th year level (8 credits), which aims to stimulate a trans-disciplinary reflection upon society and the territory. This module seeks to encourage reflection and debate on the situation of ecological catastrophe in which we currently find ourselves. It is therefore an introduction to *ecosophy*, in the study of the territory and society, nature and technique, using a methodology of systemic complexity. A significant issue is the understanding of human action in the biosphere throughout the various paradigms of civilisation. From the critique of the mechanistic paradigm, the eco-systemic view on the approach to the human landscape is introduced, urban issues and the organisation of the territory being dealt with in the framework of the perspectives of ecologically sustained development. This module is developed around general topics which seek to integrate the study of concrete cases into the global view of theoretical problems. This implies an epistemological reflection on the usual concepts about land organisation and a cross-disciplinary approach to the main contemporary urban interventions. Dossiers on issues which are decisive debate points at global, national and local levels are used as tools for research and reflection in practical classes: pollution, recycling, public spaces, waste disposal, territorial planning and urban intervention, transport, renewable energies, bio-construction, etc. This research enables students to distinguish between growth based on natural asset exhaustion, contamination and social exclusion from development, whose circular metabolism is based on renewable and clean energies, on recycling and on social cooperation.

STRENGTHS AND OPPORTUNITIES

In the current programme, there are a number of modules that introduce themes of environmental sustainability. Some of these issues represent the main focus in the syllabus of specific teaching units, while others appear only in an implicit manner. This structure reveals a number of strengths and opportunities, namely:

Strengths:

- Environmental contents are timidly present in the curriculum, particularly in modules dealing with that matter in a tangential way or even in a more specific way during the last two years of the degree. Once the degree is obtained, students have the possibility of broadening their knowledge, for example embarking on a MSc in Urban Planning and Environment;
- The fact that environmental teaching is mostly non-compulsory changes the students' view and predisposition, raising their enthusiasm, which leads them to better benefit from their contents.

Opportunities:

- Environmental contents are liable to be introduced in an implicit way in a several modules as complementary contents, or simply contributing with a particular approach that make students think of sustainability from different points of view, such as construction, structure, etc.

SOURCES AND REFERENCES

School of Architecture of Porto website: http://sigarra.up.pt/faup/web_page.inicial
Programme of the School of Architecture of Porto website:
http://sigarra.up.pt/faup/cursos_geral.FormView?P_CUR_SIGLA=LARQ

UNIVERSIDADE LUSÓFON

FACULDADE DE ARQUITECTURA, URBANISMO, GEOGRAFIA E ARTES

Master Degree in Architecture (5 years)

Level: 1st Cycle - Bachelor in General Architecture (3 years) + 2nd Cycle - Master in Advanced Architecture (2 years); 1st and 2nd Cycles / Integrated Master Degree in Architecture (5 years).

Accrediting Body: Ordem dos Arquitectos Portugueses (Order of Architects)

Educational Aims: The Master Degree in Architecture from the University Lusofona complies with the Decree - Law 74/2006 of March 24th and with the principles defined by the UIA (International Union of Architects). While training architects in the principles of architecture, it also sensitizes future architects to architectural questions of the tropical-equatorial territory, in the context of the Lusofonia, where the University is situated. The programme aims to train architects able to conceive and develop an architectural design project, taking into consideration the diverse ingredients and restrictions that play a part in it: from the choice and examination of the location, finding and operating a conceptual model, interpreting the program legal framework, to the organization and realization of the process. The basic function of the programme consists in organizing the different subjects needed for the completion of an architectural degree, including the development of all the capacities necessary for professional practice. Through theoretical and practical classes or seminars, the students gain experience in all the necessary technical and artistic knowledge that will allow them to have a solid base of competence. The 2nd Cycle - Advanced Studies in Architecture - aims to constitute a space of investigation associated to defined and differentiated scientific areas. It is expected that these areas, that can be internally subdivided, are already the embryo of future research centres or units capable of integrating (in an initial phase) the scientific or professional dissertations, in order to subsequently generate and hold a 3rd Cycle research, within the frame of the Bologna structure.

Outline Description of Course: The training in architecture following the Bologna model comprises two integrated cycles: a Bachelor of General Studies in Architecture and a Master in Advanced Studies in Architecture. Created more than a decade ago, the Lusofona Group gathers five entities operating in the educational sector in all countries whose official language is Portuguese. The biggest of these entities - COFAC - is a cooperative institution operating in the Portuguese territory in eight different schools. COFAC includes three Schools of Architecture: Lisbon (ULHT, Universidade Lusofona de Humanidades e Tecnologias), Porto (ULP, Universidade Lusofona do Porto) and Portimao (Algarve), and the ISMAT Institute (Instituto Superior Manuel Teixeira Gomes). Although scientifically autonomous, each of the three Schools of Architecture tends to converge on a specific pedagogical branch in general and applied architectural and urban studies, with the following particular skills: Lisbon - oriented towards tropical and equatorial architecture and territory; Portimao - oriented to the Mediterranean specificities; Porto - towards the north-eastern peninsular Atlantic conditions. The compulsory scientific areas included in the course are: Architectural Design; Urban Planning; Technologies; Representation Techniques; History; Theory; Critics and Aesthetics of Architecture. Along the program, students are involved in study visits, lectures, workshops and conferences, in the context of several courses. Architectural design (a basic subject in architectural training) is developed throughout the degree, growing in complexity as the studies advance. The design work is supported by the study of the subjects of drawing, technologies and humanities. Environmental design and bioclimatic architecture is included in the curriculum specifically via obligatory and elective modules.

Course Structure: The training in architecture of the Bologna model is comprised of 2 integrated cycles, with a total of five teaching years. Each module has a credit value. The course is organized following the European system of accumulation and transfer of credits. The curriculum is organized in 10 semesters. Each semester corresponds to 840 hours of student work, the equivalent of 30 credits, according to the ECTS system. The total number of credits attributed to this Master Degree is 300 during 5 years of study.

1st Cycle - Bachelor of General Studies in Architecture (3 Years)

Year 1
Semester 1 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Elements of Architectural Studies	10	Autumn
Basic Free-hand Drawing	5	Autumn
Introduction to Geometry	4	Autumn
Introduction to Contemporary Thought	5	Autumn
Introduction to Theory of Architecture	3	Autumn
Materials and Construction Systems I	3	Autumn

Credits Total 30

Semester 2 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Analytical Architecture Studies	10	Spring
Analytical Drawing	6	Spring
Geometry and Representation Techniques	5	Spring
Space Anthropology	2	Spring
History of Contemporary Architecture	4	Spring
Materials and Construction Systems II	3	Spring
Credits Total **30**		

Year 2
Semester 3 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Introduction to Architectural Design Studies	10	Autumn
Drawing of Exterior Spaces	5	Autumn
Perspective and Theory of Shadows	5	Autumn
History of Classical Thought in Architecture	4	Autumn
Statics	3	Autumn
Construction I	3	Autumn
Credits Total **30**		

Semester 4 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural Design Practice Studies	10	Spring
Theory of Colour	4	Spring
Cartography and Graphical Expression of Territory	4	Spring
History of Ancient and Medieval Architecture	4	Spring
Natural Environment – Climate	2	Spring
Construction II	3	Spring
Structural Systems I	3	Spring
Credits Total **30**		

Year 3
Semester 5 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Urban Design Studies	10	Autumn
History and Theory of the City	5	Autumn
Natural Environment – Geo-morphology	3	Autumn
Structural Systems II	3	Autumn
Constructions and Infrastructures I	3	Autumn
Urban and Territorial Analysis	4	Autumn
Socio-Economy of the Portuguese-speaking Area	2	Autumn
Credits Total **30**		

Semester 6 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Detailed Architectural Design Studies	10	Spring
History of Contemporary City	4	Spring
Urban Geo-Sociology	2	Spring
Structural Systems III	3	Spring
Physics of Constructions	3	Spring
Urban Design Methodology	3	Spring
Tropical-Equatorial Architecture	2	Spring
Constructions and Infrastructures II	3	Spring
Credits Total **30**		

2nd Cycle - Master in Advanced Studies in Architecture (2 Years, Professional Degree)

Year 4
Semester 7 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural Design Studies I	12	Autumn
Urban Studies I	4	Autumn
Urban Economy	2	Autumn
History of Portuguese Architecture I	4	Autumn
Construction I	5	Autumn

(*Elective Modules*) Students have to choose one of the following:

Construction Pathologies	3	Autumn
Critics and Aesthetics of Architecture	3	Autumn
Landscape Architecture	3	Autumn
Computer Aided Design	3	Autumn

Credits Total 30

Semester 8 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural Design Studies II	12	Spring
Urban Studies II	4	Spring
Law	2	Spring
History of Portuguese Architecture II	4	Spring
Building Construction II	5	Spring

(*Elective Modules*) Students have to choose one of the following:

Site and Building Rehabilitation	3	Spring
Urban Ecology	3	Spring
Architecture of the Portuguese Diaspora	3	Spring
Computer Aided Design	3	Spring

Credits Total 30

Year 5
Semester 9 (*Compulsory Modules*)

Title	*Credits*	*Taught*
Architectural Design Studies III+ Final Thesis or Practice	12	Autumn
Urban Studies III	4	Autumn
Building and Design Management	4	Autumn
Building Construction III	5	Autumn
Research Methods	2	Autumn

(*Elective Modules*) Students have to choose one of the following:

Any course from History, Engineering, Geography, Urban Planning or Design	3	Autumn

Credits Total 30

Semester 10 (*Compulsory Modules*)

Architectural Design Studies IV / Seminars – Final Thesis or Practice	10	Spring

(*Elective Modules*) Students have to choose one of the following:

Dissertation (Scientific Master Thesis)	20	Spring
Practice (Professional Master Report)	20	Spring

Credits Total 30

Within the Dissertation, students can choose from a professional or scientific approach.

Learning Outcomes: The programme provides opportunities for students to develop and demonstrate appropriate knowledge and understanding, intellectual and cognitive skills, professional and practical skills, including the following:

- Familiarity with the specialities, maps of openings, measurement and budget, technical assistance to the work, etc; it is expected that graduates have control of the diverse phases of design, of their complexity of execution, of the responsibilities, costs and the inherent negotiation capacity;
- Skills to operate with diverse construction systems, as a function of the options of the project, the knowledge of where to obtain technical information and integrate it coherently in the project;
- Solid and secure knowledge of the history and theory of architecture, including expressive notions on the conditions that the culture, economy, history and geography of territories and communities infer on the design attitude, with particular reference to the national territory and to the Portuguese-speaking area;
- Know how to act upon the urban territory in its diverse dimensions and extensions: the building, the built environment, the detailed plan, the plotting of a project , the development plan;
- Understanding of the diverse demands of the profession of the architect, other than the conception of buildings: rehabilitation of buildings, urban management and legal means of planning permission, critical examination of architecture, management and preparation of works, architectural education, participation in multi-disciplinary teams in land planning, in studies of environmental impact, in processes of evaluation of buildings, in juries of architectural contests, in processes of integration of the rest of the Arts in Architecture and in the City, in the physical management of cities and other ways of habitation;

- Knowledge on the use of some materials, such as the construction systems of the ancients, vernacular and contemporary structures, and the security systems, thermal and acoustic framing of the buildings, in particular in the national territory and in the Portuguese-speaking area.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

The study of environmental design at the University Lusofona appears only in a few modules.

In the first cycle, a series of compulsory modules appear that specifically deal with issues related to environmental design and its importance. Specifically, in the fourth and fifth semester (year 2) modules such as **Natural Environment-Climate** and **Natural Environment-Geo-morphology** deal with architecture and its relation to the environment where it is located.

During the second cycle, in the eighth semester (year 4) the elective module **Urban Ecology** deals with themes of environmental sustainability from an urban point of view, where sustainable development and its relation to the environment acquire great importance in the understanding of the contents presented.

STRENGTHS AND OPPORTUNITIES

The programme of Architecture at the University Lusofona includes subjects that incorporate energy-environmental issues, although mainly as a secondary concern. This system entails the following strengths and opportunities:

Strengths:

- The curriculum is structured according to the directives of the Portuguese Chamber of Architects and the Directives of the European Community;
- The current programme includes some compulsory modules with specific educational content in environmental and bioclimatic issues;
- The presence of Architectural Design in the curriculum, which is developed throughout the course, could favour the training of the student in environmental and bioclimatic architecture;
- The same can be stated regarding the modules with a strong technological and urban approach.

Opportunities:

- The teaching of Postgraduate and Doctorate studies related to the lines and research projects of the research groups of the different departments, which focus on different areas such as the new environmental and bioclimatic requirements of architecture, allow additional research of the matter upon completion of the degree;
- The existence of a Master in Architectural Management and Urban Environment (2 years – 4 semesters) allows continuity in the training on environmental and bioclimatic architecture.

SOURCES AND REFERENCES

Faculty of Architecture, Urban Planning, Geography and Arts website:
http://www.grupolusofona.pt/portal/page?_pageid=135,413660&_dad=portal&_schema=PORTAL

SCOLA SUPERIOR UNIVERSITARIA GALLAECIA

Master Degree in Architecture and Urban Planning (5 years)

Level: Graduate (MArch, 5 years)

Accrediting Body: Accredited by the Ministry of Education and recognized by the Order of Architects

Educational Aims: The Master Degree in Architecture and Urban Planning at the Scola Superior Universitaria Gallaecia (Vila Nova de Cerveira) trains architecture students in order for them to develop a global and balanced perspective on the field of action of architects.

Outline Description of Course: The programme of the Master Degree in Architecture and Urban Planning lasts 10 curricular semesters (5 years). The first three years are dedicated to the acquisition of general skills and the two final years are subdivided in two semesters focused on the general fields of Urban Planning and Heritage, and two semesters of specialization in the areas of Technology and the development of the Final Project. The degree includes investigation of the following scientific areas: Drawing and Architectural Design; Technology; Humanities; and, Support Design Tools. The course is organized following the European system of accumulation and transfer of credits (ECTS). The curriculum is organized in 10 semesters. Each semester corresponds to 840 hours of student work, the equivalent of 30 credits, according to the ECTS system. The total number of credits attributed to this Master Degree is 300 during 5 years of study.

Course Structure: The training in architecture consists of 2 integrated cycles of 3 years and 2 years respectively, with a total of five teaching years. Each module has a credit value. The total study time of the Master Degree is 8400 teaching hours (300 ECTS), distributed by the following scientific areas: DAD: Drawing and Architectural Design - 172 credits; TEC: Technologies - 68 credits; HUM: Humanities - 42 credits ;DST: Design Support Tools - 12 credits; ELEC: Elective modules - 6 credits.

<u>Master Degree in Architecture and Urban Planning (5 years)</u>

Year 1
Semester 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
A01	Architectural Design – Analysis	13	Autumn
A02	Drawing I	4	Autumn
A03	Geometry	2	Autumn
A04	History of the Architectural Space	3	Autumn
A05	Morphology and Anthropology of Space	3	Autumn
A06	Materials and Constructive Analysis	5	Autumn
Credit Total	**30**		

Semester 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
A07	Architectural Design – Concept	13	Spring
A08	Drawing II	4	Spring
A09	Spatial Simulation and Modelling I	4	Spring
A10	History of Habitation	3	Spring
A11	Theory of Architecture I	3	Spring
A12	History of Construction	3	Spring
Credit Total	**30**		

Year 2
Semester 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
A13	Architectural Design – Habitat	13	Autumn
A14	Drawing III	4	Autumn
A15	Spatial Simulation and Modelling II	4	Autumn
A16	History of Monumental Architecture	3	Autumn
A17	Constructive Systems	3	Autumn
A18	Statics	3	Autumn
Credit Total	**30**		

Semester 4 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
A19	Architectural Design – Community Habitation	13	Spring
A20	Drawing IV	4	Spring
A21	Spatial Simulation and Modelling III	4	Spring
A22	Theory of Architecture II	3	Spring

A23	Environmental Comfort	3	Spring
A24	Structures	3	Spring
Credit Total	**30**		

Year 3
Semester 5 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
A25	Architectural Design – Equipment and Open Spaces	13	Autumn
A26	History of Contemporary Architecture	3	Autumn
A27	Geography	3	Autumn
A28	Construction Technologies	4	Autumn
A29	Hydraulic Installations	3	Autumn
A30	Ecological Architecture	4	Autumn
Credit Total	**30**		

Semester 6 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
A31	Integrated Architectural Design	13	Spring
A32	History of Peninsular Architecture	3	Spring
A33	Sociology	3	Spring
A34	Constructions	4	Spring
A35	Infrastructures	3	Spring
A36	Energy and Thermal Management of Buildings	4	Spring
Credit Total	**30**		

Year 4
Semester 7 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
A37	Architectural Design – Urban Planning	15	Autumn
A38	History of the City	3	Autumn
A39	Theory of Urban Planning	3	Autumn
A40	Urban Planning and Urban Design Management	6	Autumn
A41	*Elective*	3	Autumn
Credit Total	**30**		

Semester 8 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
A42	Architectural Design – Heritage	15	Spring
A43	History and Theory of Conservation and Restoration	3	Spring
A44	Heritage Protection and Law	3	Spring
A45	Diagnosis & Technologies of Conservation and Restoration	6	Spring
A46	*Elective*	3	Spring
Credit Total	**30**		

Year 5
Semester 9 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
A47	Architectural Design – General Coordination	16	Autumn
A48	Law and Deontology	3	Autumn
A49	Management and Organization of Construction Works	11	Autumn
Credit Total	**30**		

Semester 10 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
A50	Architectural Design – Dissertation (Final project)	28	Spring
A51	Methodology of Research	2	Spring
Credit Total	**30**		

Learning Outcomes: Graduate students acquire the following competences:

- The capacity to observe the social and cultural space, to synthesize and to take part to improve the quality of life of the communities;
- The capacity to situate themselves in the historical, social, artistic and intellectual context where they live, with a clear picture of the path followed until the present day and of the influence of this context on the activity of the architect and urban planner;

- The capacity of renewal and self-criticism as a stimulus for creativity and the formal expressions inherent to any artistic activity;
- The understanding of the relation between humanity and the inhabited spaces throughout history in different territories, perceiving that the physical, cultural and social dimension of humanity is the main reason for the architectural production;
- The capacity to manipulate technical, aesthetic and construction knowledge that, at an initial stage, sustain the conceptual solutions developed, and in a second stage motivate the conceptual principles of these solutions;
- The capacity to understand the social and urban reality throughout history, the diverse models and phenomena that characterized it, as tools used in the planning and management of the territory;
- The capacity to understand the cultural value of heritage, as a dynamic and evolving concept, in which the architect and the urban planner will inevitably have to take part;
- The capacity to observe the natural and geographic context where architectural works are located, in order to adapt these works to this context in the search for inner comfort, on the one hand, and respect for the urban, rural or natural landscape, on the other hand;
- The capacity to use design tools to value and promote experimentation and communication of concepts;
- The capacity of synthesis and planning, manifested in the elaboration and coordination of design projects which reflect knowledge related to the historical, social and functional reality;
- Understanding of the final aim of architectural design, i.e. its role as a constructed reality that needs appropriate planning and monitoring processes;
- Understanding of the social and professional responsibility of the architect and the urban planner throughout the wide spectrum of the profession.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

In the first cycle of the programme, a series of compulsory modules deal specifically with aspects related to environmental design and its importance. Amongst these, in the fourth semester (year 2) **Environmental Comfort** analyses the environmental conditions that the buildings have to achieve within an efficient and sustainable design, through the study of subjects such as techniques of environmental conditioning.

In the following semester (year 3), **Ecological Architecture** is a compulsory module that introduces themes of ecology from an architectural and urban planning point of view, where sustainable development and its relation to the environment acquire vital importance in the understanding of the subject, with exploration of issues of resource management, waste, etc.

Finally, in the sixth semester of the first cycle (year 3), the module **Energy and Thermal Management of Buildings** treats topics like energy efficiency in buildings by the use and management of renewable energies, including the detailed study of solar energy.

STRENGTHS AND OPPORTUNITIES

Strengths:

- The programme is structured according to the directions of the Portuguese Chamber of Architects and the Directives of European Community;
- The current curriculum includes some compulsory modules with specific environmental and bioclimatic contents, streaming principally from the area of Technology;
- The presence of an architectural design curricular line, which is developed throughout the course, could favour the training in environmental and bioclimatic architecture;
- The inclusion of urban planning as a key (compulsory) subject within the curriculum could likewise favour the development of such skills on the part of the student.

Opportunities:

- The possibility that environmental and bioclimatic issues can be implemented in architectural design modules - even tangentially - can generate an optimum design of buildings and urban spaces, under these criteria;
- The same thing applies to the urban planning and technology modules, where a suitable environmental and bioclimatic content would also contribute to an optimum design of the buildings and urban spaces under these criteria.

SOURCES AND REFERENCES

Gallaecia University website: www.esg.pt/index.php/pt/licenciaturas/46

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Ordem dos Arquitectos Portugueses (OA, Order of Architects of Portugal)

The Order of Architects regulates the profession of architect in Portugal, according to the provisions of Decree-Law No. 176/98 of 3 July. The regulation, together with the role of representation, is one of the main tasks of OA, being the main part of its mission as a public association. The Rules of Ethics that OA establishes represent the ethical principles that have to be followed by all architects in Portugal.

The Order of Architects is the depositary of a long history of associations of architects in Portugal. The first reference to a trust involving Portuguese architects dates back to 1602, with the creation of the Brotherhood of St. Luke, a religious association of architects and other artistic professions. With the beginning of the twentieth century, the growing awareness in regulating the training of professions originated in 1902, with the creation of the Portuguese Society of Architects, accompanying the end of the monarchy and, above all, the first republic. This is where the first delegation in the North was created, based in Oporto. After April 25, 1974, the union became the Association of Portuguese Architects in 1978, broadening the array of ethics, civic and congressional criticism that anticipated the affirmation of democracy in Portugal. Ten years later, in 1988, the AAP was transformed into a public association, according to the resolution of the 4th Congress of 1986 held in Porto, assuming the exclusive representation of architects in Portugal. In 1998, members of the AAP endorsed the new draft of the voluntary association with the publication of the Statute annexed to Decree-Law No. 176/98 of 3 July, determining OA to represent all architects and to regulate their profession. In this new role, the association got involved in the growing affirmation and implementation of architects in the Portuguese society, as well as the new reality resulting from the Portuguese European integration.

The OA represents all those in the profession of architect in Portugal - about 17,000 Portuguese and foreigners - and regulates the exercise of the profession. OA promotes and supports architecture inside and outside the national borders. By promoting and defending the best conditions for practicing the profession of architect, the Order of Architects seeks to ensure the quality and sustainability of the built environment in Portugal, as a right and common good of all Portuguese people.

- The Order of Architects, as a public association, represents the profession of architect and regulates the exercise of the profession in Portugal. These are its core framework and main mission.
- The OA serves to give voice to all architects, promoting and defending their profession, the practice of architecture and the right to this for all people.
- The OA follows the actions of the Government of the Republic, the Governments of the Autonomous Regions and Local Government, and partners in all that concerns the profession of architect and architecture, including the planning, urban planning, architectural heritage and the world of construction.
- The OA monitors, likewise, the evolution of professional practice in the European Union, actively participating in the Architects Council of Europe and the European Forum for Architectural Policies.
- Under the regulation, in addition to enforcing the code of ethics for all architects, OA establishes the conditions for access to the profession of architect and the development of the teaching of architecture in Portugal, respecting the autonomy of universities.

Conditions for Professional Qualification

In Portugal, the primary requirements to become a member of the Portuguese Association of Architects are to hold a degree from a university of architecture as well as having taken an additional period of two years of practical training. Once registered, a member has the right to practice architecture and to use the title of Architect. The Agency for Evaluation and Accreditation of Higher Education, A3ES, has gained the 'associate status' within ENQA in January 2009, but it will not be totally integrated until 2011. Portugal has recently started the European accreditation process.

In Portugal, only the members of OA can use the professional title of Architect. The title of architect is the prerogative of those who are legally entitled to practice architecture. Ethical rules are designed to ensure perfect compliance in the performance of the professional role, and breach of these will ultimately result in the imposition of disciplinary actions. According to the OA, the documents concerning the profession of architect consist of:

- Studies, projects, plans, professional and managerial works, planning, coordination and evaluation, related to the field of architecture, which include the construction, urban development, planning and design of the spatial frame of people's lives, aimed at the harmonious integration of human activities on the territory, the built heritage and the environment.

- The intervention of the architect is always required in the preparation or evaluation of projects and plans in the field of architecture.

The general principles of Rules of Ethics are:

- The architect must, in exercising his activities, show himself worthy of the responsibilities that are inherent in the prestige of the profession.
- In the exercise of the profession, the architect must keep, always and under all circumstances, independence and impartiality, not pursuing objectives that undermine professional ethics, acting with proper diligence, competence and professionalism.

The architect must comply strictly with the duties of the Statute of the Order of Architects and the Rules of Ethics, and all the rules that the law and customs impose on the practice of the professional role. According to the Civil Code, architects have a liability of five years. This period starts either after completing a building or after having been issued a permit for utilisation. It is not compulsory, however, to carry insurance against these risks. Portuguese architects are covered by the disciplinary code of the Association.

SOURCES AND REFERENCES

OA Website: www.arquitectos.pt
A3ES Website: www.a3es.pt

Romania

ION MINCU UNIVERSITY OF ARCHITECTURE AND URBANISM

Master of Science in Architecture (6 years)

Level: Graduate (MSc, Bachelor + Master integrated study, 6 years)

Accrediting Body: Romanian Agency for Quality Assurance in Higher Education (ARACIS)

Educational Aims: The professional market in post-communist Romania lacks the necessary specialists to cover the institutional roles concerned with environmental issues. As a result, an unusually polyvalent type of professional is required: a building designer able to accomplish, at least for the near future, the tasks of several professionals. To provide the future designer with an additional training in the specific techniques proper to diverse specialized fields is a particularly motivated educational target. What could be therefore considered over-specialization and/or overlapping of certain activities offered by distinct departments and chairs becomes understandable and necessary. This leads to a deeper understanding of the specific practice and methods of the specialized fields, finally enhancing the common abilities of the building designer. Following the same logic, the extension of some theoretical topics, or of the critical presentation of the past and contemporary approaches, in Romania and worldwide, finds its motivation in the necessity to train a professional immediately reacting to the local context, yet generally fit for the European practice. As a result, the time-schedule of the student is rather loaded. Probably, should the local crisis be over, a simplification would necessarily occur. The educational task of the University focuses primarily on the professional education offered to those who seek to enter the architectural planning practice. The two specializations, architect and urban planner, are seen as twin-professions, although diplomas are different.

Outline Description of Course: The curriculum is articulated in two cycles of study (4 + 6 or 7 semesters). During the junior and sophomore cycle (the first 4 semesters), the taught modules (theoretical courses and design studios) share several disciplinary fields with the Faculty of Urbanism. The lecture courses analyse the main architectural issues and give the basic knowledge, while in the design studios the students become acquainted with the study of form and space and their representation, along with the basic "hands-on" training concerning the expressive means traditionally available to the architect. The senior cycle (the following 6 or 7 semesters) is distinctly structured, as it is shown in the curriculum. There are several possibilities of option (elective and optional lecture courses and design studios). The architectural design training is, for its most important parts, managed by the Design Departments, in the design studios.

Course Structure: Each year or session of study consists of 60 credits, normally 30 credits in each semester. The curriculum of each academic unit is structured on semesters and includes lecture courses and studios, provided by the Departments and Chairs. Before the Diploma project, the curriculum includes a semester of architectural and/or urban design practice in a studio or in a research structure, in Romania or abroad. The titles of architect and urban planner are obtained after a final theoretical exam (Dissertation) and a Diploma project. The Dissertation is brought before a Jury of Theory. For the two faculties (Architecture and Urbanism), the Diploma-project examination is a task given to the Diploma Jury, made/composed of members of the Faculty and two invited members (one Romanian, one from abroad). The Diploma specifies, along with the title, the Major chosen by the student. In the Grade Record, annexed to the Diploma, are entered the credits obtained by the student (written test, oral examinations, projects), together with the optional Minor obtained, if any. A Minor Certificate confirms the Minor Obtained. Other than the Master degree in Architecture (which integrates Bachelor and Master study for a total of 6 years and 360 credits), the University also offers a Bachelor degree (BSc) in Conservation and Restoration (3 years, 180 credits).

Master of Science in Architecture (6 years)

Chairs Symbols

BP2	Architectural Design – 2nd year
IT	History & Theory of Architecture
CP	Heritage Conservation
UT	Urban Planning and Territorial Development
UP	Urban and Land Planning
ST	Technological Sciences
SFA	Study of Form and Ambience

Hours/week

C	Courses
S	Seminars
L	Practical exercises
P	Project

Year 1 (*Semester 1 and 2*)

Code	*Title*	*Hours/week*			*Total Credits*	
		Sem 1	*Sem 2*	*hours*	*Sem 1*	*Sem 2*
BP1-1	Architectural Design Studio (1)	10P	-	140	11	-
BP1-2	Architectural Design Studio (2)	-	10P	140	-	11
BP1-3	Practical Exercises (Architectural Drawing)	-	2L	28	-	1
SFA-1	Shape Study (1)	3L	-	42	3	-
SFA-2	Shape Study (2)	-	3L	42	-	3
SFA-3	Introduction to PC Graphic	1L	-	14	1	-
SFA-4	3D Graphics	-	2L	28	-	2
SFA-5	Geometry of Architectural Shapes	-	2C+1L	42	-	3
SFA-6	Geometric Representations	2C+1L	-	42	4	-
ST-1	Statics of Built Shapes	2C+1S	-	42	3	-
ST-2	Mathematics	1C+1S	-	28	2	-
ST-3	Building Materials	-	1C+1S	28	-	2
ST-4	Strength of Materials	-	2C	28	-	2
IT-1	Introduction to Contemporary Architecture	1C+1L	-	28	2	-
IT-2	Historic Evolution of the Architectural Phenomenon (I)	-	1C+1S	28	-	2
IT-3	Architectural Language (1)	-	1C+1S	28	-	2
IT-4	Introduction in Philosophy	2C	-	28	2	-
CP-1	Foreign Languages (1)	2S	-	28	2	-
CP-2	Foreign Languages (2)	-	2S	28	-	2
CP-3	Sport (1)	2S	-	28	-	-
CP-4	Sport (2)	-	2S	28	-	-
TOTAL hours/credits		**30**	**32**	**868**	**30**	**30**

Year 2 (*Semester 3 and 4*)

Code	*Title*	*Hours/week*			*Total Credits*	
		Sem 3	*Sem 4*	*hours*	*Sem 3*	*Sem 4*
BP2-1	Architectural Design Studio (3)	10P	-	140	11	-
BP2-2	Architectural Design Studio (4)	-	10P	140	-	11
BP2-3	Practical Exercises (Architectural Documentation)	-	2L	28	-	1
SFA-7	Shape Study (3)	3L	-	42	3	-
SFA-8	Shape Study (4)	-	3L	42	-	3
SFA-10	3D Modelling	-	1L	14	-	1
SFA-91	Perspective	2C+1L	-	42	4	-
UT-1	Environmental Issues in Urban Planning	2C	-	28	2	-
UP-1	Morpho–Typological Urban Analysis	-	2C	28	-	2
ST-5	Architectural Construction in Wood and Steel	1C+1L	-	28	2	-
ST-6	Simple Structures in Wood and Steel	1C+1S	-	28	2	-
ST-7	Concrete and Masonry Structures (1)	-	2C	28	-	2
ST-8	Architectural Construction in Masonry and Concrete	-	2C+1L	42	-	3
IT-5	Historic Evolution of the Architectural Phenomenon (II)	2C	-	28	2	-
IT-6	Architectural Language (2)	1C+1S	-	28	2	-
IT-7	Architecture-Housing-Town	-	2C+1L	42	-	3
IT-8	History of Modern Architecture	-	2C	28	-	2
CP-22	Foreign Languages (3)	2S	-	28	2	-
CP-23	Foreign Languages (4)	-	2S	28	-	2
CP-24	Sport (3)	2S	-	28	-	-
CP-25	Sport (4)	-	2S	28	-	-
TOTAL hours/credits		**30**	**32**	**868**	**30**	**30**

Year 3 (*Semester 5 and 6*)

Code	*Title*	*Hours/week*			*Total Credits*	
		Sem 5	*Sem 6*	*hours*	*Sem 5*	*Sem 6*
BP3-1	Architectural Design Studio (5)	11P	-	154	12	-
BP3-2	Architectural Design Studio (6)	-	8P	112	-	9
BP3-3	Urban Design – PUD	-	3P	42	-	3
SFA-11	Furniture - Technology / Design Studio	2P	-	28	2	-
SFA-85	Furniture - Technology	1C	-	14	1	-
SFA-41	CAAD	1L	-	14	1	-
SFA-14	Visual Communications	-	2C	28	-	2
UP-62	Urban Design – Allotment	2P	-	28	3	-
UP-2	Urban Doctrines	-	2C	28	-	2
UP-3	Technique of Urban Design	-	2C	28	-	2
IT-9	Traditional Architecture in Romania	1C+1S	-	28	2	-
IT-10	The 19th Century from an European Perspective	-	2C	28	-	2

IT-11	Architecture – Context - Landscape	1C+1L	-	28	2	-
ST-9	Architectural Finishing Systems (1)	2C+1L	-	42	3	-
ST-10	Architectural Finishing Systems (2)	-	2C+1L	42	-	3
ST-11	Building Equipments	-	1C+1L	28	-	2
ST-12	Concrete and Masonry Structures (2)	1C+1L	-	28	2	-
ST-13	Structural Design	-	2P	28	-	2
ST-14	Practical Exercises (Building Site)	-	2L	28	-	1
Optional Courses						
	Optional courses, 1st semester	2C	-	28	2	-
	Optional courses, 2nd semester	-	2C	28	-	2
TOTAL hours/credits		**28**	**30**	**812**	**30**	**30**

Year 4 (*Semester 7 and 8*)

Code	*Title*	*Hours/week*			*Total Credits*	
		Sem 7	*Sem 8*	*hours*	*Sem 7*	*Sem 8*
SP4-1	Architectural Design Studio (7)	8P	-	112	9	-
SP4-2	Architectural Design Studio (8)	-	8P	112	-	9
SP4-3	Urban Design – PUD (1)	3P	-	42	4	-
SP4-4	Urban Design – PUD (2)	-	3P	42	-	3
SFA-15	Architecture of Interior Space	2C	-	28	2	-
UP-4	Urban Structures	2C	-	28	2	-
UP-5	Urban Design	2P	-	28	2	-
UP-6	Landscape Design	-	2C	28	-	2
ST-77	Building Physics (1)	2C	-	28	2	-
ST-16	Architectural Technology Design Studio (1)	3P	-	42	3	-
ST-17	Architectural Technology Design Studio (2)	-	3P	42	-	3
ST-78	Buildings' Physics (2)	-	2C	28	-	2
ST-19	Structural Engineering (1)	2C	-	28	2	-
ST-20	Structural Engineering (2)	-	2C	28	-	2
CP-5	Heritage Protection (conservation notions)	-	2C	28	-	2
CP-6	Restoration Design	-	2P	28	-	2
IT-12	Modern and Contemporary Architecture in Romania	1C+1S	-	28	2	-
IT-13	Concept - Language – Discourse	-	2C	28	-	2
IT-14	Practical Exercises (Study Trip)	-	2L	28	-	1
Optional Courses						
	Optional courses, 1st semester	2C	-	28	2	-
	Optional courses, 2nd semester	-	2C	28	-	2
TOTAL hours/credits		**28**	**30**	**812**	**30**	**30**

Year 5 (*Semester 9 and 10*)

Code	*Title*	*Hours/week*			*Total Credits*	
		Sem 9	*Sem 10*	*hours*	*Sem 9*	*Sem 10*
SP5-1	Architectural Design Studio (9)	9P	-	126	10	-
SP5-2	Architectural Design Studio (10)	-	9P	126	-	10
SP5-3	Urban Design – UDP (1)	2P	-	28	3	-
SP5-4	Urban Design – UDP (2)	-	3P	42	-	3
UP-7	Urban Composition	-	2C+1S	42	-	3
UP-8	Landscape Design Studio	2P	-	28	2	-
UT-3	Urban Law	-	2C	28	-	2
UT-11	Urban Management	2C	-	28	2	-
ST-21	High Performance Structures	2C	-	28	2	-
ST-22	Complex Building Design	2C	-	28	2	-
ST-23	Architectural Technology Design Studio (3)	3P	-	42	3	-
IT-15	Axiology and Philosophy of Culture	1C+1S	-	28	2	-
IT-16	Aesthetics	-	2C	28	-	2
CP-7	Practical Exercises (Survey)	-	2L	28	-	1
Optional Courses						
	Optional courses, 1st semester	2C	-	28	2	-
	Optional courses, 1st semester	2C	-	28	2	-
	Optional courses, 2nd semester	-	2C	28	-	2
	Optional courses, 2nd semester	-	2C	28	-	2
	Optional Project	-	5P	70	-	5
TOTAL hours/credits		**28**	**30**	**812**	**30**	**30**

Year 6 (*Semester 11 and 12*)

Code	*Title*	*Hours/week*			*Total Credits*	
		Sem 11	*Sem 12*	*hours*	*Sem 11*	*Sem 12*

SP6-1	Practical Training in Architectural Design Office	35	-	490	21	-
ST-24	Economic and Social Efficiency of Investments	2C	-	28	2	-
IT-17	Theory of Research	2C	-	28	2	-
IT-18	Management in Design	2C	-	28	2	-
CP-8	Rehabilitation/Contextual Integration Project - Survey	2P	-	28	2	-
Diploma exam						
	Dissertation + Pre-Diploma-					10
	Diploma Project -					21
**TOTAL credits - **					**29**	**31**

Optional Courses

Winter semester	**Summer semester**
Graphic Design	Architectural Detailing
CAAD	Crisis and Architectural Vulnerability of Town
The Theory of Monument	Hypostasis of Architecture
Central Areas in Big Towns	Architecture, Culture, Society
Thinking and Creativity in Design	Symbolic Geometry
Morphology in Romanian Architecture	Theory and Problematic of the Architect profession
Styles	Technology of Sustainable Habitat
Fractal Art in Architecture	Morphology of Architectural Styles
Computer Graphic Design	The Architecture of Un-built Spaces
Extreme Housing-Hyper Housing	Advanced Programming Techniques in Architecture
Metal in Architecture	Tourism and Urban Development
Management in Design	Architectural Eco-technology
Computer Aided Urban Planning	Preservation of Monuments: Types of Interventions
Building Rehabilitation	History of Human Settlements in Romania

Learning Outcomes: The programme provides opportunities for students to develop and demonstrate appropriate knowledge and understanding, intellectual and cognitive skills, professional and practical skills, transferable/key skills according to the requirements of the accreditation and the practice.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

The curriculum includes several aspects of sustainable environmental design, diversified in compulsory and elective courses. Most of the studies, designs and evaluations are strictly related to the fields of energy conservation, structural engineering, implementation of modern technologies, interventions on existing buildings and architectural acoustics. The students have to use their developed knowledge in design work and practical exercises. There are however not specific requirements in design studios towards architectural environmental awareness.

In the 2nd semester of the 2nd year, **Architectural Construction in Masonry and Concrete** is a semester-long compulsory module which introduces knowledge of the architectural instruments for controlling the relationship between humans, buildings and environment, focusing on construction in masonry and concrete and the ability to use these materials in sustainable architectural design. The students develop their ability: to use these instruments; knowledge of the expressive potential of masonry and concrete in architecture; understanding of the impact that materials' choice and construction detailing have on the quality and durability of the architectural object; knowledge of the basic rules of building configuration in masonry and reinforced concrete construction; knowledge of the masonry and reinforced concrete technology; knowledge of the project's implementation techniques; the necessary skills to understand and design architectural details; the ability to find, select and use the adequate information for the specific requirements of a particular design; the skills to communicate the architectural intention to the builder, by executive drawing and text; the adequate knowledge of the technical vocabulary and the correct use of terminology. Evaluation is via practical exercises and a graphic test (50%) and a final evaluation (multiple choice test, 50%).

At the 1st semester of 4th year, **Building Physics (1)** is the first part of a year-long compulsory module. It provides ability for the students to control the balance between technological and architectural requirements, as a whole and in detail, and to coordinate in a unique coherent act the various steps that make possible the construction of a project, with specific reference to the aspects regarding the relationship between building and its environment. The course introduces knowledge of bioclimatic environmental factors such as: heat; water; light; sun; biological factors; energy substance and information exchanges between man, architecture and environment; conditions of physiological comfort; the role of architectural design in energy conservation; environmental control and ecological compatibility in designing new buildings as well as in the rehabilitation of existing buildings. Evaluation is via an optional midterm paper and a final oral examination.

Architectural Technology Design Studio (2) (4th year, 2nd semester) is the second part of a year-long compulsory module. With respect to a building previously designed in Architectural Studio, the course analyses issues regarding building relationship with the natural and built environment, basing on the knowledge acquired within the Building Physics (1) course. In this general thematic context, the Architectural Technology Design Studio requires elaboration of written and graphic documents able to illustrate architectural means of environmental control (e.g., sunlight, natural light, hydro-thermal comfort, acoustic protection) within a rational use of energy. Specific emphasis is given to sunlight, solar protection and natural lighting. The studio leaves a certain degree of freedom to the students, as in the frame of a unique guiding-theme the content of each design is specified according to the characteristics of the particular building. The first stage of the evaluation consists in the analysis and comments of the designs. Final evaluation is done by a jury basing on the following criteria: thoroughness in addressing several requirements and integration in a quality architectural result; consistency of architectural conception with Architecture Studio work; quality of personal technical documentation; logic and clarity of written parts and drawings.

Architectural Eco-Technology (5th year 2nd semester) is a semester-long optional module. The course proposes the analysis of the technological conception of buildings within the last-generation architecture, in the context of the informatics explosion and the simultaneous aggravation and globalization of ecological problems. In the developed world, buildings are the largest consumers of conventional energy, more than both industry and transportation put together. Reducing the consumption of non-renewable resources and pollution caused by the built environment is a necessity and, in “ecologically-conscious” countries, this is regulated by strict, complex, and constantly evolving laws and codes. Many conception criteria inherited from the “industrial era” are no longer valid, forced by the imperatives of sustainable development and by the menace of global ecological disasters. The “intelligent” architecture of the latest years uses extremely complex technologies, but pursues a “soft” and compatible approach in relationship to the environment, as opposed to the “hard” approach characteristic of the previous era. The evaluation for the course is structured in 50% semester activity (attendance + applications) and 50% final examination test or essay.

Technology for Sustainable Habitat (5th year, 2nd semester) is a semester-long optional module, whose objectives are: the understanding and acquisition of the fundamental principles of sustainable development; achieving the required skills for the implementation of sustainable criteria in buildings' design; adequate evaluation of contemporary technologies for a sustainable habitat while using them in architectural design. Contents of the course include: the integration of the fundamentals of sustainable development in architectural design basing on a historical approach; expression and definition of “ecological quality” and how it can be used in the global evaluation of architectural design; integrated systems for the evaluation of ecological quality; environmental impact/stress; Life Cycle Assessment; architecture’s raw materials; the choice of building materials, recycling, experimenting; recycling the built environment and the use of architecture as a resource; minimizing the environmental impact (the energy within the architectural object); use optimization of energy and analysis of energy consumption rates; alternative energies; designing the building envelope as an interface; borrowing from nature - bionic architecture; the main use of utilitarian technology; bio-climatic architecture - active and passive solar architecture; (self)adaptability to external stimuli; smart “high-tech” architecture, a convenient and permanent adjustment of the energy exchange with the environment; technological extremism; “eco-tech” architecture - the technology between functionality and aesthetics; the challenges of sustainable design; technological innovations for “green” design, labelling and certification systems; “low tech” architecture and ignoring technological achievements; lessons from the vernacular practices and from the crafting technology; the dialogue between technology and social pursuit, two of the main focal points of architectural design; architecture in a sustainable - natural, cultural, social, economic - context. The final mark will consist of 40% for activities during the classes/whole semester (20% classroom activity and 20% paperwork - personal analysis and comments on a publication from the area of interest of the course) and 60% for a written examination paper at the end of the semester.

Within the University, the School of **Advanced Studies** is open to graduates in Architecture, Urbanism, liberal arts, and other connected fields, according to the curriculum of each program. The programs address various professional, administrative, cultural and social aims and needs. Generally, the advanced studies are prerequisites for future research or professorial careers, or for architectural critique, thus there are programs focused on the theoretical approach and on the education of writing abilities. The programs are meant to widen these various disciplinary fields through multidisciplinary and/or interdisciplinary approaches, and to integrate them into a more complex (technically and culturally) view on the making of space. The duration of the study is 4 semesters (year-based schedule). The objectives of the School are articulated through various types of programs: Advanced Architectural Design Programs (AADP); Master of Architecture Degree programs (MAP); Post-graduate Study Programs (PGSP); Doctoral studies (DS); and, Training courses. One of the most important topics in the Master of Architecture Degree Programs is the inclusion of a specific subject on **Sustainable Development: Integrated Concept of Building Environment and Energy Audit**.

STRENGTHS AND OPPORTUNITIES

Following an old tradition of the School, there are two distinct Departments focusing on architectural design: the *Architectural Design Department*, having in charge the junior and sophomore cycles (1st to 3rd years), and the *Synthesis of Design Department*, in charge of the senior cycle (4th to 6th years). The growing differentiation of the design teaching and the increasing number of students has lead to a division of each Department in Chairs, for strictly functional reasons. Therefore, the Architectural Design Department has three Chairs, since during the first three years there are more studios with more diverse objectives and approaches, while the Synthesis of Design Department has only two chairs. The educational programme of the Departments and their Chairs is jointly decided, according to the final target of each academic unit and the overall design philosophy of the University. However, to enable the students to practice and integrate specific knowledge and competence in environmental design within their design work, the Chair of Technological Sciences coordinates technical studios in different years of study and academic units, according to their curricula. At the same time, the Chair provides consultancy in the architectural design studios. This structure reveals some strengths and opportunities, namely:

Strengths:

- An analytical approach in the teaching of building sciences provides well qualified knowledge for students in the field of environmental design;
- Logical improvement of the design skills of student;
- Detailed teaching method according to the specific environmental aspects (e.g. energy efficiency).

Opportunities:

- Exploration and analysis of heritage and application of sustainable environmental design in practice could bring the academic curriculum closer to the reality of professional practice.

SOURCES AND REFERENCES

IMUAU website: www.iaim.ro

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Ordinul Arhitectilor din Romania (OAR, Chamber of Architects of Romania)

The OAR (Chamber of Architects of Romania) is the organisation that confers and keeps track of the right to practice architecture in Romania. Law n. 184 of 12 April 2001 on the Organisation and Practice of the Architectural Profession - Republished in the Official Gazette No 771, Part I, of 23 August 2004 - regulated the practice of the architectural profession in Romania, setting up the OAR (Chamber of Architects of Romania) as an independent, non-profit, autonomous, non-political form of organisation recognised as of public interest. The Chamber of Architects, however, does not accredit study programmes in architecture, since this task is under the responsibility of the Romanian Agency for Quality Assurance in Higher Education (ARACIS). ARACIS is a full member of the European Association for Quality Assurance in Higher Education – ENQA and is listed in the European Quality Assurance Register for Higher Education – EQAR.

Conditions for Professional Qualification

In Romania, the following requirements apply in order to exercise the profession as an independent architect and to use the professional title:

- Completion of a Master-level (MSc) education (6 years) in architecture and attainment of a Certificate of Diploma;
- Registration in the National Register of Architects
- 2 years of professional practice under the guidance of an accredited architect with at least 5 years of personal experience;
- Submission of a portfolio to the Chamber of Architects, documenting this 2-year period of professional practice.

Upon submission of the complete portfolio documenting the professional practice, a Commission of the Chamber will examine it and set up an interview with the candidate within the following 3 months At this time only Architecture graduates may obtain qualification for professional practice and acquire the right of signature of projects for Construction Authorisation (Graduates of Urban and Interior Design do not get the same "signature rights" as the Architects). Different rules apply for restoration works, since in this case the licence/authorisation is given from the Ministry of Culture. Urban designers need to be registered under a dedicated Register.

SOURCES AND REFERENCES

OAR website: www.oar.org.ro/

Slovakia

SLOVAK UNIVERSITY OF TECHNOLOGY IN BRATISLAVA
FACULTY OF ARCHITECTURE

Bachelor + Master of Architecture and Urban Design (6 years)

Level: Undergraduate (BArch, 4 years) + Graduate (MArch, 2 years)

Accrediting Body: Slovak Camber of Architects

Educational Aims: Education of architects in Slovakia started in 1946, when the Department of Architecture and Building Construction was established at the SUT and this date can be considered to be the date of birth of the architectural schools in Slovakia. The Faculty of Architecture SUT is the largest educational institution for architects in the Slovak Republic. The trends of the Faculty are developed and based on ongoing development of the university platform of Higher Education. Bound to it, is the recently realized innovation of the Faculty's profile and its education activities within the Bachelor's, Master's and PhD's study programs. The profile of the curriculum reflects university principles and establishes a condition for professional performance within the home country and the EU framework. In this respect, there is a clear orientation to prepare architects, urban planners and designers within a creative framework. The present two-year tier system of study focuses on the preparation of a skilled graduate. Awareness in the art and theory subjects is emphasized, as well as in a variety of technical and design subjects from urban planning to interior design.

Outline Description of Course: The *Bachelor of Architecture and Urban Design* degree constitutes the first level of the curriculum. It presents basic prerequisites for the second level not only at the Faculty of Architecture at SUT but for other related fields taught at other schools (e.g. the VŠVU Academy of Fine Arts and Design, the Faculty of Architecture at the VTU Brno University of Technology or the ČVUT Czech Technical University in Prague). This level of education aims at basic skills in architectural design and in architectural and urban planning theory basics. The core subjects are studios in architectural, urban, landscape and product design, which are delivered within the accredited study programmes. To conclude the study, students have to pass a state examination and defend their final work. The curriculum of the *Master of Architecture* is a continuation of the previous level in a more profound way and through option of a direction of study within the field (e.g. Housing, Public Buildings, Civic Buildings, Interior Design, Protection and Renovation in Historical Sites, Urban Architectural Planning, Landscape Planning and Landscape Architecture, Industrial Design, etc.) Studio design prevails and theory subjects are selected in dependence on the topic of the studio work. The second state examination and defence of thesis finish the study.

Course Structure: Each year of study consists of 60 credits, normally 30 in each semester. Each module has a credit value. Each year of the Bachelor course is designed to include 25 hours of student work per week including taught and contact time, assessment work and student-centred learning. Students gain 240 credits at minimum within the Bachelor degree programme out of which 216 credits are for compulsory courses, 3 credits are for Foreign Languages, 22 credits are for optional modules. For the Master course, students have to gain 120 credits at minimum which include: 50 credits for compulsory courses of the programme; 55 credits in optional courses (Design Studios, Diploma Seminar, Diploma Project); 15 credits at minimum in other courses which are part of other programmes and/or specializations. Students cannot study longer than it is stated in the Study Terms and they have to pass all parts of the State Final Exam, comprising Theory and methodology of architectural and urban design and the Diploma project defence. Students submit their complete Master's study portfolio as well as the diploma project portfolio at their final exam.

<u>Bachelor of Architecture and Urban Design (4 years)</u>

Year 1 - Semester 1

Code	*Title*	*Credits (ECTS)*
1301	Building Structures 1	5
4-2799	Mathematics	4
1-2212	Descriptive Geometry	4
1400	Introduction to Architecture	1
1401	Rendering	3
1402	Drawing I	5
1103	ABC of Architectural Design I	8
Total		**30 ECTS**

Year 1 - Semester 2

Code	*Title*	*Credits (ECTS)*
1302	Building Structures II	4
1105	Residential Buildings	4

1119	Public Buildings I	3
1-2215	Descriptive Geometry II	2
1403	Drawing II	3
	Survey Engineering	1
1104	ABC of Architectural Design II	8
1106	Architectural Composition	5
Total		**30 ECTS**

Year 2 - Semester 3

Code	*Title*	*Credits (ECTS)*
1303	Building Structures III	3
1310	Building Physics I	2
1101	Building Utilities I	3
1655	CAD basics	2
1410	Architecture and Art History	3
1122	Public Buildings II	3
	Architecture and Environment I	3
1150	Design Studio I	10
	Foreign Language I	1
Total		**30 ECTS**

Year 2 - Semester 4

Code	*Title*	*Credits (ECTS)*
1311	Building Physics II	2
1320	Statistics I	3
1102	Building Utilities II	3
1411	Architecture and Art History II	3
1123	Industrial Buildings	3
1530	Urban Composition I	5
1152	Design Studio II	10
	Foreign Language II	1
Total		**30 ECTS**

Year 3 - Semester 5

Code	*Title*	*Credits (ECTS)*
1304	Building Structures IV	3
1321	Statics II	2
1330	Bearing Structures I	3
1426	Modelling	3
1412	Architecture and Art History III	3
1205	Monuments Restoration	3
1526	Town Planning I	3
1252	Design Studio III	10
1405	Drawing – Field Trip (2 weeks)	0
Total		**30 ECTS**

Year 3 - Semester 6

Code	*Title*	*Credits (ECTS)*
1305	Building Structures 5	3
1331	Bearing Structure II	4
1342	Fire Protection in Buildings	1
1201	History of Cities	2
1527	Landscape Architecture	3
1543	Town Planning II	3
1210	Interior	3
1220	Design studio IV minor – Monuments Restoration	5
1560	Design Studio V minor – Urban Design	5
	Foreign Language III	1
Total		**30 ECTS**

Year 4 - Semester 7

Code	*Title*	*Credits (ECTS)*
1413	Architecture and Art History IV	3
1130	Building Project	1
1661	CAD Studio	3
	Universal Design	2
Elective Modules		

	Design Studio module (option M 1-9)	13
	Design studio seminar I	4
	2 Theoretic courses of the module	4
Total		**30 ECTS**

Year 4 - Semester 8

Code	*Title*	*Credits (ECTS)*
1543	Introduction to Legislation in Arch. and Urban Planning	1
1435	Design Studio VII	4
	Design studio seminar II	4
1340/1562	Design Studio VIII – Final Project (Arch. or Urban Design)	21
Total		**30 ECTS**

Optional/Elective Modules

A choice of nine studio Modules and correlated courses (M1-9) are available in the following topics:

- M1 – Dwelling Buildings;
- M2 – Public Buildings;
- M3 – Industrial Buildings;
- M4 - Interior Architecture;
- M5 – Monuments Restoration;
- M6 – Sustainable Architecture
- M7 – Architectural Constructions;
- M8 – Urban Design
- M9 – Landscape Architecture

A further choice M10 is devoted to Mobility (Socrates or Erasmus Exchange).

Modules in M6 – Sustainable Architecture comprise:

Code	*Title*	*Credits (ECTS)*
1278	Design Studio VI	13
1279	Studio Seminar I	4
1281	Low-energy Architecture	2
1280	ABC of Environmentally Friendly Architecture	2

Studio Work and architectural design curriculum

Within the Studio Work courses, students continuously deal with more and more complex briefs, where they solve the functional and service parameters of buildings, as well as the construction and general idea of architectural concept, and at the end of the course they work on overall urban solutions.

Studio Work I: Architectural Design– building only with one function, a residential building with a simple construction and technical solution (i.e. a family house)

Studio Work II: Architectural Design– multipurpose simple buildings with prevailing residential part (e.g. a residential high rise building with identical floor plans and a public ground floor, including exterior design solution)

Studio Work III: Architectural Design– a complex design of a multipurpose building with more demanding solutions of construction, space division and utility arrangement (e.g. a civic building, a production or civil engineering structure, including exterior design solutions)

Studio Work IV: Monument Preservation– minor Studio (preservation of listed buildings)

Studio V: Urban Design 0-3, GA, 5 ECTS of zone design (minor studio, a small scale zone with prevailing residential development)

Studio VI: Studio as a part of optional course of the module M1-9, 0-11, 13 ECTS - the studio offers students to analyse in more detail one of the fields of architecture, urban planning or landscape design

Master of Architecture and Urban Design (2 years)

Year 1 - Semester 1

Code	*Title*	*Credits (ECTS)*
2402	Trends of Modern Architecture and Town Planning	4
2202	Architecture and Environment II	4
2501	Design Studio I – Urban Design	15
	Building Structures VI	4
Optional Course		3
Total		**30 ECTS**

Year 1 - Semester 2

Code	*Title*	*Credits (ECTS)*
2101	Coordination of Design Work and Building Process	4
2502	Urban Planning	4

	Architectural Design Studio II – Topic Studio	
	Optional Course	3
	Optional Course	3
Total		**30 ECTS**

Year 2 - Semester 1

Code	*Title*	*Credits (ECTS)*
2305	Current Building Structures in Architecture	4
1403	Theory of Architecture	4
	Territorial Planning	3
	Architectural Design Studio III – Topic Studio	16
	Optional Course	3
Total		**30 ECTS**

Year 2 - Semester 2

Code	*Title*	*Credits (ECTS)*
2706	Execution of the Architect’s Profession	4
	Optional Course	*3*
	Diploma Seminar	3
	Diploma Project	20
Total		**30 ECTS**

From the summer term of the 1st year, students select one of the following specializations A 1 – A 8:

- A1 Dwelling Buildings
- A2 Public Buildings
- A3 Industrial Buildings
- A4 Interior and exhibition Design
- A5 Architecture Heritage Conservation
- A6 Experimental and Ecologically Conscious Architecture
- A7 Rural Architecture
- A8 Architectural Constructions

Students can select any of the offered courses depending on their interest, but it is recommended for them to take into consideration the Topic Studio or Studio Design brief. Students can also sign up for courses, including the compulsory ones, from other units of Architecture and Urban Design programme or other programmes.

Optional/Elective Modules

Students can also choose from an option of 40 optional courses, which include:

Code	*Title*	*Credits (ECTS)*
2239	Environmental Entity of Architecture	3
2215	Settlement Ecology and Sustainable Development	3
2214	Ecological Concept of Architectural Design	3
2247	Light and Sound in Architecture	3
2240	Energy Efficiency of Buildings	3

Learning Outcomes: The course offers a number of subjects in the range of fundamentals of architecture education. The curriculum meets the objectives of Directive 2005/36/EC by providing:

- Art. 46(1)(a) ability to create architectural design that satisfy both aesthetic and technical requirements;
- Art. 46(1)(b) adequate knowledge of the history and theories of architecture and the related arts, technologies and human sciences;
- Art. 46(1)(c) knowledge of the fine arts as an influence on the quality of architectural design;
- Art. 46(1)(d) adequate knowledge of urban design, planning and the skills involved in the planning process;
- Art. 46(1)(e) understanding of the relationship between people and buildings, between buildings and their environment, and of the need to relate buildings and the spaces between them to human needs and scale;
- Art. 46(1)(f) understanding of the profession of architecture and the role of the architect in society, in particular in preparing briefs that take account of social factors;
- Art. 46(1)(g) understanding of the methods of investigation and preparation of the brief for a design project;
- Art. 46(1)(h) understanding of the structural design, constructional and engineering problems associated with building design;
- Art. 46(1)(i) adequate knowledge of the physical problems and technologies and of the function of buildings so as to provide them with internal conditions of comfort and protection against the climate;
- Art. 46(1)(j) the necessary design skills to meet building users’ requirements within the constraints imposed by cost factors and building regulations;
- Art. 46(1)(k) adequate knowledge of the industries, organisations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning.

EXECUTIVE SUMMARY – Environmental Design in the Academic Curriculum

The subjects of environmental design are not specifically emphasised in the course structure. Nevertheless, the Institute of Ecological and Experimental Architecture offers a focus on environmental design which can be chosen by students during both the Bachelor and the Master degree.

In the Bachelor course, design studio makes a central part of the curriculum and the subjects dealing with sustainable environmental design can be found in the courses of **Building Physics** and **Architecture and Environment** during the second year. In the first semester of year four, by the choice of design studio, the curriculum offers a focus on environmental sustainability. This is one of a number of options that a student can pick. Specifically, the choice of Studio Module M6 includes a design unit and a seminar module of **Sustainable Architecture** and the teaching of **Low-energy Architecture** and **ABC of Environmentally Friendly Architecture**.

The Master Course offers the specialisation studio in **Experimental and Ecologically Conscious Architecture,** held by the Institute of Ecological and Experimental Architecture, and a number of optional courses that deal with sustainable environmental design, such as **Environmental Entity of Architecture**, **Settlement Ecology and Sustainable Development**, **Ecological Concept of Architectural Design**, **Light and Sound in Architecture**, and **Energy Efficiency of Buildings**. The study programme is aimed to architectural design determined by physical factors of the environment (sun, wind, precipitation), harmonizing the designed architectural work with natural and cultural complex of the environment, design of the economical structures using renewable energy resources and biocompatible building materials, search for alternative forms of residential environment and alternatives for traditional ways of living.

Cooperation, integration, complexity and interdisciplinarity are basic principles in the field of protection and creation of environment and namely of the human environment. They are, therefore, taking part in the process of decision and selection of education methods, and the content of environmental education. The classes are tutored by different field specialists, not only the university teachers but teachers from other universities as well as from foreign workplaces. The aim is to make the study programme more compact within its social- ecological and natural-ecological dimension.

STRENGTHS AND OPPORTUNITIES

Strengths:

- At Bachelor level, the studio option M6 at fourth year level focuses on sustainable architecture and is supported by seminars and elective taught modules;
- In the Master Course, an option for topical studies offers a focus on environmental design, namely "Experimental and Ecologically Conscious Architectural Design" that can be supported by elective courses and design studio;
- The open structure of topical courses leaves freedom of choice to student in terms of focus and amount of integration;
- The design studio course offers cooperation with tutors from other universities and foreign workplaces thus giving a broad horizon of teaching input.

SOURCES AND REFERENCES

Faculty of Architecture website: www.fa.stuba.sk
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Slovak Chambers of Architects

The Slovak Chamber of Architects (Slovenská komora architektov) is a professional entity of autonomous and non-commercial nature, based in Bratislava. It was established on 1 June 1992 by Act of the Slovak National Council n 138/1992 '*Coll. of chartered architects and chartered civil engineers*'. Its activities are financed from its own resources without government subsidies. The Chamber is a member of the Architects Council of Europe's ACE and part of a network of competent authorities in architecture.

The main tasks of the Slovak Chamber of Architects implemented under § 24 of Law No. SNC. 138/1992 Coll. are the following:

1. It is the competent authority (for the performance of the European Parliament and Council Directive 2005/36/EC) on the recognition of professional qualifications in the Slovak Republic for professional architect and landscape architect, in particular:

   a) accepts evidence of formal qualifications of architects for professional practice, the integrity and liability insurance;

   b) recognizes the acquired skills of architects and landscape architects acquired abroad;

   c) works under the administrative cooperation with the competent authorities of the Member States of the European Communities in matters relating to the recognition of professional qualifications for professional architect and landscape architect;

   d) holds the position of national coordinator and gives notifications of new evidence of formal qualifications for the profession of architect;

   e) is entitled to propose common platforms in the landscape architecture profession.

2. It works with single contact points established under the directive of the European Parliament and the Council 2006/123/EC on services in the domestic market and is connected to the information system of the European Commission for the profession of architect.

3. As an information centre, it provides:

   a) information about application of the rules for entry into the profession and the rules for the recognition of qualifications;

   b) information about the rules of professional ethics and disciplinary supervision;

   c) data to the national coordinator concerning the conditions of access to the regulated professions of architect and landscape architect and the number of recognized qualifications;

   d) administrative assistance to regulatory authorities, particularly the exchange of information on the recognition of documents and hosting of their members in the Slovak Republic, the disciplinary measures imposed on equipment claims and complaints.

4. It is the regulatory body for professional architect and landscape architect, in particular:

   a) keeps a list of authorized architects (established) and can register and cancel their membership;

   b) keeps a list of all landscape architects (established) and can register and cancel their membership;

   c) keeps a registry of visiting architects and can independently decide on their inclusion;

   d) keeps a registry of visiting landscape architect and can independently decide on their inclusion;

   e) exercises disciplinary authority over the architects and landscape architects registered in the lists and registers under a) to d);

5. It verifies the conditions of competition contests in the field of architecture and urbanism and in the procurement and provides expert assistance in organizing public tenders and their evaluation.

6. It implements federal action, especially:

   a) supports architects and landscape architects and advocates their professional, social and economic rights;

b) ensures that the architects and landscape architects exercise their profession professionally and lawfully;

c) ensures the professional development of the activities of architects and landscape architects, and fosters their lifelong learning;

d) takes care of the esprit de corps and professional ethics;

e) is responsible for building harmonious culture and continuing education, is involved in organizing and evaluating tenders, and organizes the competition for the Prize of the Slovak Chamber of Architects CE.ZA.AR;

f) promotes awareness, dissemination, consultancy and information;

g) gathers data about the architectural works of its members and keeps their records in the register of architectural works.

Conditions for Professional Qualification

The criteria and conditions for professional qualification of architects are the following:

- Nationality of an EC Member State declared by the passport or identity card;
- Education in Architecture declared by the diploma and certificate referred to in art. 11 Council Directive 85/384/EEC and the EU Accession Treaty;
- Training (Internship) in Architecture performed after the architectural degree achieved in the extent of 3 years minimum (training shall be certified by a logbook);
- Integrity certified by an extract from the judicial record or by a similar way according to the national legislation;
- Accomplishment of a Professional Examination,
- Making an oath.

SOURCES AND REFERENCES

Slovak Chambers of Architects website: www.komoraarchitektov.sk

Slovenia

UNIVERSITY OF LJUBLJANA
FACULTY OF ARCHITECTURE

Single Master Study Programme in Architecture (5 years)

Level: Graduate (MArch, 5 years)

Accrediting Body: Chamber of Architecture and Spatial Planning of Slovenia (ZAPS)

Educational Aims: The programme education profile is for the architect – generalist. The basic goal is to train experts for responsible tasks concerning architectural design and planning, as well as spatial management. The responsibility of architects stems from the significance of architectural design, building quality, their harmony with the environment and respect for natural and urban landscapes, which are of public interest. Public interest granted to quality of physical environment is safeguarded by Slovene as well as European laws. The Slovene law stipulates conditions for architects – designers, reviewers of planned spatial interventions, spatial planners, responsible project leaders of proposals of spatial acts, municipal urban designers, researchers etc. The European law determines minimal criteria for qualified architects for automatic recognition of professional qualifications in all European countries. The profile of an architect is very complex, since the architect has to be capable of thinking about people and their spatial issues in very varied scales, from the regional planning scale to the architectural detail and vice versa. Competence has to grow from contemporary theoretical and technological findings, supersede them, strive for balance between functional-technical and artistic components of architectural creativity. The educational profile of architects joins technical, social and humanistic sciences into a capability for managing and designing buildings.

Outline Description of Course: The first three years of the course are intended for education on general professional knowledge and skills needed by a practicing architect, while the fourth year and ninth semester are oriented into in-depth knowledge in architecture, urbanism and design. The backbone of the programme is the studio, in which the students test knowledge gained from theoretical and methodological subjects on practical examples. The studio is led by a teacher with publicly acknowledged work and experience in the field of artistic creativity. The subject is organized as a tutored seminar, with students from various years working together. Students have allocated workspaces at the faculty and can choose their tutor independently. The graduate course is completed with a diploma thesis with specified contents.

Course Structure: The single Master Study Programme in Architecture takes 5 years and requires 300 credit points. The study program includes elective modules A and B. The professional title awarded to the graduate is: Master Engineer of Architecture (Mag. Eng. Arch.). Knowledge is evaluated by oral and written examination. Assessment of knowledge in disciplinary subjects is predominantly by drawings: the oral exam can be a defence of a graphic presentation; the written exam can also be the written statement of such a presentation. The grades for most subjects, meaning those that are conducted as lectures and exercises, consist of two parts: one part is the grade for the (theoretical) exam; the other represents the graded exercises, the latter varying from subject to subject. The subject Design 1 has a single grade; the subjects Design 2, 3, 4 and 5 have dual grades (individual work, exercises). Elective subjects are graded with a single (exam) grade. A 1 to 10 grading scale is applied (1-5: fail, 6-10: sufficient, good, very good, excellent).

Single Master Study Programme in Architecture (5 years)

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
1.1	Design 1*	9	Spring
1.2	Architectural design 1	5	Autumn
1.3	Mathematics	7	Full Year
1.4	Descriptive geometry	7	Full Year
1.5	Technical mechanics	8	Full Year
1.6	Representation techniques 1	7	Autumn
1.7	Representation techniques 2	7	Full Year
1.8	Digital methods and representations	5	Spring
1.9	Materials and forms	5	Autumn
Credit Total	**60**		

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
2.1	Design 2*	16	Full Year

* In the first year students, are designated to mentors by the study committee. From the second year onwards, the students choose their mentor independently. The list of mentors is approved by the study committee. Subject leaders of

2.2	Architectural design 2	5	Autumn
2.3	Structures and dimensioning	7	Autumn
2.4	Structures 1	3	Autumn
2.5	Building physics	4	Spring
2.6	Introduction to urbanism	5	Spring
2.7	History and theory of architecture 1	5	Autumn
2.8	Building technology and materials	5	Spring
2.9	Introduction to art theory	4	Spring
2.10	Architectural workshop 1*	2	Spring
2.11	Study practice 1**	4	Spring
Credit Total	**60**		

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
3.1	Design 3*	17	Full Year
3.2	Architectural design 3	5	Autumn
3.3	Building mechanics	5	Spring
3.4	Structures 2	5	Autumn
3.5	Urban design	5	Autumn
3.6	Representation techniques 3	5	Spring
3.7	History and theory of architecture 2	5	Autumn
3.8	Utility technologies	5	Spring
3.9	Architectural workshop 2*	2	Spring
3.10	*Elective subject****A	3	Autumn
3.10	*Elective subject****B	3	Spring
Credit Total	**60**		

Year 4 (Compulsory Modules)

Code	*Title*	*Credits*	*Taught*
4.1	Design 4*	17	Full Year
4.2	Architectural design 4	5	Autumn
4.3	History of urbanism	5	Autumn
4.4	Landscape architecture	5	Spring
4.5	Urban planning	5	Autumn
4.6	Architectural renewal and conservation	7	Spring
4.7	History and theory of architecture 3	5	Autumn
4.8	Management in architecture	3	Spring
4.9	Architectural workshop 3*	2	Spring
4.10	*Elective subject****A	3	Autumn
4.11	*Elective subject****B	3	Spring
Credit Total	**60**		

Year 5 (Compulsory Modules)

Code	*Title*	*Credits*	*Taught*
5.1	Design 5*	14	Autumn
5.2	Urban sociology	3	Autumn
5.3	Building and planning legislature	3	Autumn
5.4	*Elective subject****A	3	Autumn
5.5	*Elective subject****B	3	Autumn
5.6	Study practice 2**	4	Autumn
Credit Total	**30**		
	Diploma Thesis	30	Spring
Credit Total	**30**		

Complete course with Diploma: 300 Credits

Design 1–5, Architectural workshop 1–3 and the diploma supervisors are all architects that also conduct one of the other subjects and can present adequate professional references.

** Study practice 1: on a construction site; 2 in an architectural (design) office

*** In the3rd, 4th, and 5th year the student selects a subject each from groups “A” (in any order, but can choose only from two modules) and “B”. The requirement for a subject course from group “B” to be held is at least 10 students/applicants. Instead of a subject from group “B”, a student can also enrol in a subject from another faculty’s syllabus, but has to obtain prior approval by the study committee of the Faculty of Architecture.

Elective subjects, **group "A":** 3.10, 4.10, 5.4

A1
1. Residential buildings (Kalčič)
2. Public buildings
3. Industrial buildings (Košir)
4. Recreational buildings (Leskovec)
5. Church buildings (Debevec)
6. Interior design

A2
1. 20th century Slovene architecture (Koselj)
2. Architectural theory and critique (Košir)
3. Architectural anthropology (Toš)
4. Architectural analogies (Ažman Momirski)
5. Introduction to research in architecture and urbanism (Zupančič, Lah)
6. Ecological building principles (Zbašnik Senegačnik)

A3
1. Theory of physical and regional planning (Pogačnik)
2. Communal and housing economy (Šubic Kovač, Rakar)
3. Land policy and property evaluation (Šubic Kovač, Rakar)
4. Rurism and rural architecture (Fikfak)
5. Action planning and strategic assessment (Ažman Momirski)

Elective subjects, group "B": 3.11, 4.11, 5.5

B1
1. Vernacular architecture (Juvanec)
2. Design of objects (Suhadolc)
3. Design concepts (Bonča)
4. Light in architecture (Novljan)
5. Use of colour and colour metrics in architecture (Novljan)
6. Design of green surfaces (Gazvoda)
7. Countryside settlement culture (Fikfak)

B2
1. Art history (Krečič)
2. Spatial idiomatic (Košir)
3. Artistic order (Mihelj)
4. Elements of classical composition (Marinko)
5. Environmental psychology (Polič)
6. Theory of architectural design (Toš)
7. Measurement standardisation (Muhič)
8. Artistic expression (Marolt)

B3
1. Comprehensive preservation of built heritage (Deu)
2. Renewal and adaptation (Ocvirk)
3. Integral renewal (Lah)
4. Preservation of contemporary architectural heritage (Ifko)
5. Architecture and archaeology (Ažman Momirski)
6. Industrial archaeology (Ifko)

B4
1. Graphics for architects (Botas Kenda)
2. Modelling (Mihelj)
3. Multimedia space (Zupančič)
4. Computer supported architecture (Turk)

B5
1. Building prefabrication (Muhič)
2. Concepts of structures (Kilar)
3. Structural systems (Kušar)
4. Structures of industrial buildings (Vogelnik)
5. The detail in architectural composition (Kalčič)
6 .The detail in the interior (Kalčič)
7. General safety (Muhič)
8. Spatial acoustics and noise reduction (Čudina)

B6
Subjects hosted by other faculties of the University of Ljubljana approved by the Study committee of Faculty of Architecture following concordance by the hosting faculty – party

Learning Outcomes: The Single Master Study Programme in Architecture at the Faculty of Architecture of the University of Ljubljana provides graduates with the following professional competence and skills:

- Capability of analysis, synthesis and anticipating solutions and consequences;
- Mastering of research methods, procedures and processes, development of critical and self-critical reflection;
- Capability of practical use of knowledge;
- Autonomous operation in professional work;
- Development of communication capacities and skills, especially visual communication;
- Ethical reflection and dedication to professional ethics;
- Cooperativeness, working in teams (and in the international environment).

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

At second year of the programme, **Building physics** (4 ECTS) is a compulsory module that lasts one semester and includes themes of: mechanisms and physical fundaments of transmission of heat in built structures; passage of short and long wavelength emissions; accumulation of heat and calming temperature amplitudes; vapour diffusion, condensation in built structures, vapour barrier and drainage plane; passage of light in buildings; passage of sound in the exterior and in built structures; noise reduction; heating and environmental properties of buildings, assessment methods.

In the third year, **Utility technologies** (5 ECTS) lasts one semester and explore the following topics: technology of building utilities for ensuring adequate living and working environments by sparing use of energy and minimal effects of the building on the environment; heating systems; ventilation systems; sanitary fittings; intelligent fittings; and, control systems.

At the fourth year, **Landscape architecture** (5 ECTS) lasts one semester and includes the analysis of: natural, cultural and urban landscape; typological and morphological analysis of cultural landscape; analysis of cultural landscape factors; development of content and methods of spatial planning documents; sustainable and balanced spatial planning.

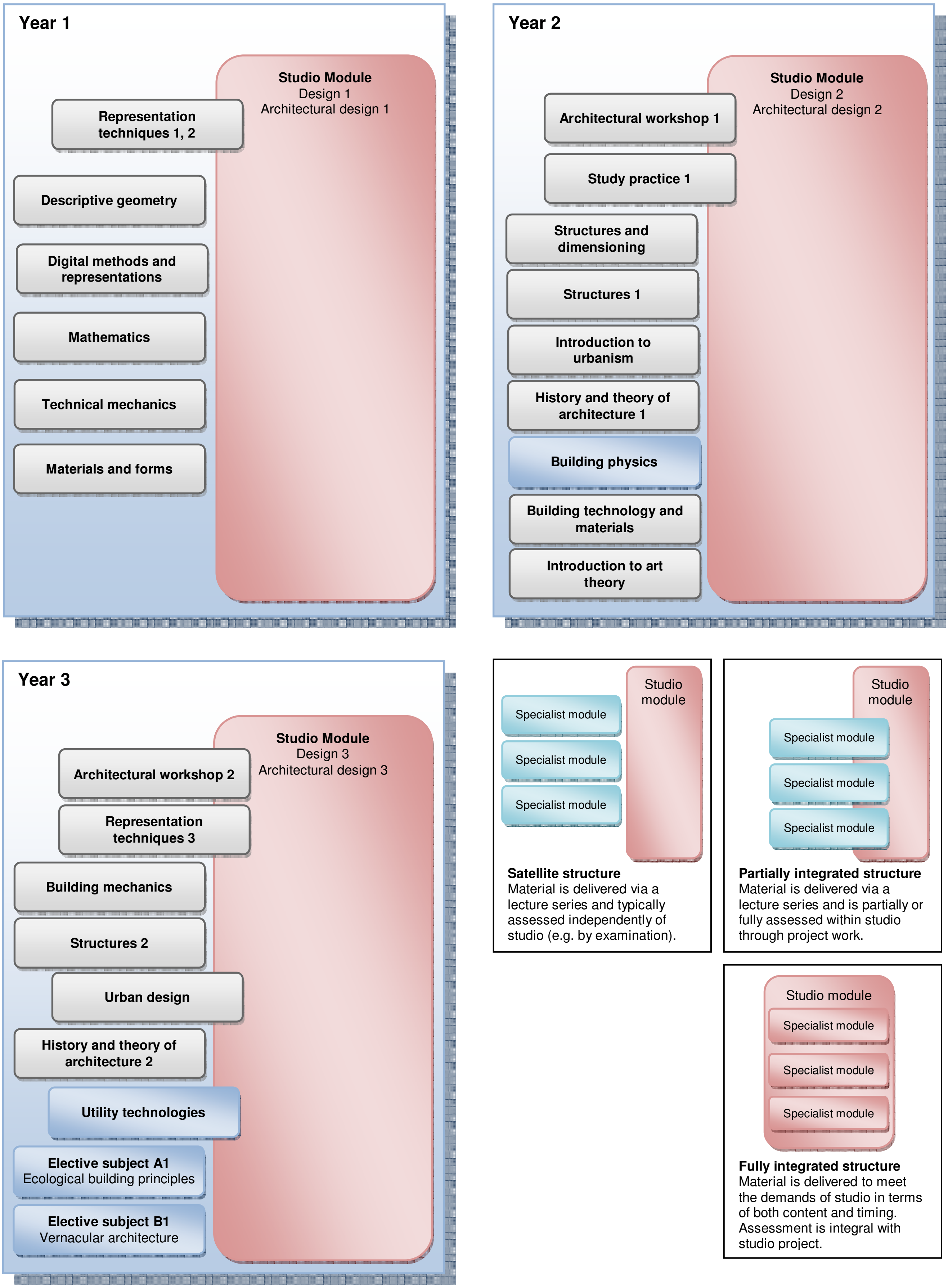
Amongst elective modules, **Ecological building principles** (3 ECTS) is a module centred on: analysis of materials and structures according to ecological principles based on valid regulation and recommendations; learning about relevant technologies in particular planning approaches on renown examples of the specific practice abroad; integrating principles of ecological building into the concept of building and settlement.

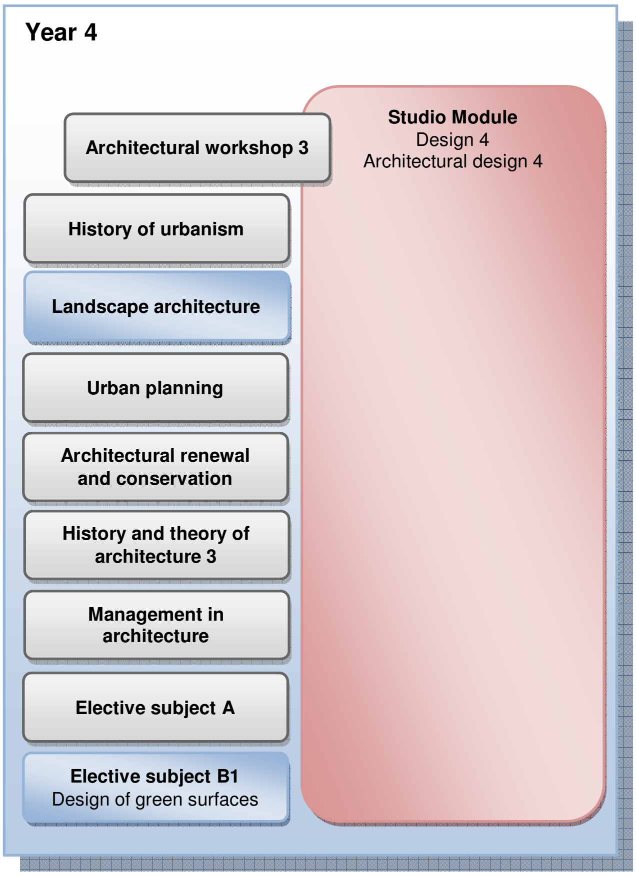
Vernacular architecture (3 ECTS) analyses comprehensive issues of vernacular architecture, from theoretical concepts to yesterday's solutions.

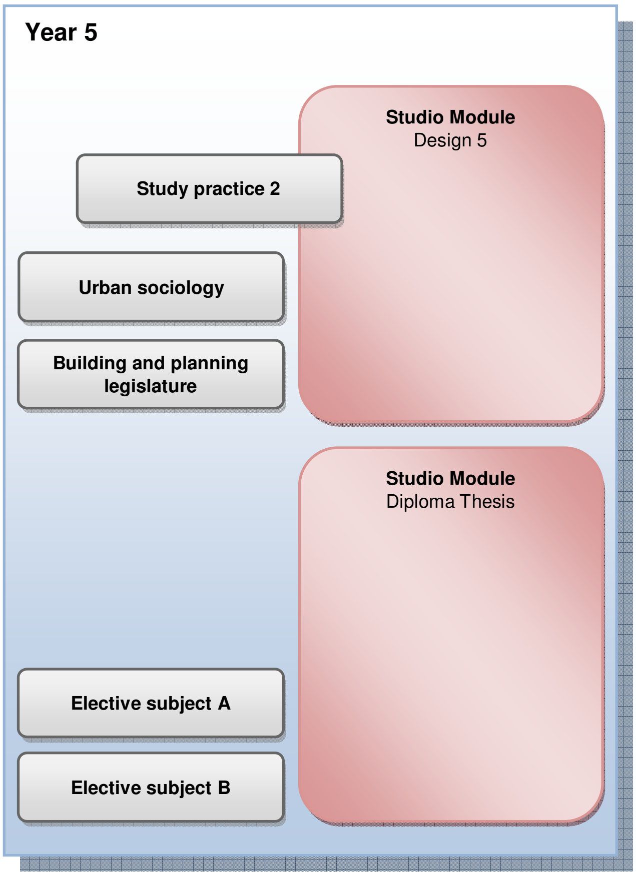
Design of green surfaces (3ECTS) introduces: origins of landscape architecture (the profession, division into specialised branches, expert terms); landscape structure (emergence of landscape patterns); garden art; types of open space; conceptualising the landscape; city parks; European practise; American practise; plaza, Chinese garden art and contemporary design, living culture; housing estate; water in the city; the concept of nature in landscape architecture.

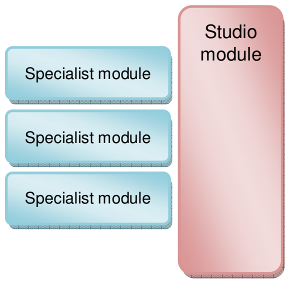
Environmental psychology (3 ECTS) focuses on: theory of social sciences and methods derived from human relations and the wide variety of environments; theories of behavioural sciences and methods in relation to mutual effects of individuals in the living and working environment.

Integration of Environmental Design with Studio – Single Master Study Programme in Architecture

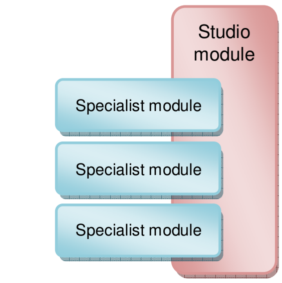




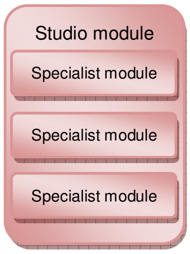




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Strengths:

- Sustainable environmental design (including the cultural dimension) is the starting point of all the courses regardless of their titles;
- Flexibility of design studio; workshops, etc.
- Academic staff members claim that what they teach is all (should all be) environmentally sustainable;
- The implementation of environmental design is strongly supported in research activities.

Opportunities:

- A higher level of implementation is given in terms of graduate and postgraduate teaching, specifically in terms of specialisation courses which focus on sustainable environmental design.

SOURCES AND REFERENCES

Faculty of Architecture of Ljubljana website: www.fa.uni-lj.si/default.asp?id=1721
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Chamber of Architecture and Spatial Planning of Slovenia (ZAPS)

The Chamber of Architecture and Spatial Planning of Slovenia (ZAPS) is an official organisation of architects, urban designers, landscape architects and spatial planners with a state licence to produce all types of plans from this field. It has developed from the Section of Architects (MSA) of the Engineering Chamber of Slovenia (IZS), founded in 1997 and has around 1,350 members.

The new organization is an opportunity to further develop its work and to become much more effective in improving the status of its professional members and to influence positive changes in the environment. ZAPS is a member of the Architects Council of Europe.

Conditions for Professional Qualification

In Slovenia, the Ministry of Labour, Family and Social Affairs is competent for the recognition of qualifications, to which the candidate addresses an application. Such application must include:

- Application for the recognition of qualification submitted on the stipulated application form;
- Proof of citizenship;
- Degree/diploma, certificate and other evidence of qualification/training;
- Proof of the competent body of the EU member state on the fulfilment of conditions for the performance of the profession or activity in that country (if diploma is from foreign EU country);
- Proof of work experience.

The Ministry of Labour, Family and Social Affairs reviews the application and submits it for an opinion to the Ministry of the Environment, Spatial Planning and Energy which prepares a binding written opinion on the adequacy of the candidate’s qualifications within a term of one month as of the receipt of the application. As regards the candidate’s work experience, the Ministry of the Environment, Spatial Planning and Energy determines whether the candidate may perform as a responsible architectural design engineer for less demanding or complicated constructions, for which he/she needs at least three years of work experience, or as a responsible architectural design engineer for demanding constructions, for which he/she needs at least five years of work experience.

On the basis of the opinion of the Ministry of the Environment, Spatial Planning and Energy, the Ministry of Labour, Family and Social Affairs issues a decision on the recognition of the qualification for performing the profession of a responsible architectural design engineer. On the basis of such issued decision, the architect submits an application for registration with the Chamber of Architecture and Spatial Planning of Slovenia.

SOURCES AND REFERENCES

Chamber of Architecture and Spatial Planning of Slovenia website: www.arhiforum.si/index.php?LNG1=si

Spain

UNIVERSIDAD DE SEVILLA
ESCUELA TÉCNICA SUPERIOR DE SEVILLA- ETSA

Diploma in Architecture (5 years)

Level: Graduate (DipArch, 5 years+ Final Project)

Accrediting Body: Spanish Ministry of Education

Educational Aims: This qualification has the aim of providing a solid theoretical and technological basis, without forgetting the narrow relationship between technical, artistic and humanistic knowledge. One of its main objectives is to train professionals who will be capable of designing buildings with structural, construction and aesthetic criteria. The first year of this degree focuses on mathematics and physics and on systems of representation. The following years use these instrumental subjects to apply them to design - through the analysis of architectural works and the project - and to construction skills, structures and installations. Moreover, in-depth training is provided in History of Architecture and Composition. Nowadays, specialities do not exist as such, although the educational organization of the school allows the student to develop a curricular line orientated towards building, urban planning or heritage.

Outline Description of Course: The global teaching load of the degree in Architecture at the University of Seville adds up to 450 credits. 242,7 credits correspond to core modules, 112,3 correspond to obligatory modules, approximately 50 credits correspond to elective modules and approximately 45 to free-choice modules. Every academic year has 90 credits. Once all the credits established by the teaching program are completed, the student must pass an exam for the Final Project. The minimum period of study for this degree is five years plus the final year exam. The core modules are developed through two cycles and the obligatory and elective modules are structured in three curriculum lines: Building, Urban Planning and Heritage, each of which has 50 credits. The free-choice modules allow the student to complete all the credits at the Faculty but can also be obtained at other centres. The School of Architecture of Seville has a wide range of postgraduate modules. PhD studies offer the possibility of obtaining a doctorate in recognition of the development of research and academic work.

Course Structure: The teaching programme of the School of Architecture of Seville is structured in two academic cycles, 1st and 2nd cycle. The first academic cycle consists of two years of lectures and the second cycle consists of another three years and the exam for the Final Project at the end of the degree. Every year, the students take year-long or semester-long modules (one academic year consists of two semesters) which can be core, obligatory, elective or free-choice modules. *Core modules* are those considered essential for the architect's education title according to the general guidelines characteristic of this degree. They must be taken obligatorily. *Obligatory* modules are those considered necessary for the architect's education by the University of Seville. They must also be taken obligatorily. *Elective* modules are those that the student chooses within the program offered by the architecture school among the modules of the three curricular lines. The number of elective modules is determined every year by a total number of credits and they are only studied from the second cycle or third academic year. The set of elective modules can belong to one or several curricular lines. *Free-choice* modules are those that the student chooses among those offered by the University, in coordination with the School of Architecture. The following can also be considered free credits: those coming from professional training in companies, public or private institutions; academically-led works integrated in the teaching program; studies carried out in the frame of international agreements subscribed by the university and other activities recognized by the School of Architecture of Seville.

Diploma in Architecture (5 years + Final Project)

Teaching program 1998 (B.O.E. date: 12-01-98)

Duration: 1S (1st semester); 2S (2nd semester); A (Full Year)
Type: C (Core); O (Obligatory); E (Elective)

Year 1

Module	*Duration*	*Type*	*Credits*
Computer Design	A	C	9
Geometry	A	C	12
Mathematics I	A	C	12
Construction I	1S	C	6
History of Architecture I	1S	C	9
Physics I	2S	C	6
Architectural Design I	2S	O	12
Architectural Design Analysis	A	O	24

Year 2

Module	*Duration*	*Type*	*Credits*
Architectural Design II	A	C	22,5
Structures I	A	C	12
Theory of Architecture	A	C	9
Urban Planning I	A	C	9
Construction II	A	C	12
Mathematics II	A	O	9
Physics II	A	O	9
History of Architecture II	A	O	7,5

Year 3

Module	*Duration*	*Type*	*Credits*
Architectural Design III	A	C	20
Structures II, Soil Mechanics and Foundations	A	C	9,7
History of Architecture III	A	C	7,5
Construction III	A	C	10
Architectural Composition	A	C	7,5
Conditioning I	2S	C	5
Urban Planning II	A	C	10
Systems of Open Spaces and Urban Landscape	2S	E1	5
Numerical Methods of Calculation	1S	E2	4,5
Architecture and Heritage - Basic Concepts	1S	E3	4,5

Year 4

Module	*Duration*	*Type*	*Credits*
Architectural Design IV	A	C	19,5
Soil Mechanics and Foundations II	1S	C	5
Construction IV	A	C	10
Installations I	2S	C	7,5
Structures III	1S	O	5,3
Urban Planning and Development	A	O	10
Urban Systems of Communications - Design of Networks	2S	E1	4,5
Land and Metropolitan Planning	1S	E1	8
Urban Installations	2S	E1	4,5
Urban Development Works	1S	E1	4,5
Acoustics and Energy Exchange in Buildings	1S	E2	4,5
Structures Complements	2S	E2	4,5
Special Structures	2S	E2	5,5
Other Technologies – Industrialization, Reports and Valuation	1S	E2	8
Architecture and Environment	2S	E3	4,5
Fundamentals of Habitation	1S	E3	5
History and Criticism of Andalusian Architecture	1S	E3	5
Pathology and Restoration of Brickworks	2S	E3	4,5
Projects and Works Supervision - Quality Control	1S	E3	5

Year 5

Module	*Duration*	*Type*	*Credits*
Organization and Management of Works	2S	C	4,5
Urban Management	1S	C	5
Final Project	1S-2S	C	3
Conditioning and Installations II	1S	O	5
Architectural Design V	A	O	20,5
Construction V	A	O	10
Environmental Planning	2S	E1	4,5
Special Planning and Heritage Protection	1S	E1	7
Local Planning and Urban Projects	A	E1	12
Special Foundations	2S	E2	6,5
Structures Projects	A	E2	12
Fire Protection, Transport and Communications	1S	E2	4,5
History of Latin American Architecture	2S	E3	4,5
Photogrammetric Drawing& Analysis of Buildings	2S	E3	4,5
Heritage Intervention Works	1S	E3	12,5

Learning Outcomes: The architect trained through this program acquires the skills to approach the design, the planning, execution and direction of woks of a project. This way, graduates are capable of taking part to all the phases of the project, including its development and implementation, as well as having the capacity of coordinating all the details, from the initial phase of the project up to the supervision of its implementation. The learning outcomes for any Spanish student of architecture are established by the Ministry of Education at the national level according to EU rules. This is reflected in the Order ECI/3856/2007 (of national scope), which states the following skills that all the students of architecture in the Spanish territory must acquire:

- Architectural design skills to create projects that satisfy both aesthetic and technical requirements;
- Adequate knowledge of the history and of the theories of architecture, as well as of the arts, technology, and human sciences related to architecture;
- Knowledge of the fine arts as a factor that can influence the quality of architecture;
- Suitable knowledge of urbanism, planning, and technologies used in the process of urban planning;
- Ability to understand the relationship between people and buildings and between buildings and their surrounding environment, as well as the need to relate the buildings and the spaces between them depending on the needs and human scale;
- Capacity to understand the building profession and its role in society, particularly in the design of projects that take into account social factors;
- Knowledge of the research methods and preparation of the detail design project;
- Understanding of the problems of structural design, construction and engineering related to the design of buildings;
- Suitable knowledge of the physical problems and the different technologies available, as well as of the function of buildings, so that buildings are provided with internal comfort conditions and protected from climatic factors;
- Ability to satisfy the requirements of the buildings' users within the limits imposed by budgetary factors and building regulations;
- Suitable knowledge of the industries, organizations, regulations, and procedures to design buildings.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Since the 1980s, the School of Architecture of Seville has hosted a research group initially called *Seminar of Bioclimatic Architecture* and later *Seminar of Architecture and Environment*, which has been developing environmental issues and applying them in the teaching methods of the module on **Architectural Composition**. However, with the splitting of this module in two parts in recent years, there is no certainty that these topics are taught equally in the different teaching groups. With the gradual introduction of the 1998 curriculum, the modules **Architecture and Environment** and **Planning and Environment** have been created as elective semester-long modules offered at the 4th and 5th year respectively. The theoretical content and methodology of the practical classes of these modules are hereafter described.

Architectural Composition, at 3rd year, focuses on knowledge and understanding of the architectural fact in all its complexity from a scientific, environmental, hermeneutic and formal approach. The environment is considered as one of the main variables to take into account in the architectural and urban project, thereby occupying a major place in the program. Conceptual issues are addressed, and examples of environmental architecture and urban design are studied. Students are asked to include these issues in their practical work.

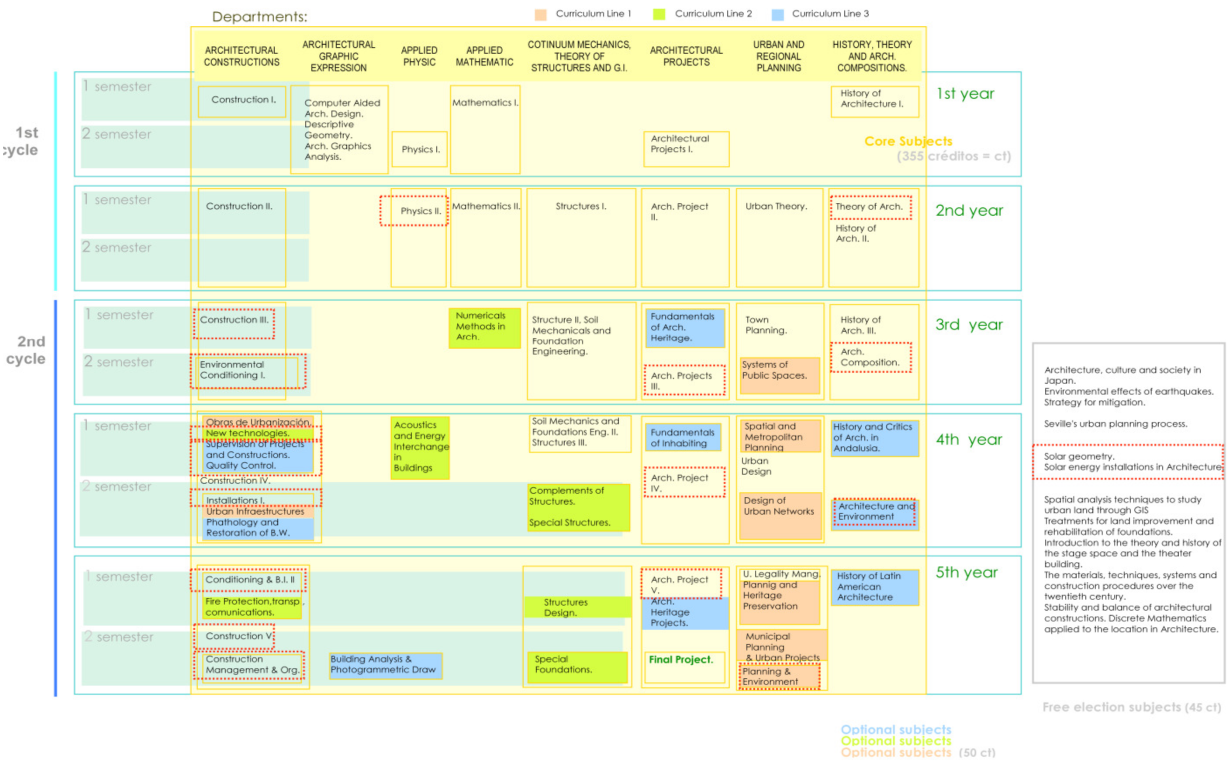
Architecture and Environment, at 4th year, is an elective module that analyses ecological and scientific fundamentals of dwellings. The program proposes a structure and treatment of key issues to be considered when undertaking an architectural project and also approaches a design methodology that includes energy-environmental criteria in the development of architectural design. The students are asked to do an in-depth practical work on a research topic of their choice among the contents of the module.

Environmental Planning is a 5th year elective course that considers the relationship between the city and the territory from a sustainability perspective. Urban planning is used and developed as a basic tool for the protection of natural areas and proper management and planning of land in general. The course addresses the design of the urban space from a planning methodology that uses sustainability indicators. The students share a common practical work in which, without losing the overall perspective, different groups cover a specific topic or a particular field in both the gathering and analysis of information and in the design process. The groups of students present their work to one another periodically.

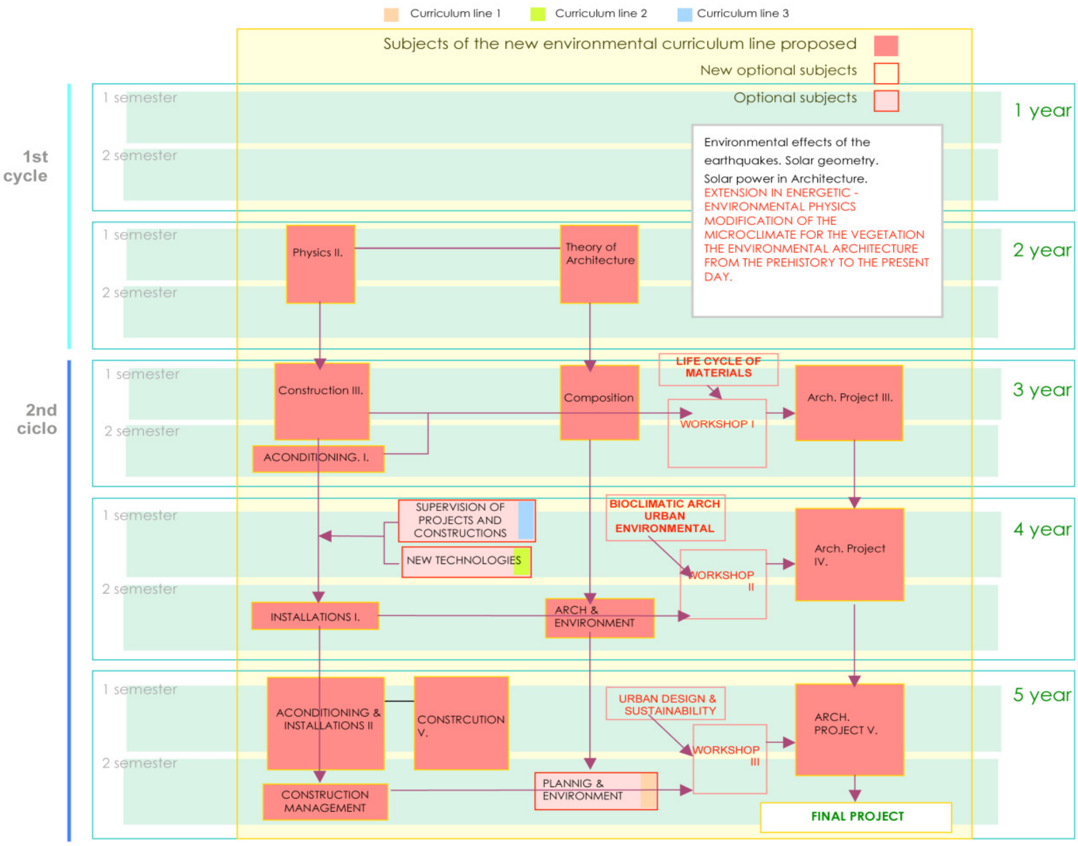
Within the programme, many other modules clearly address environmental issues, although these are not explicitly declared as being part of an environmental sustainability agenda. Some examples are Physics II, Theory of Architecture, Solar Geometry, Construction III, Construction V, Other Technologies, Organization and Management of Works, Installations, Architectural Design III, IV and V and Solar Energy Installation in Architecture. Moreover, it has to be pointed out that many teachers at the School of Architecture of Seville have shown interest in the gradual introduction of environmental issues, many of whom have been progressively introducing them in different modules of the academic curriculum.

Integration of Environmental Design in the Curriculum – Diploma in Architecture (current structure)

Outline subjects with interest in environmental issues:



Integration of Environmental Design in the Curriculum – Outline of Proposed Structure



STRENGTHS AND OPPORTUNITIES

The current program of studies includes modules which approach energy-environmental issues, some as the main focus of their contents and others in an implicit or secondary way. This system entails the following strengths and opportunities:

Strengths:

- The fact that the current programme includes several elective and free-choice modules with sound energy-environmental contents allows enough flexibility for a student interested in such issues to develop his/her own environmental curricular line through the choice of a specific selection of modules and teachers;
- Due to the increasing interest in such issues, not only from the teaching staff but also from a professional point of view, there is an increasing number of conferences and seminars that the students can attend and which take place inside the University;
- The fact that this kind of teaching is non-compulsory changes the students' view and predisposition, raising their enthusiasm, which leads them to better benefit from their contents. This also applies to the free-choice topic to be developed in the practical work of modules such as Architectural Composition or Architecture and Environment.

Opportunities:

- The current European regulations support all kinds of educational improvements related to the introduction of energy and environmental issues in architecture, although it is not actually demanded by these regulations;
- The current Spanish regulations permit the proposed necessary change and even promote it by demanding teaching methods which are more appropriate for the needs of today’s architectural practice, which undoubtedly include environmental and sustainability issues;
- The interest shown at the Escuela Técnica Superior de Arquitectura of Seville - by students and teachers alike - regarding issues related to the natural environment and architecture allows and fosters the creation of an environmental curriculum that includes this kind of knowledge in the teaching of architecture;
- The Escuela Técnica Superior de Arquitectura of Seville is currently immersed in the process of creating a new programme adapted to Europe, which means there is great opportunity to introduce environmental contents in the structure of the curriculum. Within the two proposals that are currently being developed, there two different ways of introducing these contents which are not necessarily incompatible (*please compare with proposed outline described in the previous page*): a longitudinal approach that proposes the creation of a fourth curricular line that includes non-compulsory modules throughout the second cycle; and a transversal approach that proposes the introduction of markers or headlines that provide some thematic orientation to the contents found in the different areas of knowledge of a semester and which will converge in the workshop’s proposed project. This new pedagogical strategy attempts to train architects with lots of general knowledge as a Bachelor, leaving the specialization for a later Master. This conveys the concept of architectural teaching as complex and transversal, as part of a vast cultural reality, with different roots but with a common trunk for diverse architectural specialities. Of this radical and transversal concept of architecture, some essential teaching principles can be extracted so as to take advantage of them when introducing environmental issues.
- Even though the architectural practice is conceived as an essential synthesis of all subjects and disciplinary areas, it starts from conceptual and teaching fragmentation. The instrument for the integration of architectural design is the Architectural Design Workshop. The curriculum has 8 modules, one for each semester of the second, third, fourth and fifth year. The student will produce during the whole duration of the academic training eight design developments and one Final Design Project. In each module, there will be at least one teacher properly trained in this subject who will stimulate the use of energy and environmental solutions in the design projects, as well as help other teachers to familiarize with sustainability and environmental solutions;
- The need for an in-depth basic initiation in the fundamentals of architecture - mostly from a theoretical point of view - in the search for common principles within particular problems. These fundamentals will be taught in the first and second semester of the first year and will comprise all areas of knowledge. Introducing specific knowledge of environmental issues in this first stage, will provide the student with criteria and instruments that they may apply themselves during the rest of their academic training.
- The transversal and longitudinal coordination of teaching will be achieved through the various relations between syllabuses and teaching projects, always bearing in mind the content and focus of

each semester. Several thematic markers have been thought of that have a close relation to sustainability and the environment such as "territory, landscape and environment" or "architecture and ecology".

SOURCES AND REFERENCES

Programme of the School of Architecture of Seville
http://www.etsa.us.es/index.php?option=com_content&view=article&id=58&Itemid=65
Proposal of New Programme of the School of Architecture of Seville
http://www.etsa.us.es/index.php?option=com_content&view=frontpage&Itemid=97

UNIVERSIDAD POLITÉCNICA DE VALENCIA
ESCUELA TÉCNICA SUPERIOR DE ARQUITECTURA - ETSAV

Diploma in Architecture (5 years)

Level: Graduate (DipArch, 5 years+ Final Project)

Accrediting Body: Spanish Ministry of Education

Educational Aims: The basic function of the programme in Architecture at the Escuela Técnica Superior de Arquitectura de Valencia is aimed at organizing the different teaching subjects necessary for the qualification of architects. The programme fosters the development of all the skills that the future professional will need. By means of theoretical and practical classes, students have access to all the necessary knowledge - both technical and artistic - that will allow them to have a solid base of competence. Elective modules from year 3 will allow students' specialization.

Outline Description of Course: The school of Architecture of Valencia is organized in five teaching years, each of which is divided in two semesters. Throughout those five years, students have access to a series of core, elective and free-choice modules, which include sustainability issues in various degrees and by means of different approaches. The number of credits is 42 for semester, which adds up to 420 throughout the whole teaching period. The evaluation system allows students to demonstrate all their knowledge of the matter and their skills for the application of these issues. Evaluation is a complex process which takes into account different dimensions and criteria. The assessment covers outcomes of students' work, as well as the teaching-learning resources and processes used. The knowledge acquired by the student is considered essential, but also the maturity of those who aspire to take to professional practice. During the first two years, students have a closed program of core and obligatory modules. However, from the third year until the fifth they have some obligatory modules and a wide range of elective modules to choose from. Some of them have a specific environmental character and they allow interested students to go deep into aspects that go from sustainable development to the bioclimatic parameters in architectural design, including sustainability as an instrument for design.

Course Structure: Each year is made up of semester or annual modules which are combined in such a way that every semester the student faces a program of 42 credits combining design and technological modules.

<u>Diploma in Architecture (5 years)</u>

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
5350	Architectural Analysis	13,5	Full Year
5348	Architectural Drawing	11	Full Year
5351	Physical Fundamentals in Architecture	7	Autumn
5352	Mathematical Fundamentals in Architecture	11	Full Year
5349	Geometry	10	Full Year
5354	Introduction to Architecture	4.5	Autumn
5347	Introduction to Construction	5.5	Autumn
5353	Introduction to Architectural Design	6.5	Spring

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
6254	Extension of Physics	6.5	Spring
6253	Extension of Mathematics	6.5	Autumn
6229	Art History	5.5	Autumn
6230	History of Architecture	5.5	Spring
6227	Introduction to Building´s Structures	12	Full Year
6226	Building Materials	9	Full Year
6228	Architectural Design I	16.5	Full Year
6231	Urban Planning I	12	Full Year

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
6237	Construction I	10	Full Year
6243	Structures II	11	Full Year
6234	History of Architecture	4.5	Autumn
6248	Architectural Design II	16.5	Full Year
6235	Theory and Criticism of Architecture I	9	Spring
6231	Urban Planning II	11	Full Year

(*Elective Modules*) - Students must take 39 credits from this group:

Autumn

6334	Extension of Mechanics	6.5
6269	Graphical and Chromatic Analysis	6.5
5358	Thematic Architecture: New Housing Alternatives	6.5
5358	Thematic Architecture: Reflections Concerning the Patio	6.5
5355	Computer-Aided Drawing	6.5
6265	Design and Structures Projects	6.5
6265	Architectural Design. From the Concept to the Project	6.5
6262	Environmental Context and Architectural Design	4.5
6336	French for Architects	6.5
5356	Ruler and Compass Geometry	6.5
6335	English for Architects	6.5
5349	Introduction to Composition	6.5
6109	Linear Optimization in Architecture	6.5
5351	Bioclimatic Parameters in Architectural Design	6.5

Spring

6270	Computer-Aided Urban Planning	6.5
6268	Analysis of Historical Constructive Systems	6.5
5361	Thematic Architecture I: Design, Space and Light	6.5
5361	Thematic Architecture II: Alvaro Siza´s Architecture	6.5
6339	Historical Evolution of Theories and Structural Systems	6.5
6271	The Shape of the City: Methodology of Intervention in Urban Emptiness	6.5
6263	Plan Drawing of the Built Heritage	6.5
5362	Applied Mathematics in Architecture	6.5
5360	3d Digital Models	6.5
6267	Artistic-Architectonic Heritage	6.5

Year 4 (*Compulsory* Modules)

Code	*Title*	*Credits*	*Taught*
6232	Conditioning and Installations I	11	Full Year
6233	Conditioning and Installations II	8,5	Spring
6238	Construction II	10	Full Year
6236	Composition	5,5	Spring
6256	Economy and Management of Works	4,5	Spring
6255	Structures III	5,5	Autumn
6249	Architectural Design III	16,5	Full Year
6257	Urban Planning III	9	Autumn

(*Elective Modules*) - Students must take 13 credits from this group:

Autumn

Code	*Title*	*Credits*
6277	Architectural Acoustics	6,5
6279	Thematic Architecture III. Workshop 2	6,5
6279	Thematic Architecture III. Workshop 5	6,5
6273	Comfort in Closed Spaces	6,5
6278	Structures. Computation and Numerical Methods I	6,5
6280	Intervention in Urban Residential Areas	6,5
6274	Technology and Intervention in Heritage	6,5
6272	Theory of Architecture II	6,5

Spring

6287	Metal Structures	6,5
6285	Analysis and Generation of Architectural Prototypes	6,5
6284	3D Applications to Architectural Design	6,5
6289	Thematic Architecture IV. Workshop 2	6,5
6288	Economy and Urban Planning	6,5
6282	Pathology of Constant and Discontinuous Coatings	6,5
6283	Precaution, Safety and Health in Construction	6,5
6290	Design on Built Surfaces	6,5
6281	Theory of Architecture III	6,5
6276	Architectural Topography and Aerial Maps	6,5

Year 5 (*Compulsory* Modules)

Code	*Title*	*Credits*	*Taught*
6252	Law in Architecture	5,5	Spring

6240	Construction III	10	Full Year
6259	Valencian Urban Legislation	4,5	Autumn
6246	Soil Mechanics and Foundations	5,5	Autumn
6260	Architectural Design IV	8,5	Autumn
6250	Final Degree Project	6,5	Spring
6258	Architectural Restoration	4,5	Autumn

(*Elective Modules*) - Students must take 39 credits from this group

Autumn

6297	Analysis with Finite Elements	6,5
6301	Architecture and Landscape. Workshop 1	6,5
6301	Architecture and Landscape	6,5
6296	Measurements and Valuations	6,5
6292	Design on Built Surfaces	6,5
6306	Regime of Architectural Heritage	6,5
6303	Urban Planning and Environment	6,5

Spring

6327	Thematic Architecture V	6,5
6315	Complements of Soil Mechanics	6,5
6320	Structures Design II	6,5
6329	Landscape Design	6,5
6318	Mixed and Wood Structures	6,5
6313	Concrete Slabs	6,5
6330	Urban Management: Programs and Projects	6,5
6308	History of Architecture III	6,5
6332	Initiation to the Architectural Practice	6,5
6295	Urban Installations	6,5
6304	Intervention in Metropolitan Areas	6,5
6326	Materialization of the Architectural Project	6,5
6331	Urban Morphology	6,5
6328	Land management. Workshop	6,5
6299	Organization of Building Firms	6,5
6325	Designing on the Constructed	6,5
6317	Design and Execution of Structural Systems of Buildings	6,5
6305	Technologies related to GIS	6,5
6322	Viability of Real-Estate Developments	6,5

Learning Outcomes: The learning outcomes or general competences for any Spanish student of architecture are established by the Ministry of Education at the national level according to EU rules. This is reflected in the Order ECI/3856/2007 (of national scope), which states the following skills that all the students of architecture in the Spanish territory must acquire:

- Architectural design skills to create projects that satisfy both aesthetic and technical requirements;
- Adequate knowledge of the history and of the theories of architecture, as well as of the arts, technology, and human sciences related to architecture;
- Knowledge of the fine arts as a factor that can influence the quality of architecture;
- Suitable knowledge of urbanism, planning, and technologies used in the process of urban planning;
- Ability to understand the relationship between people and buildings and between buildings and their surrounding environment, as well as the need to relate the buildings and the spaces between them depending on the needs and human scale;
- Capacity to understand the building profession and its role in society, particularly in the design of projects that take into account social factors;
- Knowledge of the research methods and preparation of the detail design project;
- Understanding of the problems of structural design, construction and engineering related to the design of buildings;
- Suitable knowledge of the physical problems and the different technologies available, as well as of the function of buildings, so that buildings are provided with internal comfort conditions and protected from climatic factors;
- Ability to satisfy the requirements of the buildings' users within the limits imposed by budgetary factors and building regulations;
- Suitable knowledge of the industries, organizations, regulations, and procedures to design buildings.

EXECUTIVE SUMMARY – Environmental Design in the Academic Curriculum

During the first year, students face a closed program where several semester modules introduce them to environmental design and the technical requirements that a building must meet in order to be considered habitable. Educational training in this year is therefore both technical and humanistic. Thus, modules such as **Architectural Design** coexist with others such as **Physical Fundamentals** or **Introduction to Construction**, providing the student with a solid scientific base. This implies that from the beginning, students learn how buildings should work in terms of thermal transmission, sound or habitability of the spaces; they also learn the importance of light theory and environmental conditioning, whilst simultaneously acquiring technical skills that they would be able to apply in a later stage.

At first year, the importance of sustainable design of buildings is dealt with in the modules **Introduction to Architecture** and **Introduction to Architectural Design**, where the student approaches architecture in terms of its moral dilemmas: use, comfort, habitability, mimesis, nature, sustainable urbanism, etc. Students start to understand the importance of location: environment, environmental quality, sustainable development, etc, although in the case of Introduction to Architecture this will mostly depend on the workshop that the student chooses.

In the second year, also within a closed course, the students' technical training in environmental subjects is reinforced by **Extension of Physics**. This scientific subject plays an important role for the student to obtain a solid technical base. After understanding how and why the thermal, acoustic and light processes work, the student will be able to face the constructive process in a conscious way. This theoretical background allows the students to choose correctly among different alternatives and find solutions for the materialization of the project in a respectful way that meets the current cultural, aesthetic, social and environmental needs.

The modules **Architectural Design I** and **Urban Planning I** are taught via several workshops, each of which has its own educational targets and assessment method. This leaves the introduction of environmental criteria to the choice of the teaching staff. In the program of the different workshops, sparse references to sustainability are found. There are exceptions, like Urban Planning I, which has among its aims the study of the territory in relation to the environment, as well as mobility and sustainability in the current city.

In the third year of studies, the syllabus is more flexible and, apart from of the obligatory modules, students can choose in the first semester between 30 elective modules. Among obligatory modules there is only one with a reference to environmental issues. One of the workshops of the module **Urban Planning II** deals with the urgency for a new urban development paradigm concerning sustainability as an alternative to the obsolete urbanism of modernity.

Against this generic absence of environmental content in the obligatory modules, students interested on research on sustainability in architecture find four interesting proposals among elective ones. **Thematic Architecture I: New Housing Alternatives** tries to show students in detail the current experiences about dwellings, dealing with both energy and social questions. **Architectural Design and Environment** deals with the environment and sustainable development, energy, natural conditioning, etc. **Bioclimatic Parameters** explores contents that can be summarized in four main blocks: climate and bioclimatic architecture, solar radiation, heat transmission and lighting. **Thematic Architecture II: Design, Space and Light** seeks to raise awareness towards appreciation and handling of the light in architectural design, fostering a correct use of natural light.

In the fourth and fifth year, obligatory modules continue combining with other two elective courses, which specifically allow students to integrate environmental considerations in their educational training. This way, the fourth year offers in-depth technical knowledge on the questions that influence thermal well-being in closed spaces, dealing with the environmental parameters necessary to reach comfort and the application of passive bioclimatic strategies during the different seasons.

Sustainability as an Instrument for Design is another elective module offered within the Design Department, whose aim is to train students in such a way that they acquire the knowledge to conceive buildings where the new principles of sustainable development are integrated.

In the fifth year, the number of elective modules dealing with sustainability issues is extended; they mostly offer a wide range of workshops that work on design and the green element, urban planning and landscape. Other courses are aimed to help the student materialize sustainability throughout their conception and design process to the Final Project.

STRENGTHS AND OPPORTUNITIES

The programme of the School of Architecture of Valencia offers to students elective modules so that they can elaborate a curriculum where environmental considerations are developed from a technical, urban, or design point of view. However, the programme lacks spaces where all this knowledge can be integrated in a coherent way in order for graduates to be able to build a general picture of how sustainability in architectural design can influence more decisions than can be initially considered. This structure reveals a number of strengths and opportunities, namely:

Strengths:

- The system proposed in the curriculum allows the student to select a determined number of modules from the third year. It enables interested students to obtain a specialized curriculum with high environmental content, so much in the design as on the scientific side;
- The wide offer of elective modules specifically directed to the environmental training of the architect allows the distribution of contents and therefore conveys a degree of specialization and intensity that would not be possible in the case of fewer environmental-related modules;
- Elective modules which are the result of the increasing interest of society in environmental issues increase the number of school activities such as conferences, seminars, etc.;
- Due to the fact that the modules that deal specifically with environmental topics are elective, students are very motivated and so they are usually highly involved.

Opportunities:

- The wide range of existing specialized modules indicates the presence of a highly prepared and motivated teaching staff in the school, who should be encouraged;
- The new social conscience demands the presence of environmental topics in the curriculum of any professional, and therefore the school - as the institution in charge of the architect's training - should provide an answer to this;
- Spanish regulations promote change and the Ministry of Education is doing a great effort in integrating environmental training at all educational levels.

SOURCES AND REFERENCES

Polytechnic University of Valencia website: http://arq.webs.upv.es

UNIVERSIDAD DEL PAÍS VASCO
ESCUELA TÉCNICA SUPERIOR DE ARQUITECTURA

Diploma in Architecture (5 years)

Level: Graduate (DipArch, 5 years+ Final Project)

Accrediting Body: Spanish Ministry of Education

Educational Aims: Architecture has accompanied humanity from ancient times. It has shaped people and cities. It has formed the character and has given representation to different cultures. Above all, it has contributed to create the field of development of human being, individual and collectively speaking. During the last centuries and due to technological advances, architecture has become more complex, including an increasing amount of humanistic and technical knowledge. The main aims of the architectural studies at the Universidad del Pais Vasco can be summarized in the following: humanistic training; technical training; training focused on urban and environmental problems. Studies conducive to the achievement of an official Diploma in Architecture degree must provide an appropriate training on theoretical basis and technologies related to this field. Its aim consists in training professionals with the capacity of designing buildings, coordinating structure and decoration, as well as the capacity of supervising the process of construction. Another important aim includes the planning and development coordination of urban areas by collaboration with urban committees and also the contribution to the aesthetic planning of landscapes and gardens.

Outline Description of Course: The 2003 program is organized in two cycles of two and three years respectively. During the first year, students deal with core modules which introduce them to the different fields of knowledge (Construction, Architectural Design) and disciplines (Physics, Mathematics) that will be developed in following courses. They also receive instruction about instruments and tools which are basic for the development of architecture: Architectural Drawing and Geometry. During the second year, students are allowed to choose a reduced number of optional, elective and free-choice modules. They can extend the knowledge already acquired during the first year or they can include new and more specific fields of knowledge. In the second stage, the elective and free-choice modules can be taken at any year during the cycle. A Final Project is included in the fifth year. The School has a specific department which is in charge of teaching those subjects belonging to the following fields of knowledge: Architectural Composition; Construction; Architectural Graphic Expression; Architectural Design; Urban Planning. The following departments within the University also contribute to the teaching of some modules: Applied Mathematics; Applied Physics; English & German Philology; Basque Philology. The School also offers a Master degree in Sustainable Building and Energy Efficiency.

Course Structure: The course is organized in five years with a total of 420 credits: 171 credits in the first stage and 249 in the second one. There are 253,5 credits corresponding to core modules, 85,5 to obligatory modules, 36 to elective modules, 42 to free-choice modules and 3 credits to the Final Project.

<u>Diploma in Architecture (5 years)</u>

Teaching Program 2003

Taught: A=Full year; S=semester
Type: C=Core; O=Obligatory; S=Free-choice; E=Elective
P = Pre-requisite (Y/N)
C = Co-requisite (Y/N)

Year 1

Modules	*Taught*	*Credits*	*Type*	*P*	*C*
Architectural Drawing I	A	18	C	N	N
Physical Principles in Architecture	A	9	C	N	N
Mathematical Principles in Architecture	A	9	C	N	N
Geometry	A	9	C	N	N
Introduction to Architecture	S	9	C	N	N
Introduction to Construction	S	9	C	N	N
Introduction to Architectural Design	A	18	C	N	N

Year 2

Modules	*Taught*	*Credits*	*Type*	*P*	*C*
Architectural Drawing II	A	18	O	Y	N
Technical Basque Language I	S	4.5	E	N	N
Geometry & Proportion in Architecture	S	4.5	E	N	N
Basic English for Architects	S	4.5	E	N	N

Introduction to Building Structures	A	9	C	Y	N
Mathematics, Art and Architecture	S	4.5	E	N	N
Construction Materials	S	9	C	N	N
Numerical Methods in Architecture	S	4.5	E	N	N
Architectural Design I	A	18	O	Y	N
Theory of the History of Architecture	S	9	C	Y	N
Theory of Planning	A	13.5	C	N	N

Year 3

Modules	*Taught*	*Credits*	*Type*	*P*	*C*
Construction III	S	9	C	Y	N
Building Structures I	A	9	C	Y	N
History of Architecture & Planning	S	9	C	Y	N
Installations	A	9	C	Y	N
Architectural Design II	A	18	C	Y	N
Workshop: Urban Planning I	S	9	E	N	N
Workshop: Building Design I	A	9	E	N	N
Urban Planning I	A	9	C	N	N

Year 4

Modules	*Taught*	*Credits*	*Type*	*P*	*C*
Conditioning	A	9	C	Y	N
Construction II	S	9	C	Y	N
Building Economy	S	4.5	E	N	N
Building Structures II	A	9	O	Y	N
Composition & Aesthetics	S	9	C	Y	N
Architectural Design III	A	18	C	Y	N
Workshop: Urban Planning II	S	9	E	N	N
Workshop: Building Design II	A	9	E	N	N
Urban Planning II	A	9	C	Y	N

Year 5

Modules	*Taught*	*Credits*	*Type*	*P*	*C*
Special Foundations	S	4.5	O	Y	N
Construction III	S	6	C	Y	N
Ethics & Laws	S	9	O	N	N
Gardening, Landscape and Environment	S	4.5	C	Y	N
Soil Mechanics	S	4.5	C	Y	N
Final Project	S	3	C	N	N
Architectural Design IV	A	18	O	Y	N
Urban Planning III	A	9	O	Y	N

Elective Modules - 2nd Cycle

Modules	*Taught*	*Credits*	*Type*	*P*	*C*
Bioclimatic Architecture	S	4.5	E	N	N
Urban Economy	S	4.5	E	N	N
Stereotomy	S	4.5	E	N	N
Technical Basque Language II	S	4.5	E	N	N
Technical English for Architects	S	4.5	E	N	N
Urban Infrastructures	S	4.5	E	N	N
Technical Analysis of Heritage Buildings	S	4.5	E	N	N

Learning Outcomes: The graduate student gains skills in those professional challenges for which he has been prepared according to the degree obtained. Some of these challenges are the following: Building design and planning of urban areas, parks, aesthetics within the landscape and a more technical side dealing with costs, materials, structure calculus and coordination of works; Ability to carry out a synthesis between design, needs and social taste and the technological advances in materials, as well as to introduce new spaces and functions related to building construction. The main sectors of activity for graduates are the professional exercise at private studios, construction companies, materials (including prefabricated pieces), industrial design, interior design, Public Administrations , urban development, etc. Within private companies, the functions that an architect can develop are the following: conception; design and construction of buildings; complex urban installations; drainage; urban consulting; recovery and restoration of old buildings; landscaping; research and teaching; management of intermediaries who take part during the construction process in these different aspects: production, finances, marketing, commercial, consulting, human resources, etc.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

There is not a continuous line of environmental studies within the architectural programme. However, there are some modules that deal with these matters. Two of them are core modules and every student must take them; there is also a specific one which is an elective module and covers environmental issues.

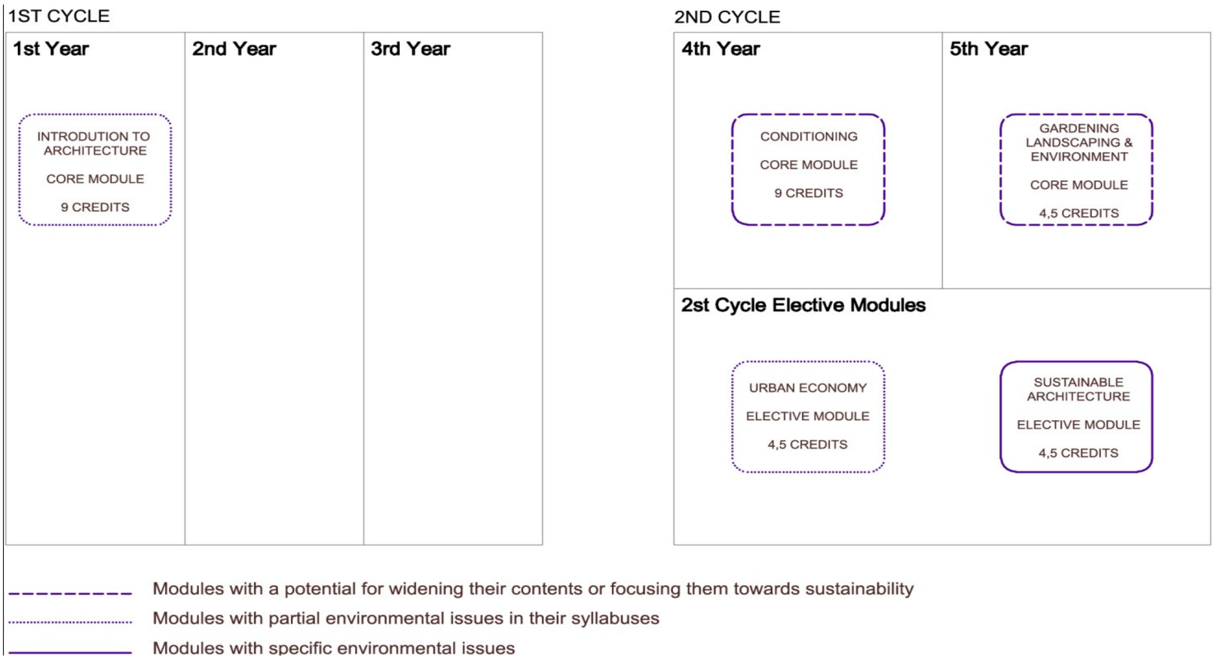
Conditioning is a core module (theoretical credits: 6; practical credits: 3; full year; 4th year) that covers energy efficiency from the point of view of design and pre-measuring. It also mentions the impact of installations on greenhouse gases, energy saving and comfort in buildings. The module tries to provide students with a deep knowledge about the energy needs of each building in order to avoid unnecessary measuring. Students will use updated regulations and they will make reference to the Construction Technical Code, specifically to the basic document titled “Energy Saving”.

Gardening, Landscaping and Environment is a core module (theoretical credits: 3; practical credits: 1.5; 2nd Semester; 5th Year) that - in coordination with the module **Urban Planning III**, which is taught in the same year - has the aim of showing to the students the role of gardening and landscape architecture in the shaping of public areas in the cities. This is understood as a structuring system specifically dedicated to questions such as place, scale, connection with the building, geometry, space, routes and views, elements (architectural, aquatic or vegetation). This knowledge will give the students the basis to understand the elements and mechanisms by which landscape in architecture is created. This will allow them to develop a practical project in this field at a later stage. It is also a question of learning concepts and basic principles of ecology; to know the ecological processes that determine the distribution and abundance of organisms and energy flows in the ecosystem; to study in-depth the knowledge of the numerical models of population dynamics, mainly regarding competence and predation; to familiarize with the process of Environmental Impact Evaluation; to learn the techniques of assessment and correction of impacts; to acquire the ability to draw up a “summary” and to interpret a “Study on Environmental Impact”. Teaching includes theoretical and practical lessons, through which the student can embark on an exercise about the treatment of an open space in which vegetation and water play a special role. This exercise, if possible, will be developed in an integrated way with the one corresponding to the above mentioned module.

Urban Economy is an elective module (theoretical credits: 3; practical credits: 1,5) whose curricular aims are to acquire the basic knowledge needed to analyze the incidence of cost and profit of residential planning at any moment during the process of planning. As a brief introduction, some aspects related to the analysis of incidence of planning in environment, in cost and utility are introduced. Cost and profit in soil preparation, demolition, pedestrian and green spaces in residential areas are also analyzed.

Bioclimatic Architecture is an elective module of the 2nd cycle (theoretical credits: 3; practical credits: 1,5) and is the only degree module that deals directly with issues such as sustainability and environment.

Integration of Environmental Design – Diploma in Architecture



STRENGTHS AND OPPORTUNITIES

In the current programme, there are some modules that have incorporated energy and environmental issues. Some of these issues are the main argument in the syllabus of specific teaching units, while others appear only in an implicit manner. This system implies the following strengths and opportunities:

Strengths:

- An increasing interest towards environmental contents from the students has been detected;
- Environmental contents are timidly present in the curriculum. They are found in modules dealing with these issues in a tangential way or even in a more specific way during the last years of the degree. Once the degree is obtained, students have the possibility of broadening their knowledge embarking on the Master of Sustainable Building and Energy Efficiency.

Opportunities:

- Environmental issues are liable to be introduced in an implicit way in a number of modules, either as complementary contents or as a particular approach to make students think about sustainability from different points of view: construction, structure, conditioning, etc.;
- Some modules show a high potential for widening their contents and focusing them towards sustainability. For example, ‘Introduction to Architecture’ offers the student a general perspective about the discipline and provides some basic and fundamental principles. One of the aims of the program is to identify and use elementary facts, key features and main ideas of contemporary architecture as opposed to those of traditional architectures with a minimum degree of critical conviction, so that the most adequate choices regarding design are taken. A module with such features represents an excellent opportunity to introduce students to environmental issues and stimulate their interest so that they might choose an environmental curriculum at a later stage. Concurrently, in ‘Urban Economy’, although these issues are dealt with in a tangential way - through the introduction of green spaces - there is a great range of economic and quality issues liable to be introduced in the curriculum, as it is the case of sustainability indicators.

SOURCES AND REFERENCES

Faculty of Architecture website: www.arkitektura.ehu.es/p203-home/es/
Curriculum of the School of Architecture of San Sebastián:
http://www.ehu.es/p200content/es/contenidos/titulacion/act_tit_arqui302_240/es_esarq/es_filetit_arqui302_240.html

UNIVERSIDAD POLITÉCNICA DE MADRID
ESCUELA TÉCNICA SUPERIOR DE ARQUITECTURA

Diploma in Architecture (5 years)

Level: Graduate (DipArch, 5 years+ Final Project)

Accrediting Body: Spanish Ministry of Education

Educational Aims: The programme provides opportunities for students to develop and demonstrate appropriate knowledge and understanding, both intellectual and cognitive skills and professional and practical skills. The student takes at a basic level the subjects necessary for the architecture degree, including the development of all the capacities necessary for the professional practice. By theoretical, practical classes and seminars, the students acquire all the technical and artistic knowledge necessary to allow them to have a solid base of competence. In the third year, the elective and free choice modules will allow a certain specialization to the student.

Outline Description of Course: The study of the degree in Architecture is based on the development of five curricular lines: Conservation and Restoration of the Architectural Heritage; Urban Planning and Environment; Building Technologies; Architecture and Contemporary Art; Landscape Architecture. These are decided on by each student via the election of elective and free choice modules. The study of architectural design (a core module in the Architectural education) develops throughout the degree, growing in complexity as the studies advance. This design work is supported by the study of drawing, use of technology and humanities, and also as required by physical sciences. Environmental design and bioclimatic architecture issues enter the curriculum from several perspectives, principally from the urban development and technical point of view, but also more specifically via elective modules. The programme of the Architectural degree at the UPM includes 450 credits and finishes with the presentation and advocacy of an individual Final Degree Project. The minimum period for this degree is five years plus the Final Project. The above mentioned credits of the curriculum are distributed in four–month subjects, each of which corresponds to a module. The credits are distributed as follows: 395 obligatory credits distributed in 42 modules; 10 elective credits to choose among 43 modules; 45 free-choice credits to choose among 44 modules.

Course Structure: The study of Architecture is divided in two stages with a total of five years: 1st and 2nd year, and 3rd, 4th and 5th year. The initial two years require the completion of a minimum of 180 credits (175 in core and obligatory modules, and 5 in free-choices). 270 credits are required for the final part of the degree (220 in core and obligatory modules, 40 in free choice modules and 10 in elective; credits of elective modules can be covered by free-choice modules). Each module has a credit value, distributed in four-month modules. At the end of the degree, the student must complete a Final Project for the award of the Diploma.

<u>Diploma in Architecture (5 years)</u>

Year 1 (*Obligatory Modules*)

Code	*Title*	*Credits*	*Taught*
110	Geometry	10	Autumn/Spring
120	Architectural Design I	10	Autumn/Spring
130	Design, analysis and visualization of Ideas I	10	Autumn/Spring
140	Design, analysis and visualization of Ideas II	10	Autumn/Spring
150	Metric, Projective, Analytic Geometry and Algebra	10	Autumn/Spring
160	Infinitesimal Calculus in Architecture	10	Autumn/Spring
170	Introduction to Architecture	10	Autumn/Spring
180	Practical and Theoretical Physics	10	Autumn/Spring
190	Constructive Systems	5	Autumn/Spring
Credit Total	**85**		

Year 2 (*Obligatory Modules*)

Code	*Title*	*Credits*	*Taught*
210	Architectural Design II	10	Autumn/Spring
220	Architectural Design III	10	Autumn/Spring
230	Design, analysis and visualization of Ideas III	10	Autumn/Spring
240	Introduction to Urban Planning	10	Autumn/Spring
250	Geometry, Differential Equations and Calculus	10	Autumn/Spring
260	Building Materials	10	Autumn/Spring
270	History of Art and Architecture	10	Autumn/Spring
280	Architectural Analysis	10	Autumn/Spring
290	Mechanics of Solids and Structural Systems	10	Autumn/Spring
Credit Total	**90**		

Year 3 (*Obligatory Modules*)

Code	*Title*	*Credits*	*Taught*
310	Architectural Design IV	12	Autumn/Spring
320	Architectural Design V	12	Autumn/Spring
330	Construction, Large Works	10	Autumn/Spring
340	Urban Planning, Basic Concepts and Projects	10	Autumn/Spring
350	Physics and Building Mechanics	10	Autumn/Spring
360	Environmental Conditioning and Equipment Techniques	5	Autumn/Spring
370	History of Architecture and Urban Planning	10	Autumn/Spring
380	Analysis of Structures	10	Autumn/Spring
Credit Total	**79**		

Year 4 (*Obligatory Modules*)

Code	*Title*	*Credits*	*Taught*
410	Architectural Design VI	12	Autumn/Spring
420	Architectural Design VII	12	Autumn/Spring
430	Interior Building Works	10	Autumn/Spring
440	Urban Planning	10	Autumn/Spring
450	Electronic, Lighting & Communication Techniques	5	Autumn/Spring
460	Installations and Technical Services	5	Autumn/Spring
470	Architectural composition	10	Autumn/Spring
480	Structure Measurement	10	Autumn/Spring
Credit Total	**74**		

Year 5 (*Obligatory Modules*)

Code	*Title*	*Credits*	*Taught*
510	Architectural Design VIII	12	Autumn/Spring
520	Architectural Design IX	12	Autumn/Spring
530	Installations, Design and Execution	5	Autumn/Spring
540	Land and Metropolitan Planning	5	Autumn/Spring
550	Structures, Design and Execution	5	Autumn/Spring
560	Gardening and Landscape	3	Autumn/Spring
570	The Architect's profession	12	Autumn/Spring
580	Soil Mechanics and Foundations	10	Autumn/Spring
Credit Total	**64**		

Students must make a Final Degree Project equivalent to 3 credits.

(*Elective Modules*) - Students must take 10 credits from this group:

115	Computer Science Geometry 1	5	Spring
125	Design of Nature	5	Spring
135	Model Workshop	5	Autumn/Spring
137	Introduction to English for Architects	5	Autumn/Spring
601	Structures in Architectural Design	5	Spring
602	History of Construction I	5	Autumn/Spring
603	Wood in Architectural Design	5	Spring
604	Advanced Design and Graphic Interpretation I	5	Autumn
605	Computer Science Geometry II	5	Autumn
606	Computer Science in Furnishings	5	Autumn/Spring
607	Furniture Design I	5	Autumn
608	Statistical Methods I	2,5	Autumn
609	Statistical Methods II	2,5	Spring
611	Furniture Design II	5	Autumn
612	History of Construction II	5	Spring
613	Advanced Design and Graphic Interpretation II	5	Spring
614	Determination and Graphic Restitution of Architecture	5	Spring
615	Communication and Graphic Design	5	Autumn
617	New Building Materials	5	Spring
618	Seminar in Laboratory of Materials I	5	Autumn/Spring
619	Seminar in Laboratory of Materials II	5	Autumn/Spring
621	Industrialised Construction	5	Autumn
622	Advanced Analysis of Structures	10	Spring
624	Architectural Representation, in Print and Photography	5	Autumn
625	Architecture and Urban Planning in Latin America	5	Spring
626	Advanced Acoustics	5	Autumn
627	Professional Applications in English for Architects	5	Autumn/Spring
628	English 3: Cities with Names	5	Autumn/Spring

629	Modern Language: German 1	5	Autumn/Spring
630	Modern Language: German 2	5	Spring
631	Modern language: German 3	5	Autumn
632	History and Theory of Modern Architecture	7,5	Spring
633	Theory and Techniques of Restoration	5	Autumn
635	Geometry Laboratory I	5	Autumn
636	Geometry Laboratory II	5	Spring
640	Case Studies I	7,5	Spring
641	Case Studies II	7,5	Spring
650	Techniques of Urban Analysis	5	Autumn
651	Advanced Studies of Traffic	5	Autumn
652	Urban Design Organization in Europe	5	Autumn
653	Advanced Urban Projects	5	Autumn
654	History of Spanish Architecture	7,5	Autumn
656	Spanish Architecture. Popular Architecture	7,5	Spring

(*Free choice Modules*) - Students must take 45 credits from this group:

701	Photovoltaic Solar Energy for Architects	5	Autumn
706	Analysis and Consolidation of Ancient Constructions	5	Autumn/Spring
708	Design of the City	5	Spring
709	Network and Technologies for 21st Century Urban Planning	5	Autumn/Spring
712	Landscape. Supervision/Protection in undeveloped areas	5	Autumn
714	Residential Projects and Public Space	7,5	Autumn
715	Basic Habitability	5	Autumn
716	Architecture and Landscape I: Drawing Design	5	Autumn/Spring
721	Architecture and Landscape	5	Spring
726	Quarry Workshop	5	Autumn/Spring
728	Practice in Structure Design: Concrete	10	Autumn
729	Practice in Structure Design: Metals	10	Spring
730	Urban Excavations and Induced Effects	5	Autumn
731	Advanced Techniques of Construction	5	Spring
732	Business Organization of Architecture	5	Autumn
736	Bioclimatic Architecture in a Sustainable Environment	5	Autumn
737	Seminar of Textile Architecture	5	Autumn
738	Seminar of Brick Architecture	5	Spring
743	Architecture and Structure in Modern Design	5	Autumn
744	Fundamentals of Modern Architecture	7,5	Spring
745	Classicism and Modernity	5	Spring
746	Spanish Art, from the Enlightenment to the Present Day I	5	Spring
747	Architecture of the Metropolis and Cinema	5	Autumn/Spring
750	Transitory Architecture. From dark room to audiovisual space	5	Autumn
751	Architecture Photography and Graphic Design	5	Spring
754	Spanish Art, from the Enlightenment to the Present Day II	5	Spring
757	Geometry in Avant–garde Architecture	5	Spring
758	Design of the garden and natural space I	5	Autumn
759	Design of the garden and natural space II	5	Spring
760	Construction Management	5	Spring
761	Architecture and Landscape II: Drawing Design	5	Autumn/Spring
763	The Construction of Religious space	5	Autumn
764	Hybrids Actions of Landscape, Art & Architecture of the 20th	5	Autumn
765	Gardening Techniques	5	Spring
766	Architecture and Industry	5	Spring
767	The Expert Activity of Architect	5	Autumn/Spring
768	Industrial Archaeology	5	Autumn
769	The Footprint of History in Architecture	5	Spring
770	Design Processes. Constructive Biographies	5	Autumn
771	Advanced Industrialized Construction	5	Spring
772	Workshop of Gothic Construction	5	Spring
773	Workshop of Experimental Construction	5	Spring
774	Professional Communication between Architect & Engineer	5	Autumn
775	Collaboratory	5	Autumn

Learning Outcomes: The learning outcomes or general competences for any Spanish student of architecture are established by the Ministry of Education at the national level according to EU rules. This is reflected in the Order ECI/3856/2007 (of national scope), which states the following skills that all the students of architecture in the Spanish territory must acquire:

- Architectural design skills to create projects that satisfy both aesthetic and technical requirements;
- Adequate knowledge of the history and of the theories of architecture, as well as of the arts, technology, and human sciences related to architecture;
- Knowledge of the fine arts as a factor that can influence the quality of architecture;
- Suitable knowledge of urbanism, planning, and technologies used in the process of urban planning;
- Ability to understand the relationship between people and buildings and between buildings and their surrounding environment, as well as the need to relate the buildings and the spaces between them depending on the needs and human scale;
- Capacity to understand the building profession and its role in society, particularly in the design of projects that take into account social factors;
- Knowledge of the research methods and preparation of the detail design project;
- Understanding of the problems of structural design, construction and engineering related to the design of buildings;
- Suitable knowledge of the physical problems and the different technologies available, as well as of the function of buildings, so that buildings are provided with internal comfort conditions and protected from climatic factors;
- Ability to satisfy the requirements of the buildings' users within the limits imposed by budgetary factors and building regulations;
- Suitable knowledge of the industries, organizations, regulations, and procedures to design buildings.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

In the first year, the obligatory module **Constructive systems** covers, among other topics, aspects related to environmental design, such as the influence of Bioclimatic Architecture in the election of the type of envelope system (facades and horizontal surfaces) or the function of conditioning and energy flow.

In the third year, the module **Environmental conditioning and equipment techniques** approaches specifically the topic by means of contents such as climate and environment or technologies of environmental conditioning in architecture and urban planning, architectural and constructive criteria of the bioclimatic, environmental and the ecological construction design, etc.

Meanwhile, urban planning is developed tangentially throughout the degree by means of obligatory modules such as **Introduction to Urban Planning** (2nd year), **Urban Planning, bases and projects** (3rd year), **Urban Planning** (4th year) and **Land and Metropolitan Planning** (5th year). These modules are concerned with the planning of a sustainable and balanced city, landscape and ecology, bioclimatic design of cities, sustainability and evaluation of the environmental impact, etc.

In the second cycle, the free-choice modules **Photovoltaic Solar Energy for Architects** (with basic contents of energy, renewable energies and energy in the building) and **Bioclimatic Architecture in the Sustainable Environment** (with the study of climate and bioclimatic design criteria) deal with themes of environmental sustainability in a specific way.

Finally, throughout the curriculum a series of modules are assigned to the *Department of Physics and Facilities Applied to the Building, to the Environment and to Urban Planning* and to the *Department of Mathematics Applied to Urban Planning, to the Building and to the Environment*, which approach environmental design and bioclimatic architecture in a transversal way. Obligatory modules such as **Installations and Technical Services** (year 4) deal with renewable energies, or such as **Advanced Acoustics**, (an elective) which deals with noise pollution and its due treatment

Likewise, environmental subjects appear in a transversal way in **Architectural Design IV** and **V** (it does not appear in all the workshops) and very slightly in some workshops of **Architectural Design IV** and **VII.**

STRENGTHS AND OPPORTUNITIES

The programme includes modules that introduce energy-environmental issues, some as the core of their syllabus, and others as a secondary concern. This system entails the following strengths and opportunities:

Strengths:

- The current curriculum includes several obligatory modules of high educational content on environmental and bioclimatic issues, specifically or tangentially;
- The fact that this implementation develops mainly from the area of Urban Planning and Construction and Technology, makes environmental design of buildings and cities possible, with substantial improvement in the quality of life of its habitants;
- The existence of elective and free-choice modules with energy-environmental content allows the student with interests in these topics to acquire specific knowledge and enquiry in this matter;
- The presence of many modules related to environmental issues ensures a very well prepared teaching staff.

Opportunities:

- The current European regulations support all kinds of educational improvements related to the introduction of energy and environmental issues in architecture, even though they do not actually demand this;
- The current Spanish rules permit the change necessary, and even promote it by requiring a teaching method that is more convenient to solve the needs of today's architectural practice, which undoubtedly include environmental and sustainability issues;
- The teaching of Postgraduate and Doctorate programmes relates to research projects of the Groups of Investigation of the Departments, that develop in very varied areas, such as the new environmental and bioclimatic requirements of Architecture, allowing an additional investigation in the matter once a first degree is completed;
- Likewise, the existence of a Master in Bioclimatic Architecture and Environment allows continuity in the training on bioclimatic architecture.

SOURCES AND REFERENCES

Polytechnic University of Madrid – UPM website: www.aq.upm.es/nuevaweb/

UNIVERSIDAD DE GRANADA

ESCUELA TÉCNICA SUPERIOR DE ARQUITECTURA DE GRANADA

Diploma in Architecture (5 years)

Level: Graduate (DipArch, 5 years+ Final Project)

Accrediting Body: Spanish Ministry of Education

Educational Aims: Formally, the architect is a professional with knowledge in urban and landscape planning, construction and architectural heritage. One of the fundamental aims of the profession - and that of society too - is that the architects are able to fully understand the matters aforementioned. Therefore, their training should be wide and conceptual and, consequently, they will be open to receiving knowledge related to technological advances and the characteristic architectural method. Also, the professional should apply rationally the prevailing law in this way. Moreover, another fundamental mission of the teachers is that the students question their knowledge any time, to continue learning all their life. The success of the process will lie in achieving that the basic training, learned previously by the student, is extended and complemented by a general training of global contents and one more detailed and specific, of principles and concepts, for its prompt application. Students have to learn to synthesize solutions for any specific, daily problem that might appear in the exercise of the profession.

Outline Description of Course: Architectural Design (core module in the Architectural education) develops throughout the degree, growing in complexity as the studies advance. This design work is supported by modules related to drawing, technology and humanities, and also occasionally by physical sciences. Themes of environmental design and bioclimatic architecture enter the curriculum from a technical and, partially, from an urban development perspective, and also from specific issues developed within elective modules. The programme of the Architectural degree from the University of Granada includes 400 credits and culminates with the presentation and advocacy of an individual Final Degree Project.

Course Structure: The programme is divided in two stages with a total of five years of study plus the Final Project. Each module has a credit value. At the end of the degree, the student must complete a Final Project for the Diploma. There are equivalent credits for: Practical work in enterprise, public or private institutions, etc (40 free-choice credits); Academically supervised work integrated in the programme (3 core credits for the Final Project); Studies done via agreement with the University (completely recognized as a core, obligatory, elective or free choice module according to corresponding European directives and the resolutions of the governing council of the University). Maximum of 43 credits is awarded for extra-programme activities (40 free-choice credits + 3 core credits for the Final Project).

Diploma in Architecture (5 years)

(C): Core subjects.
(O): Obligatory subjects

Year 1 (*Obligatory Modules*)

Code	*Title*	*Credits*	*Taught*
11	Building Materials (C)	10.5	Full year
12	Drawing (C)	18	Full year
13	Geometry (O)	15	Full year
14	Fundamentals of Physics in Architecture (C)	12	Full year
15	Fundamentals of Mathematics in Architecture (C)	10.5	Full year
16	Architectural Design I (C)	9	Spring
17	History of Architecture I (C)	7.5	Autumn

Year 2 (*Obligatory Modules*)

Code	*Title*	*Credits*	*Taught*
21	Construction I (C)	7.5	Autumn
22	Architectural Analysis (C)	9	Full year
23	Structures I (C)	10.5	Full year
24	Architectural Design II (C)	18	Full year
25	History of Architecture II (C)	9	Full year
26	Urban Design Theory I (C)	9	Full year
27	Mathematics II (O)	4.5	Spring

Year 3(*Obligatory Modules*)

Code	*Title*	*Credits*	*Taught*
31	Architectural Design III (O)	18	Full year

32	Installations I (C)	6	Autumn
33	Construction II (C)	12	Full year
34	Urban Design Theory II (C)	6	Autumn
35	History of Architecture III (C)	7.5	Autumn
36	Structures II (C)	7.5	Spring
38	Urban Design Theory III (O)	4.5	Spring

Year 4 (*Obligatory Modules*)

Code	*Title*	*Credits*	*Taught*
41	Architectural Design IV (C)	22	Full year
42	Installations II (C)	9	Full year
43	Construction III (C)	7.5	Full year
44	Urban Design Theory IV (C)	6	Spring
45	Architectural Composition (C)	6	Autumn
46	Structures III (C)	4.5	Spring
49	Soil Mechanics and Foundation Engineering (O)	4.5	Autumn

Year 5 (*Obligatory Modules*)

Code	*Title*	*Credits*	*Taught*
51	Architectural Design V (C)	11	Autumn
53	Construction IV (C)	4.5	Autumn
54	Urban Design Theory V (C)	6	Autumn
55	Construction V (O)	4.5	Spring
56	Structures IV (O)	4.5	Autumn
57	Architectural Restoration (O)	6	Spring
58	Architectural Law (O)	4.5	Spring

Students must make a Final Project of Career equivalent to 3 credits.

(*Elective Modules*)

A1	Extension of Mathematics	6	Spring
A2	Extension of Physics	6	Spring
A3	Computer Aided Architectural Design	9	Full year
B1	Urban Analysis	6	Spring
B2	Urban Projects	6	Spring
B3	Architectural Landscapes	6	Spring
B4	Introduction to Architectural Restoration	6	Spring
B5	Architecture and City in Islamic Society	6	Full year
B7	Design Monographs	6	Full year
B8	Earthquake Resistant Structures	9	Full year
B9	Numerical Methods in Architecture	6	Autumn
C1	Materials and Building Techniques	6	Full year
C2	Prefabrication	6	Autumn
C3	Extension of Installations	6	Spring
C4	Urban Installations	6	Autumn
C5	Real–estate Evaluations	6	Full year
C6	Urban History	6	Spring
C7	Photogrammetric Drawing of Buildings	6	Spring
C8	Differential equations I - Derivatives Finite elements	6	Autumn
C9	Visual and presentation technologies applied to architecture	6	Autumn

Learning Outcomes: The learning outcomes or general competences for any Spanish student of architecture are established by the Ministry of Education at the national level according to EU rules. This is reflected in the Order ECI/3856/2007 (of national scope), which states the following skills that all the students of architecture in the Spanish territory must acquire:

- Architectural design skills to create projects that satisfy both aesthetic and technical requirements;
- Adequate knowledge of the history and of the theories of architecture, as well as of the arts, technology, and human sciences related to architecture;
- Knowledge of the fine arts as a factor that can influence the quality of architecture;
- Suitable knowledge of urbanism, planning, and technologies used in the process of urban planning;
- Ability to understand the relationship between people and buildings and between buildings and their surrounding environment, as well as the need to relate the buildings and the spaces between them depending on the needs and human scale;

- Capacity to understand the building profession and its role in society, particularly in the design of projects that take into account social factors;
- Knowledge of the research methods and preparation of the detail design project;
- Understanding of the problems of structural design, construction and engineering related to the design of buildings;
- Suitable knowledge of the physical problems and the different technologies available, as well as of the function of buildings, so that buildings are provided with internal comfort conditions and protected from climatic factors;
- Ability to satisfy the requirements of the buildings' users within the limits imposed by budgetary factors and building regulations;
- Suitable knowledge of the industries, organizations, regulations, and procedures to design buildings.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Environmental design education appears only tangentially within the Architectural Curriculum of the Escuela Técnica Superior de Arquitectura de Granada - without doubt insufficiently for the requirements of the profession. In the third year, the elective and free choice subjects will allow a certain degree of specialization for the students.

In the first stage (second year), there is only one module, **Urban Design Theory I**, which develops tangentially themes of environmental design and its impact on architecture.

In the second stage, core subjects such as **Installations I** (third year) and **Installations II** (fourth year) also deal in a tangential way with subjects related to environmental sustainability such as environmental conditioning techniques in architecture and urban planning.

Within the elective modules on offer, **Architectural Landscape** deals primarily with the management of natural resources, whilst **Extension of Installations** focuses on solar energy and energy saving.

Finally, throughout the degree, a series of modules assigned to the Department of Applied Physics are included in the teaching programme, which treat transversally the matter of environmental design and bioclimatic architecture. Amongst others, **Fundamentals of Physics in Architecture** (core module of the first year) and **Extension of Physics** (elective) deal with acoustics and illumination.

STRENGTHS AND OPPORTUNITIES

The current programme includes subjects that introduce energy-environmental issues, although generally as a secondary concern. This entails the following strengths and opportunities:

Strengths:

- The current curriculum includes some obligatory modules containing environmental and bioclimatic contents with their consequent development;
- The fact that this implementation develops principally from the area of technology, makes possible the consideration of environmental design in buildings;
- The existence of elective modules with energy-environmental contents allows the students concerned with these topics to guarantee specific knowledge in this matter and to investigate it.

Opportunities:

- The current European regulations support all kinds of educational improvements related to the introduction of energy and environmental issues in architecture, even though they do not actually demand this;
- The current Spanish rules permit the change necessary, and even promote these changes by requiring a teaching method that is more convenient to solve the needs of today's architectural practice, which undoubtedly include environmental and sustainability issues;
- The development of the Bologna Process and its introduction through a new programme is an opportunity to offer better training on environmental matters, which is at the moment very limited.

SOURCES AND REFERENCES

Escuela Técnica Superior de Arquitectura de Granada website: http://etsag.ugr.es/

UNIVERSIDAD DE A CORUÑA

ESCUELA TÉCNICA SUPERIOR DE ARQUITECTURA DE A CORUÑA

Master of Architecture (5 years)

Level: Graduate (MArch, 5 years+ Final Project)

Accrediting Body: Spanish Ministry of Education

Educational Aims: The School of Architecture at the University of La Coruña refers to national regulations concerning the structure of its programme, as in Spain the Ministry of Education decides the aims and competences of each degree. This refers to the general aim of training architects by means of teaching methods which have a balance between the theoretical and practical aspects of the architectural profession. The programme of the Architecture School therefore tries to offer teaching methods which are adapted to the new needs of the students within the contemporary society. The curriculum provides the student with all the skills, aptitudes, abilities and knowledge necessary for a successful development of any architectural design project until its complete execution, complying with the technical and administrative regulations.

Outline Description of Course: The degree consists of 300 credits and it ends with the presentation and advocacy of a Final Project. The credits of the course are distributed in four-month subjects, each of which corresponds to a module. The credits are distributed as follows: 282 obligatory credits distributed in 44 subjects of 6 ECTS credits and 2 subjects of 9 ECTS credits; 18 elective credits distributed in 4 subjects of 4.5 credits. The curriculum also considers the possibility of dedicating 4.5 credits to external non-obligatory professional training to be validated as elective modules. The programme goes into detail in the description of the skills and targets reflected by the law and classifies them as follows: specific, transverse and nuclear skills. Many of these skills involve the topic of environmental design in the university curricula.

Course Structure: The 300 credits of the programme to be obtained before the Final Project are distributed in 5 years of 60 credits each. Every year is divided into 2 semesters of 30 credits with 5 subjects of 6 ECTS credits each (except the 9th and 10th). Teaching is mainly delivered through the Workshop (Studio) as a learning tool. The Workshop is a working space to exchange knowledge and has been conceived to facilitate the confluence of contents of the different subjects around the architectural design project. The aim for this is to ensure optimization of teaching resources and rationalization of student work. The Workshop therefore tries to establish interdisciplinary dialogue and collaboration throughout the curriculum, avoiding duplicities and unnecessary repetition of the contents. It attempts to help the student to move securely from one semester to the next and to minimize the negative effect of scattered subjects. The Final Project is a complete architectural design project developed at a professional level, which should also pay attention to the relevant urban development aspects. It is mainly developed in the Final Project Workshop. The project should comply with the technical, documentary and national regulations requirements in order to guarantee its viability. This Final Project will combine all the skills acquired by the students during their degree studies, and should reflect the student's ability to accomplish the design and management of works of the completed project within the parameters of architectural quality.

Master of Architecture (5 years)

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Semester*	*Workshop*
1	Architectural Design I	6	1	Workshop 1
2	Architectural Drawing	6	1	Workshop 1
3	Geometry	6	1	Workshop1
4	Mathematics I	6	1	
5	Introduction to Architecture	6	1	
6	Architectural Design II	6	2	Workshop 2
7	Architectural Design Analysis	6	2	Workshop 2
8	Physics I	6	2	
9	Mathematics II	6	2	
10	Construction I	6	2	

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Semester*	*Workshop*
11	Architectural Design III	6	3	Workshop 3
12	Architectural Analysis I	6	3	Workshop 3
13	Physics II	6	3	
14	Geometry of the Architectural Form	6	3	
15	History of the Art	6	3	

16	Architectural Design IV	6	4	Workshop 4
17	Architectural Analysis II	6	4	Workshop 4
18	Urban Planning I	6	4	Workshop 4
19	Structures I	6	4	
20	Construction II	6	4	

Year 3 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Semester*	*Workshop*
21	Architectural Design V	6	5	Workshop 5
22	Construction III	6	5	Workshop 5
23	Structures II	6	5	Workshop 5
24	Urban Planning II	6	5	
25	Theory and Criticism of Architecture I	6	5	
26	Architectural Design VI	6	6	Workshop 6
27	Construction III	6	6	Workshop 6
28	Structures III	6	6	Workshop 6
29	Urban Planning III	6	6	Workshop 6
30	Installations I	6	6	

Year 4 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Semester*	*Workshop*
31	Architectural Design VII	6	7	Workshop 7
32	Urban Planning IV	6	7	Workshop 7
33	Construction V	6	7	Workshop 7
34	Structures IV	6	7	Workshop 7
35	History of Architecture I	6	7	
36	Architectural Design VIII	6	8	Workshop 8
37	Construction VI	6	8	Workshop 8
38	Structures V	6	8	Workshop 8
39	Installations II	6	8	Workshop 8
40	History of Architecture II	6	8	

Year 5 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Semester*	*Workshop*
41	Architectural Design IX	9	9	Workshop 9
42	Urban Planning V	6	9	Workshop 9
43	Foundations	6	9	
44	Architectural Design X	9	10	Workshop 10
45	Construction VII	6	10	Workshop 10
46	Law in Architecture	6	10	
	Final Project	30	Final Project Workshop	

(*Elective Modules*) In the 9th and 10th semesters students will attend 1 module of 9 credits, 2 modules of 6 credits and 2 elective modules of 4.5 credits. The following table shows all the elective modules available:

47	Industrialized Architecture	4.5	9/10
48	Management of Works	4.5	9/10
49	Special Structures	4.5	9/10
50	Structures Design	4.5	9/10
51	Advanced Representation in Architecture	4.5	9/10
52	Complex Geometry in Architecture	4.5	9/10
53	Graphic Communication in Architecture	4.5	9/10
54	Installations Design	4.5	9/10
55	Composition theory & heritage intervention	4.5	9/10
56	Sustainable Landscape and Habitat	4.5	9/10
57	Land Planning	4.5	9/10
58	Planning Methods	4.5	9/10

Learning Outcomes: The learning outcomes or general competences for any Spanish student of architecture are established by the Ministry of Education at the national level according to EU rules. This is reflected in the Order ECI/3856/2007 (of national scope), which states the following skills that all the students of architecture in the Spanish territory must acquire:

- Architectural design skills to create projects that satisfy both aesthetic and technical requirements;
- Adequate knowledge of the history and of the theories of architecture, as well as of the arts, technology, and human sciences related to architecture;

- Knowledge of the fine arts as a factor that can influence the quality of architecture;
- Suitable knowledge of urbanism, planning, and technologies used in the process of urban planning;
- Ability to understand the relationship between people and buildings and between buildings and their surrounding environment, as well as the need to relate the buildings and the spaces between them depending on the needs and human scale;
- Capacity to understand the building profession and its role in society, particularly in the design of projects that take into account social factors;
- Knowledge of the research methods and preparation of the detail design project;
- Understanding of the problems of structural design, construction and engineering related to the design of buildings;
- Suitable knowledge of the physical problems and the different technologies available, as well as of the function of buildings, so that buildings are provided with internal comfort conditions and protected from climatic factors;
- Ability to satisfy the requirements of the buildings' users within the limits imposed by budgetary factors and building regulations;
- Suitable knowledge of the industries, organizations, regulations, and procedures to design buildings.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

During the first year, **Workshops 1** and **2** integrate environmental competences regarding the program of needs in architectural design through the architectural design modules. By doing this, when students establish a program of needs, they will start considering both the demands of the client and the new social environmental requirements.

These considerations of environmental character are reinforced in the module **Introduction to Architecture** during the first semester of the first year. From September to January, students work and analyze all factors that define concepts such as quality of life or habitability. After the basic concepts are learnt in the first semester, in the second semester students improve their capacity to design, calculate and integrate solutions of environmental fitting-out in buildings and urban areas. This includes thermal and acoustic insulation, climatic control, energy efficiency and natural lighting. By doing this, students finish their first year having certain initial knowledge of the architect's responsibility on the basic principles of ecology, sustainability and conservation of resources, as well as of environment and construction, urban planning and landscape.

In the second year, architectural design modules deepen into the environmental and sustainability criteria introduced in the previous year. While in the first semester the students begin to develop competence of urbanization and gardening projects, in the second semester they are provided with the necessary knowledge for the accomplishment of environmental and landscaping studies that can produce measures of protection with respect to environmental impact.

In this year, the modules **Architectural Analysis I** and **II** (that are part, respectively, of Workshops 3 and 4) analyse the social side of sustainability in depth - through study methods to determine social needs and demands - as well as into the study of traditional architectures in the search for architectural, urban development and landscape fundamentals for their adaptation to their environment.

The **Urban Planning** module, integrated in Workshop 4, also insists on the architect's responsibility for the preservation of natural resources and the environment. Students are assessed by means of brief projects developed in class and several research essays of longer duration.

The most technical training received during the second year comes with the module **Construction II** that works on the student's capacity to conceive, design, calculate and integrate environmental solutions in urban buildings, including thermal and acoustic insulation, climatic control, energy efficiency and daylighting.

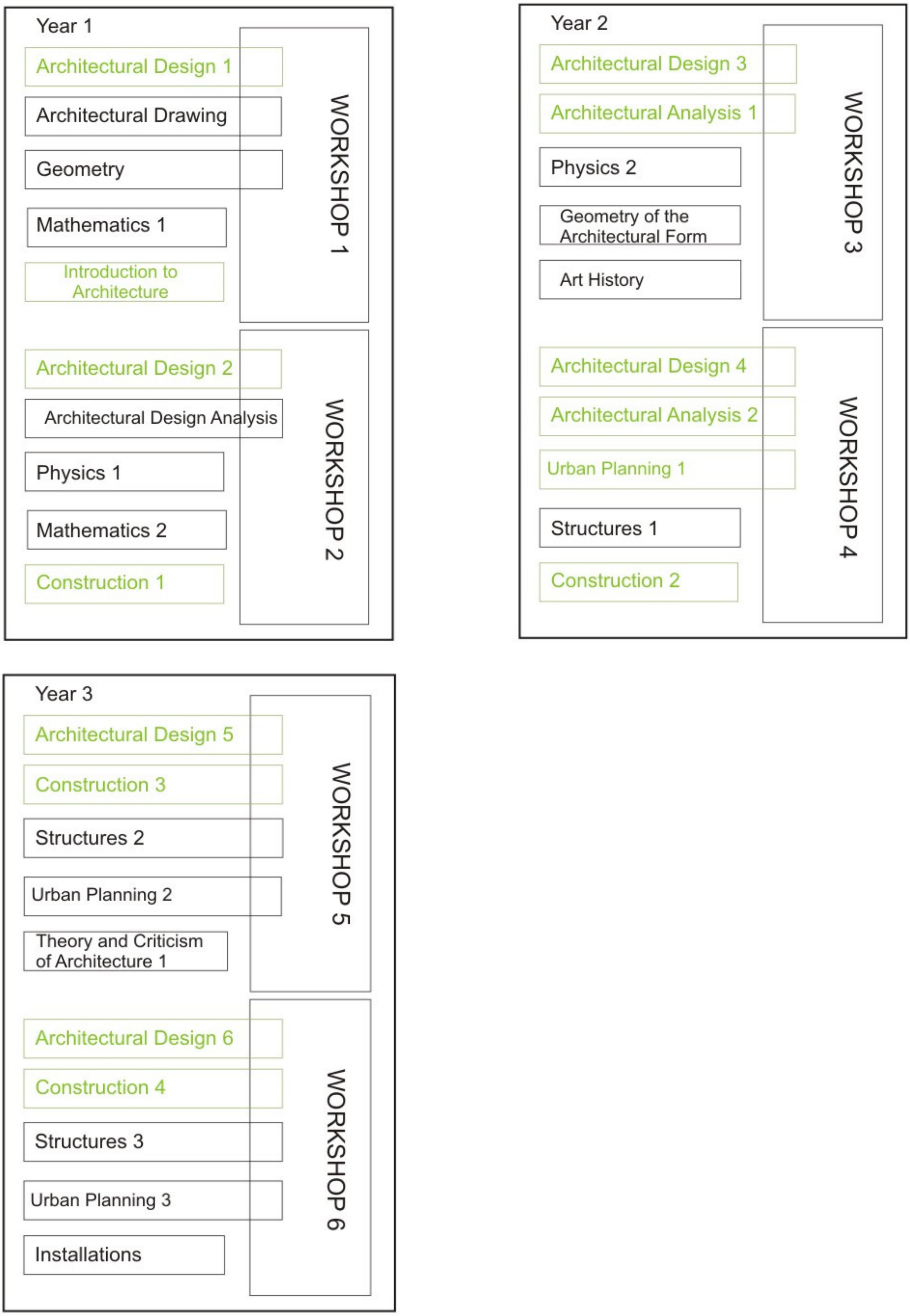
In the third year, both Workshops of the first and second semester (**Workshop 4** and **5**) integrate design modules with construction teaching, allowing the confluence of contents of both subjects around the architectural project, thus rationalizing the students' work. The workshop coordinator, before the beginning of the semester, defines the topics and projects that students will do. This way, students have access to the description of the topics, locations, educational aims and workshop requirements from the beginning, as well as to the plans that will be used in the different modules. Although the presentation of the workshop includes all modules, every module also presents individually its particularities and specific requirements. This way, each student will be asked to provide - for the same project - a program of needs on the design area, as well as the design and calculation of climatic facilities with a good energy performance, alongside of construction.

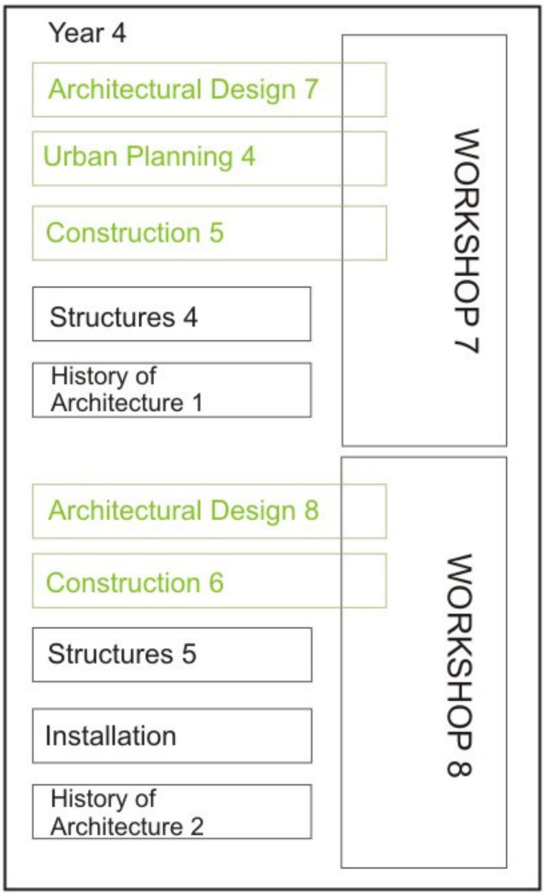
In the fourth year, the **Workshop** is extended and the module of **Architectural design** - which is generally demanding on environmental adequacy - is interrelated with **Urban Planning IV**, which incorporates ecology and sustainability criteria, environmental solutions of conditioning, structures, and installations.

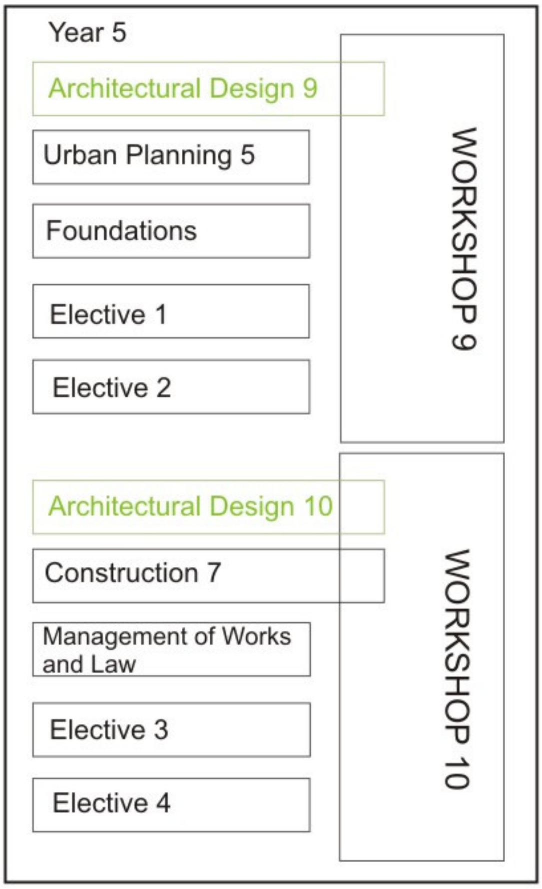
Among the elective modules on offer, **Sustainable Landscape and Habitat** gives special relevance to the environmental curriculum of the architect. This module deals with environmental adequacy issues, influencing projects, ecology and sustainability. It introduces the students to environmental land and landscape planning. This way, students are able to relate the theory behind design issues - oriented towards the scale and rural problematic - with environmental values, concepts, land and urban planning techniques. The module deals with aspects related to habitat and landscape from a sustainability point of view in its three facets: economic, social and environmental. This is carried out through a practical workshop exercise supported by theoretical lessons, so that the student goes deep into environmental planning. In order to do this, students have to become familiar with some aspects and documents of their professional competence such as the study of strategic environmental evaluation, environmental impact projects, or intervention projects in areas of great environmental and landscape value with social and economic complexity.

The fundamental requirement for the presentation and defence of the **Final Proje**ct is that the student should have already completed the 300 credits necessary for the degree. Then, after they have successfully completed the final project workshop and have a favourable report from the Evaluation Committee, they can submit the Final Degree Project to be assessed by an examining board. The Project is mainly developed in the final project workshop to control attendance to class, to guarantee the work's authorship and to adjust it to the proposed objectives, namely to demonstrate an ability to produce a complete professional architectural project susceptible to be built. In order to obtain a favourable report, the Evaluation Committee will take into account the global quality of the project and the documents provided; how the project adapts to the proposed program and to the student´s approach; its conceptual interest; its integration in the physical, urban, environmental, sociological and economic environment; resolution of the problems raised by the project's dimensional definition; development of technical, constructive and structural aspects; integration of knowledge and techniques acquired; as well as the material and design tools used in the development of the design work.

Integration of Environmental Design with Studio – Master of Architecture




Year 4
Architectural Design 7
Urban Planning 4
Construction 5
Structures 4
History of Architecture 1
WORKSHOP 7
Architectural Design 8
Construction 6
Structures 5
Installation
History of Architecture 2
WORKSHOP 8


Year 5
Architectural Design 9
Urban Planning 5
Foundations
Elective 1
Elective 2
WORKSHOP 9
Architectural Design 10
Construction 7
Management of Works and Law
Elective 3
Elective 4
WORKSHOP 10

STRENGTHS AND OPPORTUNITIES

The programme at the School of Architecture of La Coruña is characterised - within its structure of year-long and semester-long modules - by workshop spaces in which students analyse the relationships between the different disciplines around architectural design. This transversal approach to architectural learning - in which different modules show common aspects - helps students to understand architectural design as an exercise of consistency between the different architectural aspects at stake. This facilitates the integration of sustainability issues from every possible angle: technological, social and from a design point of view.

Strengths:

- The curriculum has been recently approved and this is one of the reasons why one of its main educational aims is developing abilities related to the architect's responsibility towards society and care of environmental problems;
- The workshop as the work space for several modules is the perfect environment for students to become aware of the intimate relationships between the factors that affect sustainability in a design project: design, urban planning, materials, constructive typologies, installations, etc.;
- As environmental issues are approached in workshops from the first year, sustainability becomes a regular factor when it comes to designing, and the student assumes it as one of the key points that they should take into account from the very beginning of any design or urban-planning project;
- The insistence on sustainability issues in architectural design throughout the five teaching years makes the future professionals more conscious of their responsibility towards environmental questions, both economic and social.

Opportunities:

- The current European regulations support all kinds of teaching improvements related to the introduction of energy and environmental issues in architecture, even though it is not demanded by these regulations;
- The current Spanish regulations allow the necessary changes and foster them by demanding teaching methods which are more appropriate for the needs of today's architectural practice, which undoubtedly include environmental and sustainability issues;
- The established workshops structure is perfect to improve relations between departments and to harness the criteria and general aims in an organized way;
- The proposed structure allows students to see from the first year how architectural design consists of multiple factors, sustainability being present in almost all of them.

SOURCES AND REFERENCES

A Coruña School of Architecture website: www.ucd.ie/arcel/index

UNIVERSIDAD POLITÉCNICA DE CATALUNA

SCHOOL OF ARCHITECTURE OF BARCELONA

Curricular Structure: The Architecture degree at the School of Architecture of Barcelona is obtained by 2 cycle training and the presentation (and advocacy) of a Final Degree Project. The first cycle is developed in two years and the second in three. The programme is structured in core and obligatory modules (300 credits), electives (37,5 credits) and free-choice modules (37,5 credits). The core modules do not consider sustainable environmental and energy efficiency subjects, nor implement these on architectural design courses. Nevertheless, some elective modules focus on environmental issues, encouraged by professors trained on it. These initiatives aim to contribute to specialization and could be extended on postgraduate programs (Master and PhD). The elective sustainable environmental and energy efficiency courses represent less than 4% of all elective modules, therefore representing isolated and unstructured initiatives.

Future Prospect: The current programme was approved in 1994. On August 2010, a new curriculum will be in force in accordance with the Bologna Process. Unfortunately, the new structure does not consider or implement sustainable environmental design and energy efficiency courses. On other hand, it is important to mention that the UPC has developed an Environmental Program (First Plan of 1996-2001 and Second Plan of 2002-2005) with a “green” programme as one of its main objectives, although this program still has not been implemented and there is no fixed term to do it.

SCHOOL OF ARCHITECTURE OF SANT CUGAT DEL VALLES

Curricular Structure: The Architecture degree at the School of Architecture of Sant Cugat del Valles is obtained by 2 cycle training and the presentation (and advocacy) of a Final Degree Project. The first cycle is developed in two years and the second in three. The curriculum is structured in core and obligatory modules (300 credits), elective modules (37,5 credits) and free choice courses (37,5 credits). Some of the elective modules have continuity through postgraduate programs (Master and PhD). Basically, the programme has the same structure of the Barcelona’s School although the contents are different. The main differences lie in the architectural design course, also named TAP (Spanish acronym for Workshop of Architectural Design), with a multidisciplinary approach shared by professors of different modules working together to develop projects. Almost all the core and obligatory modules do not consider sustainable environmental and energy efficiency subjects, except one: Architectural Design IV (4^{th} Semester on First Cycle). This initiative is powered by a group of professors capacitated and interested in sustainable environmental issues. This group is largest than the group of the Barcelona’s School. Consequently, there are more elective courses in Sant Cugat del Vallès’s curriculum with environmental contents. The relative percentage is almost 13% of the all elective modules. Finally, it is important to mention the Centre for Research and Technology Transfer CRITT (Spanish acronym), which was created in 2006 to support and integrate some of the sustainable environmental and energy efficiency educational and professional projects. Nevertheless, these environmental efforts are still insufficient and could not be considered as an effective integration of sustainable environmental design and energy efficiency in the Academic Curriculum.

Future Prospect: The current curriculum was approved in 1993. The new programme will be enacted in 2010/11. The published report defines sustainability and social commitment as one of the seven powers of the course. These objectives will be implemented in the 2^{nd} year (Physics, Technology, Urban Planning and Architectural Design modules), and also in the 4^{th} and 5^{th} year (Technology, Urban Planning and Architectural Design modules). Unfortunately, there are not published detailed contents for each core and obligatory course, neither for elective modules.

The schemes presented in the following pages represent the current programme at the Schools of Architecture of Barcelona and Sant Cugat del Valles, emphasising the presence of environmental contents within the degree structures in Architecture at the UPC.

SOURCES AND REFERENCES

Programme of the School of Architecture of Barcelona:
http://www.etsab.upc.edu/web/frame.htm?i=0&m=estudios&c=estudios

Programme of the School of Architecture of Sant Cugat del Vallés:
http://www.etsav.upc.edu/

SCHOOL OF ARCHITECTURE OF BARCELONA

FIRST CYCLE

Year 1

1st Semester

Architectural Design I	9 Credits
Geometry I	7.5 Credits
Physics	6 Credits
Mathematics I	6 Credits
Drawing I	6 Credits
Construction I	4.5 Credits

2nd Semester

Architectural Design II	9 Credits
Geometry II	7.5 Credits
Architectural Composition I	4.5 Credits
Mathematics II	9 Credits
Drawing II	6 Credits

Year 2

3rd Semester

Architectural Design III	9 Credits
Drawing III	9 Credits
Urban Planning I	6 Credits
Construction II	6 Credits
History of Art and Architecture I	6 Credits

4th Semester

Architectural Design IV	9 Credits
Structures I	9 Credits
Urban Planning II	6 Credits
Construction III	4.5 Credits
History of Art and Architecture II	4,5 Credits
Conditioning and Services I	3 Credits

SECOND CYCLE

Year 3

5th Semester

Architectural Design V	9 Credits
Construction IV	7.5 Credits
Urban Planning III	6 Credits
History of Art and Architecture II	4.5 Credits
Conditioning and Services II	4.5 Credits
Architecture and Law	3 Credits

6th Semester

Architectural Design VI	9 Credits
Aesthetics	4.5 Credits
Structures II	6 Credits
Urban Planning IV	6 Credits

Year 4

7th Semester

Architectural Design VII	9 Credits
Construction V	7.5 Credits
Urban Planning V	6 Credits
Conditioning and Services III	4.5 Credits
Architectural Composition II	4.5 Credits
Computer Applications	3 Credits

8th Semester

Architectural Design VIII	9 Credits
Structures III	6 Credits
Urban Planning VI	6 Credits
Architectural Composition III	4.5 Credits

Year 5

9th Semester

Architectural Design IX	9 Credits
Conditioning and Services IV	6 Credits
Construction VI	6 Credits

10th Semester

Architectural Design X	9 Credits
Final Degree Project	3 Credits

Free choice Module
37,5 Credits

No Environmental Subjects

Elective Module
37,5 Credits

80 courses of other subjects

3 environmental courses

SCHOOL OF ARCHITECTURE OF SANT CUGAT DEL VALLES

FIRST CYCLE

Year 1

1st Semester

Construction I	6 Credits
Mathematics I	4 Credits
Drawing I	8 Credits
Architectural Design I	4 Credits
TAP	7 Credits
History of Art and Architecture I	6 Credits

2nd Semester

Construction II	2 Credits
Structures I	1 Credit
Physics I	4 Credits
Mathematics	4 Credits
Drawing II	5 Credits
Architectural Design II	4 Credits
TAP II	7 Credits
Urban Planning I	3 Credits
History of Art and Architecture I	3 Credits

Year 2

3rd Semester

Construction III	3 Credits
Structures II	4 Credits
Physics II	4 Credits
Mathematics III	3 Credits
Drawing III	4 Credits
Architectural Design III	5 Credits
TAP III	5 Credits
Urban Planning II	3 Credits
History of Art and Architecture III	3 Credits

4th Semester

Construction IV	4 Credits
Structures III	4 Credits
Physics III	3 Credits
Drawing IV	4 Credits
Architectural Design IV	4 Credits
TAP IV	6 Credits
Urban Planning III	3 Credits
History of Art and Architecture IV	3 Credits

SECOND CYCLE

Year 3

5th Semester

Construction V	4 Credits
Structures IV	3 Credits
Conditioning and Services I	3 Credits
Architectural Design V	6 Credits
TAP V	7 Credits
Urban Planning IV	3 Credits
Architectural Composition I	3 Credits

6th Semester

Construction VI	4 Credits
Structures V	3 Credits
Conditioning and Services II	3 Credits
Architectural Design VI	6 Credits
TAP VI	8 Credits
Urban Planning V	3 Credits
Architectural Composition II	3 Credits

Year 4

7th Semester

Construction VII	4 Credits
Structures VI	3 Credits
Conditioning and Services III	3 Credits
Architectural Design VII	7 Credits
TAP VII	7 Credits
Urban Planning VI	3 Credits
Architectural Composition III	3 Credits

8th Semester

Construction VIII	4 Credits
Structures VII	3 Credits
Conditioning and Services IV	3 Credits
Architectural Design VIII	7 Credits
TAP VIII	7 Credits
Urban Planning VII	3 Credits
Architectural Composition IV	3 Credits

Year 5

9th Semester

Construction IX	5 Credits
Architectural Design IX	7 Credits
TAP IX	8 Credits
Urban Planning VIII	3 Credits

10th Semester

TAP X	21 Credits
Final Degree Project	3 Credits

Free-choice Module
37,5 Credits

No Environmental Subjects

Elective Module
37,5 Credits

62 courses of other subjects

8 Sustainable Environmental and Energy Efficiency courses

CRITT
Center of Research and Technology Transfer

APPENDIX
SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Consejo Superior de Arquitectos de España (CSCAE, Orders of Architects of Spain)

The CSCAE takes responsibility for the General Register of Architects which is made up of the registers of the different professional bodies. This Register authorizes architects to practice, for them being compulsory to be registered with one of the Spanish professional bodies.

The Orders of Architects of Spain were created in 1929 by the initiative of the then existing Societies of Architects, and they were officially established in 1931 under the Statutes for the Regimen and Government of Orders of Architects, approved by the provisional Government Decree of the Republic of 13 June and ratified by the Law of 4 November approved in a Constituent Assembly held in the same year. Over these years, the six initial Orders of Architects have given rise to the twenty-six currently existing associations, while the nearly 1,000 architects of then have now become more than 50,000.

Accreditation of Academic Curricula

The education of architecture, as a professional qualification, is linked to the creation of the San Fernando Royal Academy of Fine Arts in Madrid, which initiated its preparatory meetings in 1744. The reform of the arts' education during the reign of Isabel II (1844) gave rise to a provisional "special study of architecture", which was a branch of a new School of Noble Arts (1845), still linked to the Academy. It was in 1848 when the Special School of Architecture, as an independent institution, was created, being the first one in Spain that worked as a School of Applied Knowledge. With four-year duration, it was necessary to pass an entrance examination and to study for two years in the so-called Preparatory School. Architects in Spain graduate holding a degree issued by the Spanish Ministry of Education through its more than 30 Schools of Architecture, both public and private. The Spanish State is the competent authority for the recognition of foreign degrees, while the Professional Body of Architects is responsible for authorizing architects to practice the profession, provided that they comply with the academic requisites established by the Spanish Law and the European Directive on the recognition of professional qualifications.

Excerpts from the "ORDEN ECI/3856/2007", from the BOE nº 310, 29/12/2007.

The 9^{th} additional provision of the Royal Decree 1393/2007 of 29 October - establishing official university teaching management - states that the Ministry of Education and Science will require the contents of ANNEX I which shall comply to the applications by the Universities to obtain verification of leading curricula provided for in its article 24, which demands for the exercise of regulated professions to obtain official degree or Master titles. The existing legislation declares the profession of Architect as a regulated profession which requires being in possession of the corresponding title, obtained, in this case, in accordance with the article 12.9 referred in Royal Decree 1393 / 2007, in accordance with the conditions laid down in the agreement of Council of 14 December 2007, published in the Official Gazette of 21 December 2007. This agreement, in its 4^{th} paragraph in relation to the 9^{th} additional provision previously cited, instructs the Minister of Education and Science to establish requirements regarding the title and the learning objectives of the teaching contents.

Annex - Establishment of requirements concerning certain paragraphs of Royal Decree 1393/2007 of 29 October states the following:

1. The denomination of official university titles shall facilitate the identification of the profession that they enable, and under no circumstances may lead to error or confusion about their professional effects.

2. A university curriculum whose name includes the reference to the profession of architect cannot be subject to verification by the University Council unless that title satisfies the conditions laid down in the said agreement and the present Order.

3. No title may use the name of graduate or graduate in architecture without complying with the conditions laid down in this agreement and in the present Order.

The fundamental requirements that architectural students have to acquire, according to the Directive 2005/36/EC of The European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications include:

- An ability to create architectural designs that satisfy both aesthetic and technical requirements.
- An adequate knowledge of the history and theories of architecture and the related arts, technologies and human sciences.
- Knowledge of the fine arts as an influence on the quality of architectural design.

- An adequate knowledge of urban design and planning and of the skills involved in the planning process.
- An understanding of the relationship between people and buildings, and between buildings and their environment and of the need to relate buildings and the spaces between them to human needs and scale.
- An understanding of the role of the architect in society, in particular in preparing briefs that take account of social factors.
- An understanding of the methods of investigation and preparation of the brief for a design project.
- An understanding of the structural design, constructional and engineering problems associated with building design.
- An adequate knowledge of physical problems and technologies and of the function of buildings so as to provide them with internal conditions of comfort and protection against the climate.
- The necessary design skills to meet building users' requirements within the constraints imposed by cost factors and building regulations.
- An adequate knowledge of the industries, organisations, regulations, contracts and procedures involved in translating design concepts into buildings and integrating plans into overall planning.

Certificates referred to in this agreement are Official University Degrees, and their curricula will have duration of 300 credits, as referred in article 5 of the above-mentioned Royal Decree 1393 / 2007 of 29 October, and presentation and defence of a Final degree project.

Agencies for Quality Accreditation in Spain

Origin and Mission of ANECA

Art. 32 of Organic Law 6/2001 of 20 December on Universities lays down that, by means of a Resolution by the Council of Ministers and subsequent to a report by the Universities Coordinating Council, the Government shall authorise the setting up of the National Agency for Quality Assessment and Accreditation (ANECA). ANECA was set up as a public trust on 19 July 2002. The ultimate goal of the Trust is to contribute to the quality improvement of the higher education system through the assessment, certification and accreditation of university degrees, programmes, teaching staff and institutions.

Guiding principles

In order to attain its aims, the Trust shall carry out its activities independently, transparently and objectively, and ensure and promote the participation of the Spanish and international university community. In order to carry out its aims, the Trust shall act in accordance with the principles of coordination and cooperation with the external evaluation bodies established for similar purposes, within their respective sphere of jurisdiction. Furthermore, the Agency shall take into consideration in its actions the internationally acknowledged general principles on the subject, for which it will form part of the existing international networks and establish appropriate mechanisms for cooperation to this end.

Board of Trustees

The government authority exercising protectorship over this public trust shall be the Spanish Ministry of Education and Science, in accordance with the provisions laid down in Law 50/2002 of 26 December on Trusts and Fiscal Incentives for Private Participation in Activities of General Interest, and Royal Order 316/1996 of 23 February, whereby approval is given to the Regulation on public trusts.

Spanish Agencies Directory

ANECA – NATIONAL AGENCY FOR QUALITY ASSESSMENT AND ACCREDITATION OF SPAIN
Founding Date: 2002
ENQA Full Membership: 2003
Ownership: Independent from government, directed by a board of trustees
Scope of Authority: National
Agency's Role: Independent, non-profit body
Review Outcome: Full membership reconfirmed 20 September 2007

AQU - AGENCIA PER A LA QUALITAT DEL SISTEMA UNIVERSITARI DE CATALUNYA
Founding Date: 1996
ENQA Full Membership: 2000
Ownership: The agency is independent, but funded by the Ministry of Education and Universities of the Catalan Government. The Board of the agency is comprised of representatives from different institutions, government and independent members.
Scope of Authority: All universities in Catalonia

Agency's Role: Evaluation, certification and accreditation of institutions (programmes, centres, services, processes) and teaching staff
Keywords: Quality assurance, improvement, accountability and cooperation
Methods Used: External assessments based on self-evaluation
Review Outcome: Full membership reconfirmed 07 September 2007

AGAE - AGENCY FOR QUALITY ASSURANCE IN HIGHER EDUCATION AND RESEARCH OF ANDALUCÍA
Founding Date: 2001
ENQA Full Membership: 2000
Ownership: Independent from regional government
Scope of Authority: Regional university and R&D systems
Agency's Role: Assessment of teaching and management activities in universities. Assessment of R&D activities (competitive projects, research groups, professors and researchers)
Keywords: Andalusia, assessment, evaluation, experts, independent
Methods Used: Peer review, experts review
Review Outcome: Full membership reconfirmed 16 March 2009

ACSUCYL - QUALITY ASSURANCE AGENCY FOR THE UNIVERSITY SYSTEM IN CASTILLA Y LEÓN
Founding Date: 2001
ENQA Candidate Membership: 2007
Ownership: Independent from the regional government
Scope of Authority: University System in Castilla y León
Agency's Role: Evaluation activities related to the quality of the university system, and specifically the evaluation of teaching staff, degrees as well as research
Keywords: assessment, quality assurance, continual improvement

ACSUG - AGENCY FOR QUALITY ASSURANCE IN THE GALICIAN UNIVERSITY SYSTEM
Founding Date: 2001
ENQA Candidate Membership: 2007
Ownership: The agency is independent and has its own full legal personality. ACSUG has established a clear difference in the structure and functions between the governing bodies (Director, President and Board of Directors), the assessment organs (Galician Committee for Reports, Assessment, Certification and Accreditation (CGIACA)) and the consultative organs (Advisory Board).
Scope of Authority: Galician University System
Agency's Role: Assessment, certification and accreditation of institutions (programmes, services, teaching activity evaluation, Internal Quality Assurance Systems of the centres and other processes). Labour market insertion analysis and surveys. Evaluation of teaching staff prior to hiring in the Galician universities and evaluation of the teaching staff for the assignment of complementary compensation
Keywords: Independence, transparency, objectivity, stakeholders, feedback, continuous improvement, accountability

Conditions for Professional Qualification

The CSCAE is responsible for authorizing architects to practice the profession, provided they comply with the academic requisites established by the Spanish Law and the European Directive on the recognition of professional qualifications. The compulsory conditions to apply for registration are:

a) Possess the qualifications required by Spanish law to practice as an architect;
b) Not be legally incapacitated or disabled for the practice;
c) Not be suspended from practice for college disciplinary firm;
d) Pay the corresponding rights of incorporation.

In case of foreign qualifications, further documentation of the approval or recognition of the Title in Spain for professional purposes must be provided, and for nationals working in other countries, there is a need to fulfil the other legal requirements for the establishment and work of foreigners in Spain. The condition b) shall be attested by the concerned statement. The condition c) includes, except in the case of first licensing, certification by the General Register of Architects in the Superior Council of Colleges.

SOURCES AND REFERENCES

CSCAE Website: www.cscae.com
ANECA Website: www.aneca.es
MED Website: www.mec.es

Sweden

KTH ROYAL INSTITUTE OF TECHNOLOGY

SCHOOL OF ARCHITECTURE AND THE BUILT ENVIRONMENT

Bachelor of Architecture (3 Years) + Master of Architecture (2 years)

Level: Undergraduate (BArch, 3 years) + Graduate (MArch, 2 years)

Educational Aims: The School of Architecture and the Built Environment (ABE) at the KTH Royal Institute of Technology (Stockholm) is noted for its excellent contacts with research, business and the public sector, and for involving the professional organisations in the content and development of its educational programmes. The School offers a 5-year professional degree in architecture which is divided into the Bachelor of Architecture (years 1 to 3) and the Master of Architecture (years 4 and 5) programmes.

Outline Description of Course: Tuition is in small groups of some 20 students, each led by two professional architects, a civil engineer and an artist. This integrates academic and practical subjects with studio projects. There are compulsory courses on Architectural Technology and on Architectural Theory. In Year 4, students can choose between different studios. These include the Sustainable Design Studio which emphasises economy, ecology, energy and new technology in relation to architecture and urban design, the Design Process Studio which aims to develop new tools and methods for architectural design, the Advanced Design Studio which deals with the development of complex projects as a synthesis of social, spatial and technological considerations, the Performative Design Studio which uses parametric design as a way of evolving new information systems and new building components, and the Urban Studio which views sustainable urban development in terms of globalization, climate change, mega cities and urban strategies.

Course Structure: The ABE School's programme consists of project-based teaching which supports courses in engineering, history and theory and communications. Students solve architectural tasks undertaking integrated studies that are carried out through project work. The course structure is guided by the EU Directive which enables the School's graduates to work as architects in other European countries.

Bachelor of Architecture / Master of Architecture (5 years)

Year 1 *(Mandatory courses)*

Code	*Title*	*Credits*	*Taught*
A11CCA	Architecture, Crash Course 1	6.0	Full Year
A11TEA	Architectural Technology 1	6.0	Full Year
A11KOA	Architectural Communication 1, Artistic Training	4.0	Full Year
A11P4A	Project Studio 1:4, Housing	9.0	Full Year
A11P3A	Project Studio 1:3, Order and Meaning	9.0	Full Year
A11HIA	History and Theory of Architecture 1	6.0	Full Year
A11P2A	Project Studio 1:2, What is a House?	9.0	Full Year
A11POA	Portfolio 1	2.0	Full Year
A11P1A	Project Studio 1:1, Structure	9.0	Full Year
Credit Total	**60 Credits**		

Optional courses

A11IDA	Introductory Course in Design	3.0	Full Year
A11INA	Introductory Course	2.0	Full Year
A11RVA	Excursion	3.0	Spring
A11RHA	Excursion	3.0	Autumn
A11VEA	Carpentry	1.5	Full Year
A11DBA	Digital and Photographic Imaging	6.0	Full Year

Year 2 *(Mandatory courses)*

Code	*Title*	*Credits*	*Taught*
A21TEA	Architectural Technology 2	6.0	Full Year
A21P3B	Project Studio 2:3, Material-Space-Detail	14.0	Full Year
A21HIB	Theory and History of Architecture 2	6.0	Full Year
A21KOA	Architectural Communication 2, Artistic Training	4.0	Full Year
A21POA	Portfolio 2	2.0	Full Year
A21CCA	Architecture, Crash Course 2	6.0	Full Year
A21P1B	Project Studio 2:1, Place-Structure-Program	16.0	Full Year
A21P2A	Project Studio 2:2, Tectonics	6.0	Full Year
Credit Total	**60 Credits**		

Optional courses

A21D2A	Advanced Computer course	3.0	Full Year

A21RVA	Excursion	3.0	Spring
A21RHA	Excursion	3.0	Autumn

Year 3 *(Mandatory courses)*

Code	*Title*	*Credits*	*Taught*
A31HIB	Theory and History of Architecture 3	6.0	Full Year
A31P1C	Urban Design Studio 3:1	15.0	Full Year
A31KOA `	Architectural Communication 3, Artistic Training	3.0	Full Year
A31CCB	Architecture, Crash Course 3	6.0	Full Year
A31P2C	Urban Design Studio 3:2	9.0	Full Year
A31TEB	Architectural Technology 3: Environmental Control	3.0	Full Year
A31HSA	Sustainable Urban Design	3.0	Full Year
Credit Total	**45Credits**		

Optional courses

A31RVA Excursion		3.0	Spring

Conditionally Elective courses

1A10KA	Degree Project in Architecture (Bachelor of Science)	15.0	
A31KAX	Degree Project in Architecture, First Level	15.0	

Year 4 *(Mandatory Courses)*

Code	*Title*	*Credits*	*Taught*
A42O1A	Orientation; History, Theory &Technology of Architecture 4:1	3.0	Autumn
A42O2A	Orientation; History, Theory & Technology of Architecture 4:2	3.0	Spring

Year 5

Code	*Title*	*Credits*	*Taught*
Conditionally Elective courses			
1A10AX	Master's Project in Architecture	30.0	Full Year
A52ARX	Degree Project in Architecture, Second Level	30.0	Full Year

Optional Studios Year 4 & 5 (20-24 students in each studio)

A41RHA	Excursion	3.0	Autumn
A41RVA	Excursion	3.0	Spring
A42A1B	Advanced Design - Studio 4:1-4:4	12.0	All year
A42D1C	Performative Design Studio 4:1-4:4	12.0	All year
A42G1B	Basic Design - Studio 4:1-4:4	12.0	All year
A42H1A	History and Theory of Architecture 4:1-4:2	3.0	All year
A42H1B	Sustainable Design Studio 4:1-4:4	12.0	All year
A42K1B	Critical Studies Design Studio 4:1-4:4	12.0	All year
A42L1B	Landscape Design Studio 4:1-4:4	12.0	All year
A42P1B	Design Process Studio 4:1-4:4	12.0	All year
A42R1B	Rebuilding, Addition, Restoration Studio 4:1-4:4	12.0	All year
A42T1A	Architectural Technology 4:1-4.2	3.0	All year
A42U1B	Urban Studio 4:1-4:4	12.0	All year
A42Y1B A	Architecture/Practice Related Studio 4:1-4:4	12.0	All year

Learning Outcomes: By the end of Year 1 of the Bachelor of Architecture, students are expected to acquire a common language. They will be able to draw plans, sections, elevations and site plans, as well as constructing models. In Year 2 of the BArch, students learn how to proceed from abstract propositions to concrete architectural proposals. At the end of the first three years of study, specific emphasis is given to urban housing design and complex design briefs. In Year 4 (Master of Architecture), there is opportunity for international exchanges (with both incoming and outgoing students), since teaching is primarily conducted in English. Choice of one of the specialised studios enables in-depth study of selected topics over three consecutive projects that lead to the conclusion of the programme in Year 5.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

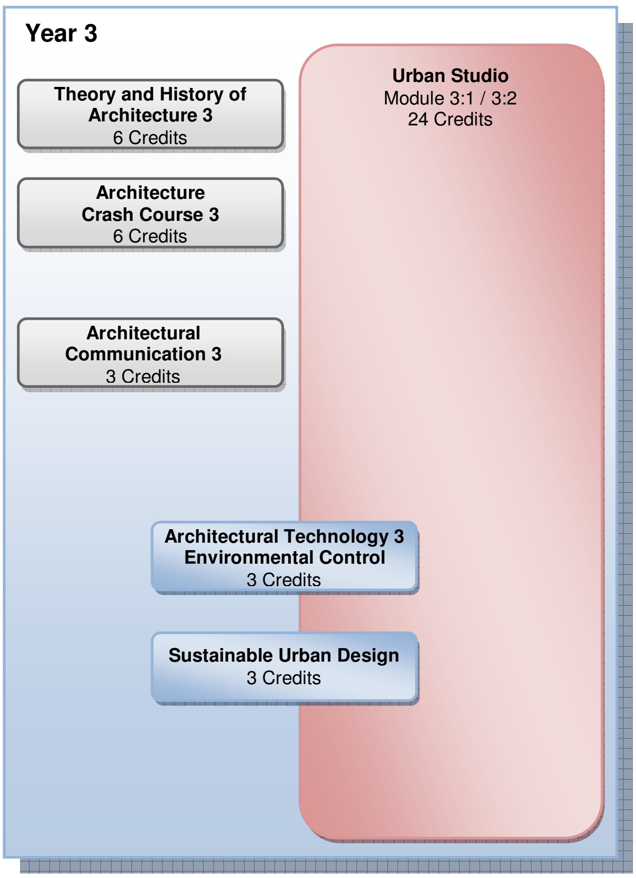
At third-year level, the **Architectural Technology 3: Environmental Control** module focuses on environmental control. The aims of the course are to convey key concepts of building physics to students, relating them to architecture in an operational manner. The course contents focus on sustainable development, energy in architecture and urban design, building form and the variables affecting thermal and visual internal comfort. The course is organized as a series of lectures and seminars on building physics and environmental engineering and on built examples. Students engage in team work based on ongoing projects.

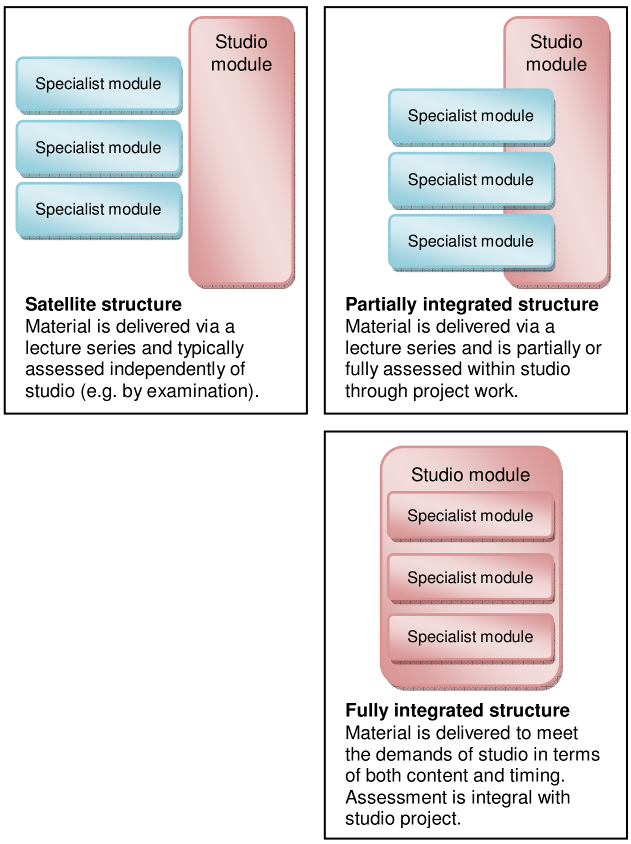
Sustainable Urban Design is another third year course aiming to show that sustainable development is an integral part of urban design and planning. The course is organized as a series of lectures and seminars linked to students' ongoing urban projects. Students must actively participate and submit approved course work. Submission requirements are tailored to the year's projects. Projects must be documented in a portfolio that is presented for the assessment of the degree.

At MArch level, in the fourth and fifth years, the **Sustainable Design Studio** places special emphasis on interdisciplinary processes, building up technical and architectural know-how by investigating materials, processes and details through project work. Active participation in lectures, tutorials, and seminars is expected and intermediate and final assessments must be passed. The project work is to be documented in a portfolio, including drawings, analysis and models.

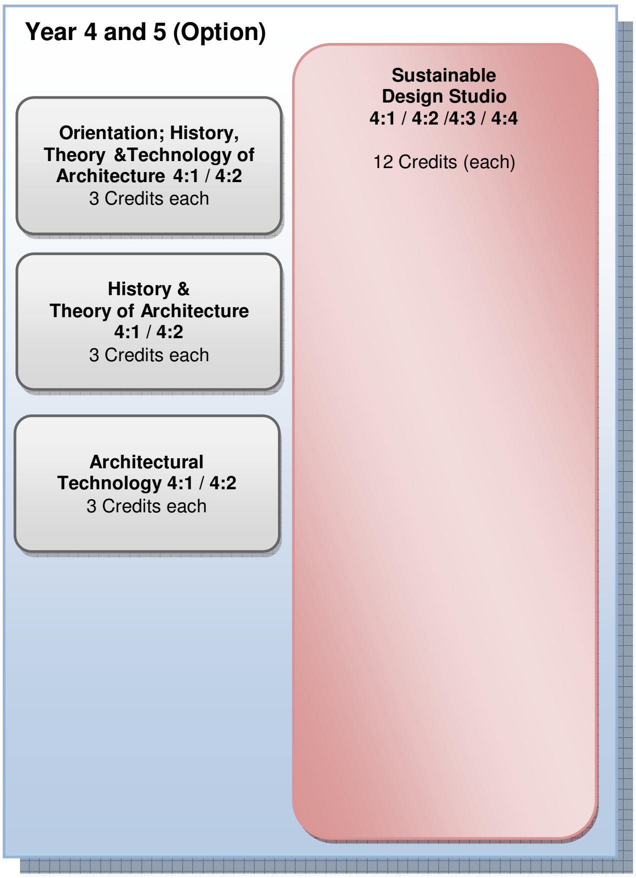
Concurrently, the **Urban Studio** explores the notion of the sustainable city posing key questions such as what makes an urban environment sustainable, what forms of sustainability are there, what are principal parameters for future planning, what can we learn from existing examples of planned "eco-cities" in China and Sweden, etc. Active participation in lectures, tutorials, and seminars is expected and intermediate and final assessments must be passed. The project work is to be documented in a portfolio, including drawings, analysis and models.

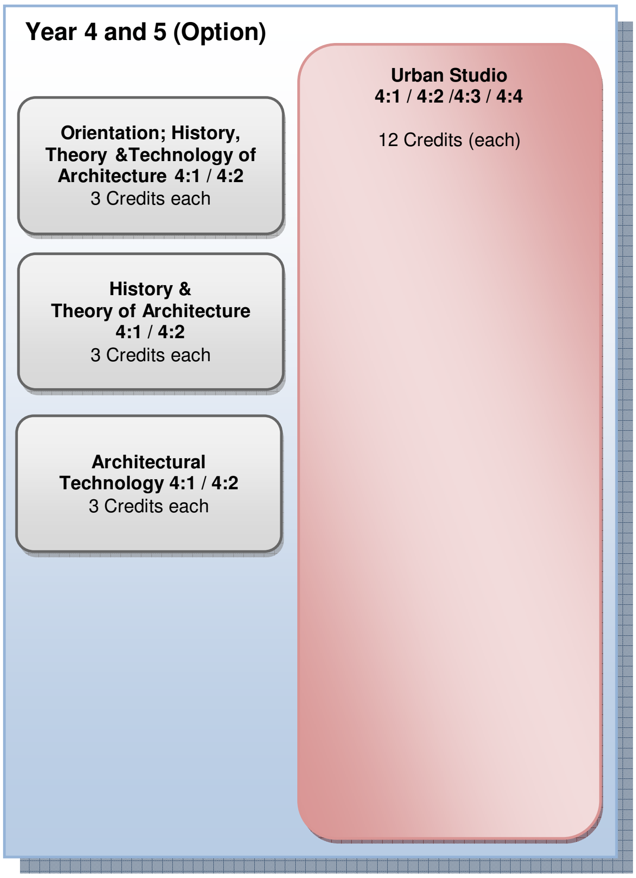
Integration of Environmental Design with Studio (3rd year Bachelor of Architecture only):

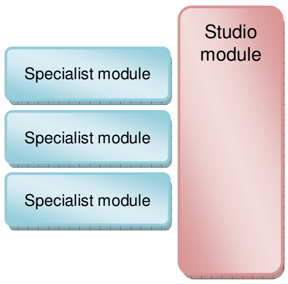




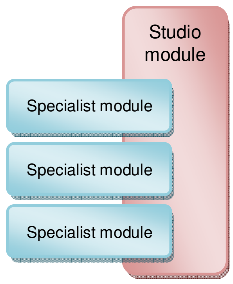
Integration of Environmental Design with Studio – Master of Architecture



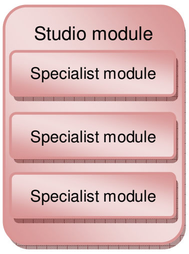




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

The School of Architecture and the Built Environment (ABE) is one of eleven schools at the Royal Institute of Technology (KTH), and holds a unique character amongst them since it works with both the natural sciences and technology and with the social sciences and the humanities. The ABE School is also noted for its excellent contacts within research, business and the public sector, a strong tradition of contract education, and continual and well-organized contacts with professional organizations about the content and development of its educational programs. The ABE School is comprised of seven departments and four centres for advanced research, many led by internationally renowned scientists. Amongst the most significant strengths and opportunities of the curriculum on offer:

Strengths:

- Strong incorporation of sustainable design from third year onward combining assessed course work with studio projects.

Opportunities:

- Introducing Architectural Technology: Environmental Control from an earlier stage and as part of studio projects.

SOURCES AND REFERENCES

School of Architecture and the Built Environment website: www.kth.se/abe?l=en_UK
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Swedish Association of Architects

Architecture can be studied in Sweden at the KTH (Royal Institute of Technology) in Stockholm, LTH (Lund Institute of Technology) in Lund, CTH (Chalmers University) in Gothenburg and at Umeå University.

The training is over five years and follows the Bologna model in two stages with a Bachelor's degree after three years and the professional Master or Diploma degree after a further two years of study. Chalmers University also runs a training programme in Architecture and Technology which is addressed to those interested in the technical aspects of the architectural profession. Prospective graduates can also choose to follow a degree in both architecture and civil engineering which requires six years of full-time education.

The architectural profession is involved in urban and social planning as well as in the design of new buildings. An increasingly important requirement is for ecological planning to achieve a sustainable society that is not wasting natural resources. Another growing area of work for architects is to manage the existing building stock. That means both to care for cultural heritage and to develop and adapt existing buildings for new businesses and new demands. This can help both architects as project managers employed by larger property managers and consultants.

In Sweden, there is no formal register of architects but only an association set up on a voluntary basis The Swedish Association of Architects (Sveriges Arkitekter) was formed in 2002 to serve architects, interior designers, landscape architects and planning consultants It replaced a number of previous professional organizations and offers broad representation of interests regarding the conditions and terms of professional conduct, aiming to strengthen the role of the architect. It currently counts around 10.000 members (including 2.100 students). The Association keeps members updated on important matters related to their work. It works to ensure a good working situation for architects and planners, and to strengthen the role of architects through promoting greater architect participation and clearer responsibility in the planning, building and management process. The Association also works to increase the value ascribed to the architecture profession in terms of wages and fees. It represents its members' interests in matters relating to their duties, their terms of employment, the job market, education and training.

Membership is required in order to use the title of "Architect SAR/MSA". Members can either be an active member, passive member or student member. In exceptional cases, the Board can, acting unanimously, appoint a member to honorary membership. For active or passive membership it is required either:

(I). Bachelor of architectural education in the EU or an equivalent degree from a non-EU country;

(II). Having completed at least four years of older architectural education;

(III). Any other academic training with acquired knowledge of content and detail at least corresponding to category (I).

Active and passive members of the Swedish Association of Architects have the right to use the title MSA (Member of the Swedish Association of Architects). After obtainment of a diploma or Master degree, a period of professional training of at least one year is compulsory for registration to the Swedish Association of Architects and for award of a professional title. Professional experience must be supported by certificates and be acquired in Sweden or in another EU country. The following job titles can be obtained:

- Architect SAR / MSA
- Landscape architect LAR / MSA
- Architect SIR / MSA
- Planning Architect FPR / MSA

SOURCES AND REFERENCES

Swedish Association of Architects website www.arkitekt.se
SACO Swedish Confederation of Professional Associations web site: www.saco.se

United Kingdom

UNIVERSITY OF NOTTINGHAM

FACULTY OF ENGINEERING - DEPARTMENT OF THE BUILT ENVIRONMENT

Bachelor of Architecture with Honours + Diploma in Architecture (6 years)

Level: Undergraduate (BArch, 3 years) + Graduate (DipArch, 2 years)

Accrediting Body: RIBA (Royal Institute of British Architects), ARB (Architects Registration Board)

Educational Aims: The three-year degree Bachelor of Architecture (BArch, meeting ARB-RIBA Part 1 conditions) provides the first stage in the seven-year (6+1) education of an architect and introduces at a theoretical level the humanities, sciences and technologies that influence the built environment, thus allowing students to acquire the necessary basic skills for building design and construction. The degree aims to equip students for contemporary challenges, by encouraging a creative response to fast changing social, economic and environmental conditions. After a year out spent in architectural practice (year four), the two-year degree Diploma in Architecture (DipArch) provides the students with the knowledge, skills and judgment necessary to contribute responsibility to the quality of the built environment and to the general advancement of architecture through a career within the building profession. The course is designed to allow students to develop advanced skills in architectural design and specialist knowledge in related subject areas, and aims to construct an informed theoretical and ethical position in relation to architectural design and its appropriate relationship to a wider social, cultural and environmental context. The BArch-DipArch course provides a curriculum that meets the Architects Registration Board prescription of qualifications for ARB-RIBA Part 2.

Outline Description of Course: The 3-year BArch degree is based upon project work, some of it analytical, but mainly engaged with innovative problem solving, growing in complexity as the course develops. Project work is supported by lectures in technical studies, architectural sciences and humanities. A study of historical precedent and environmental design are central to the design component of the course. At first-year level, students initially undertake design projects with limited objectives, proceeding by stages to the design of a small building. At second-year level, design efforts are focused on the wider context of human settlements and environmental concerns. At third-year level, the urban context generates complex design projects that develop problem-solving skills in aesthetics, planning, building construction and building performance. At Diploma level (DipArch), the programme extends over two years full-time education and is structured on a modular basis. At first year level, each of the design modules has a specific theme and is combined with a seminar/lecture module to allow students to develop a particular specialism. During this year, students also undertake compulsory modules in technology and professional practice. In the second year of Diploma, students undertake a series of compulsory modules including a combination of design studio, a briefing document, a research dissertation and a research-based module, culminating in a self-generated final thesis.

Course Structure: Each year or session of study consists of 120 credits, normally 60 in each semester. Each module has a credit value. 10 credits are designed to require around 100 hours of student work, including taught and contact time, assessment work and 'student-centred learning'.

Bachelor of Architecture (3 years)

Year 1

Code	*Title*	*Credits*	*Taught*
K11DAC	Design and Communication (Studio)	40	Full Year
K11DCT	Design Communication Techniques	10	Full Year
K1AED1	Environmental Design 1 - People and Environment	20	Full Year
K11SC1	Structures and Construction 1	20	Full Year
K11IDA	Integrated Design in Architecture	10	Full Year
K1ACAT	Contemporary Debates	10	Autumn
K1AHA1	History of Architecture 1: Antiquity to the Present Day	10	Spring
Credit Total	**120**		

Year 2

Code	*Title*	*Credits*	*Taught*
K12DT1	Design Technology 1 (Studio)	60	Full Year
K12EDT	Environmental Design and Tectonics 1	20	Autumn
K1BHA3	History of Architecture 3: 19th & 20th Century	10	Spring
K12SC2	Structures and Construction 2	10	Spring
(*Optional Modules*) - Students must take 10 credits from this group			
K1APOD	Philosophy of Design	10	Autumn
K1BHA2	History of Architecture 2: Medieval Age to 18th century	10	Autumn
K13UDT	Urban Design Theory	10	Autumn

And 10 credits from this group			
K13DEX	Design Extra	10	Spring
K1BFST	Field Study	10	Spring
K1BGDL	Geometric Description Language 1	10	Spring
K13PM1	Project Management and Development	10	Spring
K1BSPS	Spatial Stories: Thematic Issues in Spatial Narratives	10	Spring
Credit Total	**120**		

Year 3

Code	*Title*	*Credits*	*Taught*
K13DT6	Design & Technology 2 (Studio)	70	Full Year
K13EDT	Environmental Design and Tectonics 2	20	Full Year
K1BTAC	Theory and Criticism of Architecture	10	Autumn
K1CPAM	Practice and Management	10	Spring
(*Optional Modules*) - Students must take 10 credits from this group			
K1BIRE	Introduction to Renewable Energy	10	Autumn
K1BSUD	Environmental Sustainability: Principles and Practice	10	Autumn
K11PCM	Performance of Construction Materials	10	Autumn
Credit Total	**120**		

Diploma in Architecture (2 years)

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
K1DMPL	Management Practice and Law	15	Spring
K14CDP	Comprehensive Design Project	30	Spring
K14MDT	Materials, Design and Technology	15	Spring
Credit Total	**60**		

Within Comprehensive Design Project (K14 CDP) students can elect from a choice of design projects: Sustainable Tall Building Design, Sustainable Housing Design, Urban Tectonics and a 'Live' building project

(*Optional Modules*) - During semester 1, students select from the following two groups of modules. Group 1 modules are taken whilst the student continues work experience in architectural practice, whilst Group 2 modules are taken in residence at the university.

Group 1 Modules

K14PCE	Personal Critical Evaluation	20	Autumn
K14RAP	Record of Architectural Practice	20	Autumn
K14BCS	Building Case Study	20	Autumn
Credit Total	**60**		

Group 2 Modules

K1DARM	Architectural Research Methods	15	Autumn
K14AD1	Architectural Design 1	30	Autumn
K14DS1	Architectural Design Seminars 1	15	Autumn
Credit Total	**60**		

The options for Architectural Design 1 (K14 AD1) and Architectural Design Seminars 1 (K14 AS1) include: Architecture and Environment, Urban design, Architectural history and theory.

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits*	*Taught*
K14AD2	Architectural Design 2	30	Autumn
K14DS2	Architectural Design Seminars 2	15	Autumn
K14TRP	Thesis Research Project	15	Autumn
Credit Total	**60**		
(*Restricted Modules*)			
Students must take 60 credits from the following modules			
K14DDT	Diploma Design Thesis	60	Spring
K14DDS	Diploma Dissertation	60	Spring
Credit Total	**60**		

Learning Outcomes: The programme provides opportunities for students to develop and demonstrate appropriate knowledge and understanding, intellectual and cognitive skills, professional and practical skills, transferable/key skills according to the requirements of the Royal Institute of British Architects and Architects Registration Board Prescription of Qualifications (RIBA - ARB criteria for Part 1 and Part 2).

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

At 1st year of BArch, **Environmental Design 1** is a year-long module that introduces students to the interrelated factors that influence human interaction with the environment and integrates human behaviour to the field of environmental design. Starting from an appreciation of climate as an integral part of the design process, the module specifically highlights the relationship between daylight and architecture and presents the key parameters that affect human visual comfort and, concurrently, inform architectural design, either in terms of composition of spaces as in terms of sustainability and energy-related issues. In addition to attending lectures, students undertake assessed exercises (30% of final mark) ranging from environmental assessments taken during field trips, the creation and testing of a working sundial and a daylight filter, the construction of a 3-dimensional sunpath for a series of locations, and the calculation of a shading mask for a window/building of their choice (preferably their own design project) with indication of shadow angles. All exercises are consolidated toward the main assignment (40%) that is conducted and assessed within design studio and that also implies the submission of a technical report on the daylight strategy devised (30%).

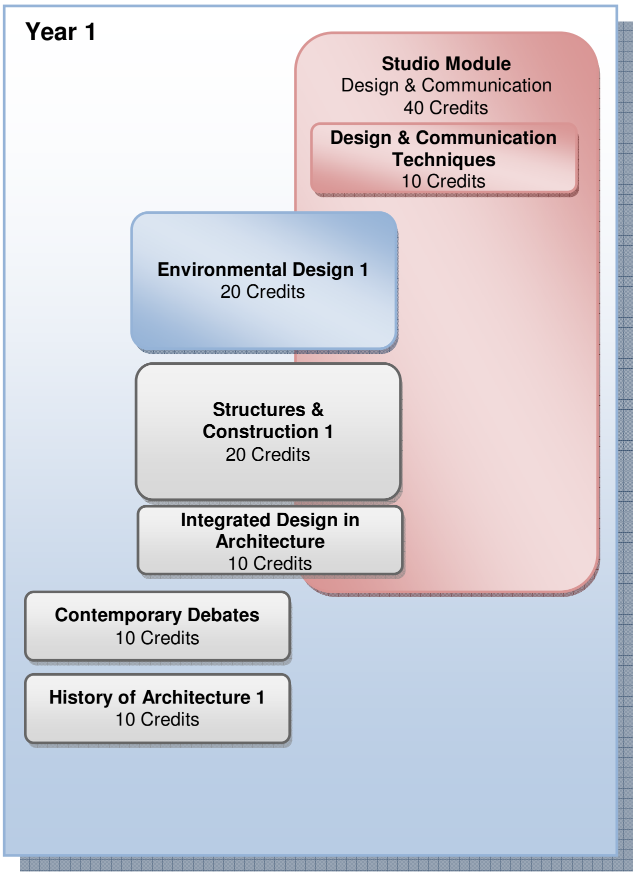
In the second year of BArch, **Environmental Design and Tectonics 1** is a semester-long module that examines the key structural, constructional and environmental systems used to create building fabrics and maintain appropriate conditions for the occupants of buildings. It builds upon work covered in year 1, exploring in more detail issues of natural lighting and building thermal performance. Techniques and tools used by designers to develop and test environmental strategies are introduced, and opportunities to apply these to the design of buildings are provided. The module aims to generate a basic understanding of the technology of medium-scale buildings and the importance of considering it as an integral part of the design process. Knowledge will develop through study of materials, structural forms, environmental performance and their behaviour, and then applied through examination of architecture, integrated elements/components and the construction process. The module is assessed basing on a 'learning-by-doing' approach, whereas the 'design studio' and the 'construction site' are brought into the lecture theatre. Assessment includes active participation of students at technical workshops (*charrettes*) (30%) and the production of a technical report on the environmental and constructional development of the 2nd year design studio project (70%).

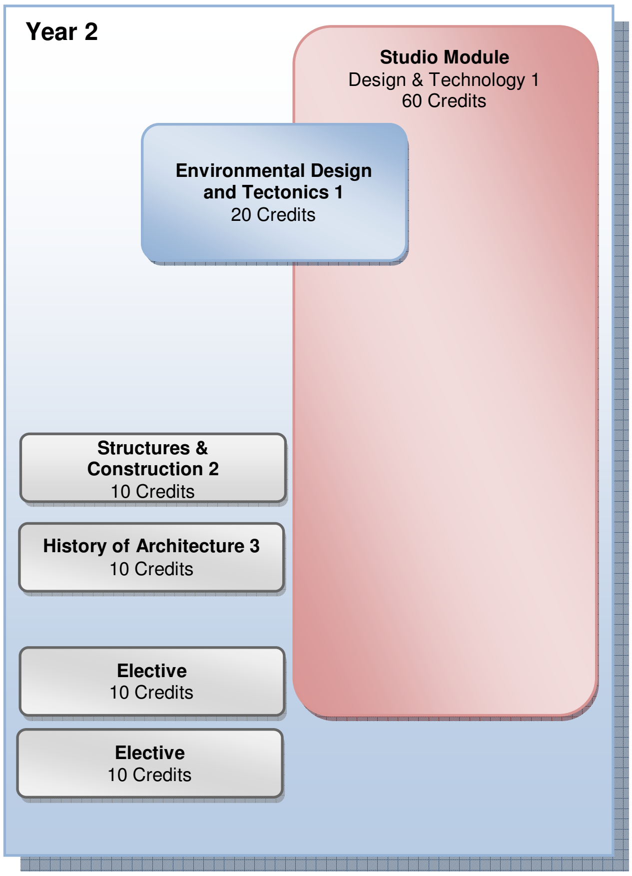
At third year level of BArch, **Environmental Design and Tectonics 2** progresses the daylighting themes raised in the 1st year and the thermal issues investigated in year 2, looking in more detail at integrated strategies in the first semester and architectural acoustics in the second. The module is specifically targeted towards developing a comprehensive understanding of the ways that climate, building programme and occupant interact within building design and how they can be applied coherently within a design project. To support the learning process, key tools and techniques are introduced whereby the students can explore these interrelationships in a meaningful manner and apply the resulting understanding within their design. Delivery is primarily by way of lecture with extensive tutorial support given in design studio. The environmental component is assessed through both group work (50%) and individual project work (50%). Within the group work, students are expected to comprehensively explore a case study of a building of their choice with the view to understanding the relevance and importance of the environmental systems employed. The remaining part of the assessment is devolved to design studio which, given the vast range of briefs on offer, can tailor the exact environmental requirements of the brief to the aims of the specific unit.

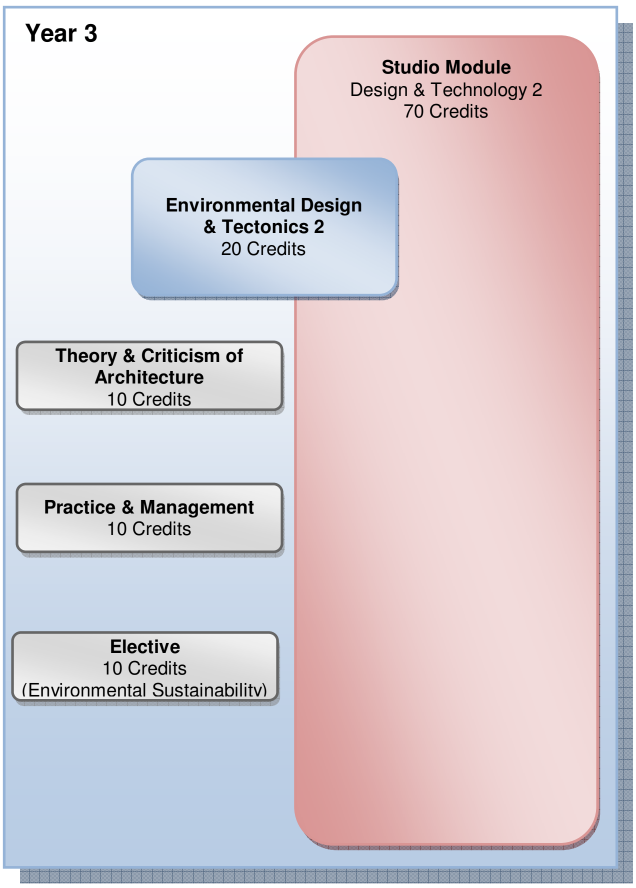
At third year BArch, students can choose to attend an optional module from the BA in Architectural Studies Degree, **Environmental Sustainability: Principles and Practice**, which introduces the environmental issues that pervade the built environment and therefore influence sustainable design. This leads to the undertaking of a detailed and systematic exploration of the principles and practice of sustainable design that includes a group work analysis of selected case studies and an essay on a topic chosen by the student.

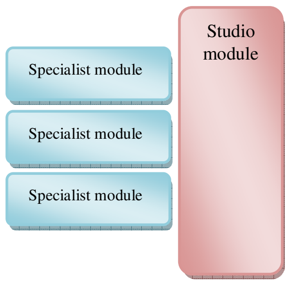
At **Diploma** level, environmental design is mainly taught in the context of specific optional design modules. Specifically, in Year 1 and the first semester of Year 2 students are given the possibility of choosing the modules and related seminars they wish to attend, which include **Sustainable Tall Building Design** – a module that comprises workshops, model-making, computer modelling, urban appraisal, structural explorations, imaginative visualisations, visits etc. in the first semester, for then exploring in detail the theme of the bioclimatic skyscraper in semester 2; **Sustainable Housing Design** – which facilitates, through design and research work, engagement with issues of sustainable design and techniques for the prefabrication of architecture and entails design of a housing scheme on a given urban site; **Architecture and Environment** - which builds on the core environmental modules undertaken during the undergraduate BArch degree and explores the implications of integrating environmental control strategies at the formative stages of a design proposal, testing strategic options, and refining the proposal in the light of critical analysis. In the second semester of Year 2, students develop a design or written **Thesis** based on previous research. The thesis is supported by periodic environmental tutorials throughout its progression and has to respond to environmental criteria as highlighted in a technical report that supports the development of the final project.

Integration of Environmental Design with Studio (Bachelor of Architecture only):

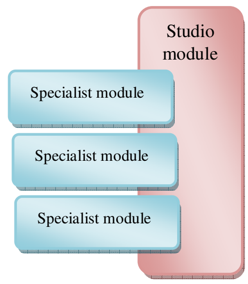




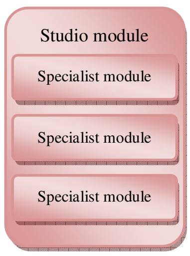




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Within the BArch/DipArch (6 years) degree, the integration of environmental design in the curriculum follows two different structures. A partially-integrated structure is applied during the first degree (BArch), where contents are delivered via satellite lectures and environmental knowledge and skills are partially or fully assessed in studio through project work. Conversely, in DipArch environmental teaching is fully integrated in terms of delivering and assessment for those modules which specifically focus on themes of sustainable environmental design. This structure reveals strengths and opportunities, such as:

Strengths:

- At the end of the course, students generally demonstrate reasonable knowledge, understanding and ability of environmental agenda as applied to the development of their specific design work, with the best projects showing consistency and insight into the process;
- By assessing environmental components through studio work (particularly in BArch), the removal of a 'one-fits-all' approach seems to fall favourably with both students and design tutors – i.e. there is more autonomy in design studio to develop themes of interest to the specific unit, whilst the main learning outcomes are guaranteed via the technical exercises, workshops and case studies;
- There seems to be a gradually stronger buy-in from design studio to a partially-integrated structure, although the level of 'acceptance' varies throughout the different years and the specific units;
- An 'applied' approach to teaching and learning facilitates the process of knowledge transfer;
- Enthusiasm shown by students in discovering that environmentally-sensitive buildings can be beautiful and inspiring in terms of use of the environmental characters of a place (*genius loci*).

Opportunities:

- The devised methodology of teaching shows that an applied 'learning by doing' approach can bring tangible results and successfully link objective physical measures with inspiring design;
- Investigate complementary alternative means to achieving the same aim, specifically:
  - Blended learning for delivery and assessment of content, where this takes place early on in the student's education (better outcomes in terms teaching and assessment methods).
  - Content specific. Building upon blended learning platform but with a programme dedicated towards integrated learning (i.e. specialist stream). This would be equivalent to an advanced environmental design module / studio package.

SOURCES AND REFERENCES

Department of the Built Environment website: www.nottingham.ac.uk/sbe
Academic Surveys and Feedback

UNIVERSITY OF NOTTINGHAM

FACULTY OF ENGINEERING - DEPARTMENT OF THE BUILT ENVIRONMENT

MEng in Architecture and Environmental Design with Honours (4 years)

Level: Undergraduate (MEng Hons; 4 years)

Accrediting Body: RIBA - ARB (Part I), CIBSE (Chartered Institute of Building Service Engineers)

Educational Aims: The MEng degree in Architecture and Environmental Design with Honours provides an education in architecture with specialization in the design of environmental systems for buildings, with a curriculum that meets the Architects Registration Board prescription of qualifications for Part I and the requirements of the Engineering Council. The 4-year course can be followed by one year's supervised professional experience before embarking on the two year Diploma of Architecture and one further year's professional experience to achieve full architect status. Graduates may also gain Chartered Engineer status. The aim of the MEng programme is to produce graduates who are able to provide professional expertise within the construction industry with the necessary intellectual and practical skills required for both architecture and environmental design by means of an integrated educational programme. As such, the programme seeks to provide students with the knowledge, skills and judgement that enable them to contribute to the quality of the built environment and to the general advancement of architecture through a career within the architectural and/or the engineering profession.

Outline Description of Course: The first year of the MEng is structured around a core studio module that develops key design skills and techniques. Supporting modules cover fundamental ideas and concepts relating to environmental design, construction, structural design, and architectural theory. The first year also introduces mathematical tools that support the design of environmentally responsible building systems. The second year is composed of modules that explore the concepts behind the active and passive systems used to provide healthy, comfortable conditions for building occupants. The design studio serves as a forum to explore the application of these ideas and integrate the material covered in structures, construction and architectural history. Studio projects offered in the third year seek to extend the students' ability to tackle briefs for more complex building types. These are linked to environmental systems modules that provide material to inform this work. Independent research skills are nurtured through completion of a dissertation that allows students to develop a specialism in a relevant area of their own choice. The final fourth year introduces advanced environmental design techniques that facilitate a holistic approach to design. The year culminates in the completion of a major studio project where students are expected to bring all of their skills in response to a brief for the design of a complex building.

Course Structure: Each year or session of study consists of 120 credits, normally 60 in each semester. Each module has a credit value. 10 credits are designed to require around 100 hours of student work, including taught and contact time, assessment work and 'student-centred learning'.

MEng in Architecture and Environmental Design (4 years)

Year 1 (*Compulsory Full Year Modules*)

Code	*Title*	*Credits*	*Taught*
K11DAC	Design and Communication (Studio)	40	Full Year
K11DCT	Design Communication Techniques	10	Full Year
K111ED	Environmental Design 1 - People and Environment	20	Full Year
K11SC1	Structures and Construction 1	20	Full Year
K11IDA	Integrated Design in Architecture	10	Full Year
Semester 1 - *(Compulsory Semester Modules)*			
HG1M11	Engineering Mathematics	10	Autumn
Or one amongst the following:			
1HG1M01	Calculus for Engineers	10	Autumn
K11EM1	Environment Engineering Mathematics 1	10	Autumn
Semester 2 - *(Compulsory Semester Modules)*			
K11EM2	Environment Engineering Mathematics 2	10	Spring
Or one amongst the following:			
HG1M12	Engineering Mathematics 2	10	Spring
HG1M02	Applied Algebra for Engineers	10	Spring
Credit Total	**120**		

Year 2

Semester 3

Code	*Title*	*Credits*	*Taught*
K12DTA	Design and Technology A (Studio)	30	Autumn
K12EDT	Environmental Design and Tectonics 1	20	Autumn
K1AES1	Environmental Services Design 1	10	Autumn

Semester 4

K1ATF1	Thermofluids 1	10	Spring
K12SC2	Structures and Construction 2	10	Spring
K1AHA1	History of Architecture 1: Antiquity to the Present	10	Spring
K1AES2	Environmental Services Design 2	10	Spring
K12EBE	Electricity and the Built Environment	10	Spring

(Optional Modules) - Students must take 10 credits from this group

K1BFST	Field Study	10	Spring
K1BGDL	Geometric Description Language 1	10	Spring
K13PM1	Project Management and Development	10	Spring
K1BSPS	Spatial Stories: Thematic Issues in Spatial Narratives	10	Spring
K11IFW	Introduction to Fuels and Waste Utilisation	10	Spring
Credit Total	**120**		

Year 3 (*Compulsory Full Year Module*)

Code	*Title*	*Credits*	*Taught*
K14ASD	Advanced Study Dissertation	20	Full Year

Semester 5

K13DTB	Design and Technology B (Studio)	30	Autumn
K1BES3	Environmental Services Design 3	10	Autumn
K1ATF2	Thermofluids 2	10	Autumn

and

HG2M03	Advanced Calculus and Differential Equation Techniques	10	Autumn

Or one amongst the following:

HG2M13	Differential Equations and Calculus for Engineers	10	Autumn
K12EM3	Environment Engineering Mathematics 3	10	Autumn

Semester 6

K1BHA2	History of Architecture 2: Medieval Age to 18c	10	Spring
K1BESC	Electrical Services and Control	10	Spring
K1BTF3	Thermofluids 3	10	Spring
K1BES4	Environmental Services Design 4	10	Spring
Credit Total	**120**		

Year 4 (*Compulsory Full Year Modules*)

Code	*Title*	*Credits*	*Taught*
K13DT6	Design and Technology 2 (Studio)	70	Full Year
K13EDT	Environmental Design and Tectonics 2	20	Full Year

Semester 7

K1BTAC	Theory & Criticism of Architecture	10	Autumn

Semester 8

K1CPAM	Practice & Management	10	Spring
K14IED	Integrated Environmental Design	10	Spring
Credit Total	**120**		

Learning Outcomes: The programme meets the RIBA/ARB prescription of qualifications for Part I, the requirements of the Engineering Council and the Higher Education Qualifications Framework: Level 3. The MEng is designed to encourage a questioning and receptive attitude that enables students to construct an informed theoretical and ethical position in relation to architectural design, paying special attention to the consideration and integration of environmental strategies. Upon successful completion of the course, students will have developed a systematic understanding of knowledge and critical awareness of current problems relevant to the profession of architecture, knowledge and skills in architectural and engineering design and in related subject areas with an emphasis on creativity, adaptability, independent thinking, constructive and creative dialogue, ingenuity and originality in problem solving and exposition of ideas.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

In the first year, **Environmental Design 1** introduces students to the interrelated factors that influence human interaction with the environment, aiming to integrate human behaviour to the field of environmental design. Starting from an appreciation of climate, the module highlights the relationship between daylight and architecture and presents the key parameters that affect human visual comfort and, concurrently, inform architectural design, either in terms of composition of spaces as in terms of sustainability and energy-related issues. In addition to attending lectures, students undertake assessed exercises (30% of final mark) ranging from environmental assessments, the creation and testing of a sundial and a daylight filter, the construction of a 3-D sunpath for a series of locations and the calculation of a shading mask for a window/building of their choice. Exercises are consolidated toward the main assignment (40%) that is conducted and assessed within studio and that implies the submission of a technical report on the daylight strategy devised (30%).

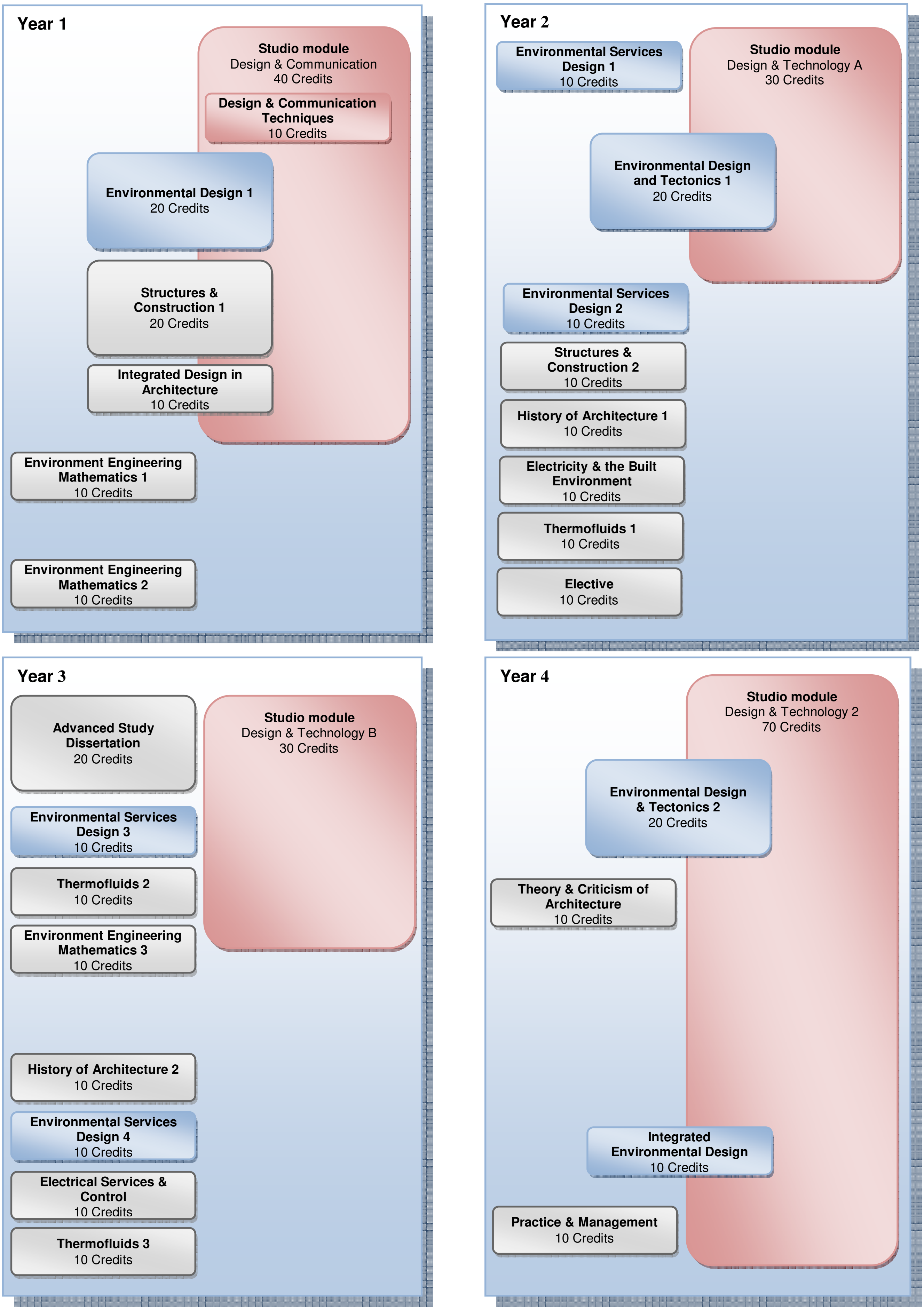
In the second year of the MEng, **Environmental Design and Tectonics 1** is a semester-long module that examines the key structural, constructional and environmental systems used to create building fabrics and maintain appropriate conditions for the occupants of buildings. It builds upon work covered in year 1, exploring in more detail issues of natural lighting and building thermal performance. Techniques and tools used by designers to develop and test environmental strategies are introduced and opportunities to apply these to the design of buildings are provided. The module aims to generate a basic understanding of the technology of medium-scale buildings and the importance of considering it as an integral part of the design process. Knowledge will develop through study of materials, structural forms, environmental performance and their behaviour, and then applied through examination of architecture, integrated elements/components and the construction process. The module is assessed basing on a ‘learning-by-doing’ approach, whereas the ‘design studio' and the 'construction site' are brought into the lecture theatre. Assessment includes active participation of students at technical workshops (*charrettes*) (30%) and the production of a technical report on the environmental and constructional development of the 2nd year design studio project (70%).

During the 2nd and 3rd year, **Environmental Services Design 1, 2, 3** and **4** cover respectively: fundamentals of water services design, providing an introduction to fluid mechanics and the relationships that govern the behaviour of static fluids and fluids in motion; introduction to environmental services systems, presenting the techniques used to select, size, and integrate them in buildings; analysis of large scale building services - principally natural ventilation, air conditioning and other environmental control systems - with discussion of design alternatives, assessment of heat gains and losses, thermal comfort and relevant climatic data; design of environmental control systems (including utility services, lighting and fire protection systems) with discussion of the integration of active and passive environmental principles and strategies in the overall design of buildings. Other than delivering theoretical knowledge in the field of environmental engineering, these modules also provide hands-on experience of the practical skills related to environmental services in order to help students understand materials and fabrication methods in relation to component selection and installation. The modules are assessed mainly by an exam and a coursework component, which can consist of a laboratory report, fabrication exercise or design projects including calculation and drawings.

During the fourth year, **Environmental Design and Tectonics 2** progresses the daylighting themes raised in the 1st year and the thermal issues investigated in year 2, looking in more detail at integrated strategies in the first semester and architectural acoustics in the second. The module is specifically targeted towards developing a comprehensive understanding of the ways that climate, building programme and occupant interact within building design and how they can be applied coherently within a design project. To support the learning process, key tools and techniques are introduced whereby the students can explore these interrelationships in a meaningful manner and apply the resulting understanding within their design. Delivery is primarily by way of lecture with extensive tutorial support given in design studio. The environmental component is assessed through both group work (50%) and individual project work (50%). Within the group work, students are expected to comprehensively explore a case study of a building of their choice with the view to understanding the relevance and importance of the environmental systems employed. The remaining part of the assessment is devolved to design studio which, given the vast range of briefs on offer, can tailor the exact environmental requirements of the brief to the aims of the specific unit.

In the last semester of the MEng course, **Integrated Environmental Design** is a module that runs alongside the final year’s student design studio project and seeks to identify and develop holistic environmental strategies that can be integrated in the final design. The module aims to explore the steps involved in the identification of appropriate active and passive environmental strategies – informed by engineering principles - for integration within the context of an overall building design, practice the development of these ideas throughout the design process, and effectively communicate these to both technical and non-technical audiences. The module is assessed by a series of group short exercises, the production of an Environmental Design sketchbook and of a design portfolio, supported by appropriate technical material.

Integration of Environmental Design Modules with Studio – MEng



STRENGTHS AND OPPORTUNITIES

Most of the modules focusing on sustainable environmental design in the MEng course are taught simultaneously with those of the BArch degree, therefore the strength and opportunities previously highlighted can be considered as applicable to this course as well. Investigation of the additional modules that compose the MEng curriculum reveals the following:

Strengths:

- Specific resources are allocated to bring in external practitioners support for weekly tutorials and periodic reviews to support consideration of environmental principles and strategies in studio design and increase sophistication of final solutions proposed.

Opportunities:

- The application of design days-'charrettes' involving students from different academic courses seem to prove successful in facilitating the definition of design briefs for environmental services design modules;
- Experience reveals that students are quickly able to revert to the analytical approach once their design solution has been finalised and apply this to developing environmental themes. This suggest alternative methods of delivery/assessment that may address some of the current shortcomings:
    - Create a short case-study element that provide essential background information on the environmental design of the student's selected typology;
    - Develop student's analytical skills by going beyond hand-calculations and use software tools in an efficient manner;
    - Staging the design process so that there are interim submission requirements during the semester that reflect upon the design solution (critical reflection and evaluation) and explore it at an appropriate level;
    - Develop a bespoke analytical framework in the process of meeting stages submissions that can be applied quickly as the design proceeds as well as developing understanding and appreciation of the building typology that can inform the design process.

SOURCES AND REFERENCES

Department of the Built Environment website: www.nottingham.ac.uk/sbe
Academic Surveys and Feedback

UNIVERSITY OF NOTTINGHAM

FACULTY OF ENGINEERING - DEPARTMENT OF THE BUILT ENVIRONMENT

Master of Architecture (MArch) - Environmental Design

Level: Postgraduate (MArch- Environmental Design, 1 year)

Accrediting Body: Not applicable

Educational Aims: This professional course aims to provide training in integrated environmental design in architecture and is intended primarily for practitioners who wish to broaden their knowledge in sustainable building design and its application to architectural projects. The course is also designed for individuals who wish to pursue research careers in these areas. The MArch emphasizes a problem-solving approach where technical and theoretical knowledge is integrated and builds on a project-based approach which is unique in environmental design education. The theoretical and technological aspects of environmental design are treated in equal measures in the design projects. This is further supported by group seminars and lectures.

Outline Description of Course: The prescribed course of study is either 12 months full-time, or not less than 24 and not more than 48 months part-time. Candidates for the Postgraduate Diploma (PgDip) in Architecture - Environmental Design are required to follow a prescribed course of study of either 9 months full-time, or not less than 18 and not more than 36 months part-time. As part of the course content, students take studio-based environmental design modules where practical skills and imagination are challenged and examined through an architectural project. The key design projects include: Environmental Design in Architecture; Sustainable Housing Design or Tall Building Design. Additional lectures and seminars provide a parallel knowledge base and intellectual support for the design projects. During the summer semester, students produce a supervised dissertation as an in-depth study of an individually determined topic.

Course Structure: To fulfil the requirements for the MArch in Environmental Design (180 credits), students need to complete 120 credits' worth of modules including design projects, which are supported by additional lectures and seminars, and a 60-credit project / dissertation on a subject of their choice.

Compulsory Modules

Code	*Title*	*Credits*	*Taught*
K1DARM	Architectural Research Methods	15	Autumn
K14AED	Advanced Environmental Design	15	Autumn
K14EEP	Environmental Design Process in Architecture	30	Autumn
K14CSP	Case Study Project	15	Spring

Restricted Modules

Students must also take one of the following pairs of modules according to a package theme K14ATB & K14DTMI or K14HDP & K14DTM:

K14HDP	Sustainable Housing Design Project	30	Spring
K14ATB	Advanced Tall Buildings	30	Spring
K14DTM	Design, Technology and Materials	15	Spring
Credit Total	**120**		

Compulsory Module

K1DDIS	Dissertation: Built Environment	60	Summer
Credit Total	**60**		

The 30-credit and the 15-credit modules in each semester are thematically related and with independent assessments in Autumn and Spring. A total 45-credit package is offered in both semesters. In the Autumn semester, the 30-credit module is a studio-based design exercise where practical skills and imagination are challenged and examined through an architectural project. In tandem with the 30-credit module, a 15-credit module provides a parallel knowledge-based and intellectual support, through the study of issues related to the design theme chosen. The 15-credit module is examined and assessed through an independent project. In the Spring semester, the 30-credit module has a linked 15-credit seminar module as an integral teaching component. It is compulsory for the students to take this module and the knowledge gained through the linked 15-credit module is assessed within the main 30-credit design project.

Learning Outcomes: The programme provides a curriculum that supplies students with the knowledge and understanding of the opportunities and benefits which arise from the application of environmental design principles in architecture and urban design, and the role of an integrated approach in the design process. The learning outcomes are achieved through a combination of studio-based and seminar-led learning that includes lectures, seminars and workshops, symposia and peer feedback.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Within the MArch in Environmental Design, in the first semester of the course the **Advanced Environmental Design** module introduces methods for exploring the environmental performance of buildings, basing on an integrated environmental design approach. Heavy reliance is placed on computer simulation and use of physical models in a process of testing-analysis-development that facilitates the understanding of the likely environmental behaviour of buildings. Computational and physical modelling techniques are used to study the interactions of glazing, thermal envelope design, ventilation and environmental dynamic performance of occupied buildings. The module is primarily assessed via coursework (60%) including a design presentation report of a project developed by the students, and a presentation (40%) on a short design project.

Environmental Design Process in Architecture is a studio-based project, concentrating on the design and assembly of the enclosure for an architectural space which must meet a specified environmental performance. Construction and environmental substantiation of the design are parts of the requirements, as the evidence of an exploration of the concept of design generated by technical factors. The aims of the module are to encourage students to develop design skills and formulate a personal attitude to technology and environmental performance through the exploration of the interaction between architectural form, building services and construction. Activities are undertaken within groups and include weekly tutorials, periodic reviews and criticism, and private study. The module is assessed by a design presentation report.

Architectural Research Methods covers the skills and resources that students need so as to conduct independent high quality academic research. The module introduces some of the practical and theoretical issues involved in architectural research and related built environment studies, such as choosing a research topic, how to shape research and literature search techniques, ways to analyse and present information, how to clearly report research findings, etc. It also introduces students to research methods for conducting primary research, including quantitative and qualitative methodologies, data collection and simple statistical analysis. The module is assessed via an essay, which also includes a direct presentation by students.

In the second semester of the course, students choose a studio-based design module, which is thematically related to a seminar series. Amongst the modules on offer, **Advanced Tall Buildings** explores the design of tall building in an urban setting. The module requires the determination of a comprehensive design strategy on a particular site in accordance with a specific design brief. Its aims are to provide students with experience on the application of the architectural design process associated with tall buildings and gain the necessary skills to adequately communicate their design, its construction and its assembly, via drawings, models, computer images or other graphical technique. The module is assessed via a final review, which includes a drawn and oral presentation. **Sustainable Housing Design Project** is a studio-based module that aims to develop a holistic sustainable approach to housing design and facilitate, through design work, engagement with theoretical issues of sustainable design. Throughout the module, students engage with the social, economic and environmental aspects of sustainable housing, investigate and apply an integrated environmental design approach and develop appropriate design proposals to work with these parameters. Assessment comprises a final review, which is conducted via an oral and drawn presentation. In parallel and in close relationship to studio modules, the seminar/lecture series **Design, Technology and Materials** aims to develop knowledge and understanding of the material and technical dimensions of building design. The module is designed to support practical application in the design studio and its assessment consists of a construction / technical / environmental study and/or a report related to the design project undertaken as part of the studio module chosen.

Concurrently, the **Case Study Project** module aims to examine building-related environmental design issues through fieldwork and on-site monitoring on a chosen case study. Through this hands-on environmental design exercise, students gain a sound understanding of the inter-related environmental design issues involved in building design. The module is assessed by a written report that summarises the monitoring results and/or occupant questionnaires from post-occupancy evaluations and consolidates the findings and alternative design options from the qualitative and quantitative analysis.

Finally, the **Dissertation** consists of an exercise in the preparation and production of an informed piece of writing within recognised constraints. The Dissertation (20,000 words) is to be undertaken under the guidance of a supervisor during the summer semester and activity includes periodic tutorials with an individual tutor, private study and field study as required by the selected subject.

Throughout the MArch - Environmental Design, students are assessed entirely through coursework (design projects, essays/reports and presentations), plus a 60 credit dissertation. As mentioned, the choice of the topic for the Dissertation generally needs to have a direct link to field work and involve analysis and/or critical consideration of environmental design issues.

STRENGTHS AND OPPORTUNITIES

Strengths:

- A good organisation of focused lectures, together with the resourcing of external speakers and consultants for tutoring and reviews (generally sourced from the environmental design industry) is very useful to reinforce the link between the technical contents delivered and the applications of the discussed principles in practice;
- Students seem to be receptive, motivated and enthusiastic about an integrated approach to the teaching of environmental design in architecture;
- The encouragement of group work (often pushing students to operate as a small practice) facilitates peer reviewing in design studio and reinforces the learning of the concepts delivered in the seminar and lecture series;
- The use of computer modelling and physical testing facilitates the acquisition of technical knowledge, in order for students to acquire familiarity with advances simulation tools to perform quantitative and qualitative analysis;
- The use of a “real life” building construction design challenge forces all individual students to acquire basic environmental design knowledge and also helps the teaching staff to identify weaker students that needed specific attention;
- Assessment methods that utilise student presentations and interim reviews encourage participation and help students to build up confidence and maintain momentum throughout the modules.

Opportunities:

- Some interesting pedagogical opportunities may be given by the introduction of small exercises which focus on key environmental aspects of design, the organisation of site visits and the encouragement of enquiry-based learning;
- An integrated teaching and learning approach comprising theoretical lectures, team working and applications in workshop seems to guarantee a successful achievement of targeted learning outcomes.

SOURCES AND REFERENCES

Department of the Built Environment website: www.nottingham.ac.uk/sbe
Academic Surveys and Feedback

ARCHITECTURAL ASSOCIATION SCHOOL OF ARCHITECTURE

AA Intermediate (3 years) / AA Diploma (2 years + 1 year-out)

Level: Undergraduate (3 years) / Graduate (2 years + 1 year out)

Accrediting Body: RIBA (Royal Institute of British Architects), ARB (Architects Registration Board)

Educational Aims: Based in central London and currently in its 162nd year, the Architectural Association School of Architecture is the oldest and one of the largest schools of architecture in the UK. The AA School is an independent institution with a worldwide reputation for its experimental orientation. It is also the world's most international school of architecture with some 90% of its full-time students - and nearly as many of its teachers - coming from abroad. As a learned society, the AA offers a Public Programme of evening lectures, symposia, exhibitions and publication launches that is considered to be the largest year-round series of public events dedicated to contemporary architectural culture. Choice, diversity and experimentation are hallmarks of the School's pedagogy. In the AA Undergraduate School - which comprises the Foundation, First Year, Intermediate School and Diploma School - these features are represented by the "units", the School's design studios. In 2009-10, the Intermediate School (2nd and 3rd Year) consists of 13 design units each of which has 10-15 students in their second and third years. The Diploma School (4th and 5th Years) has 16 design units of similar size that combine 4th and 5th year students. The First Year is organised as a single studio intended to introduce students to architectural design, critical thinking and experimental ways of working. For students who do not have an extensive visual or design background, the AA Foundation is an Open Studio providing a year-long introduction to an art and design-based education. The five-year programme (plus one year-out in practice) of the AA Undergraduate School is a RIBA/ARB-accredited course leading to the AA Intermediate Examination (Part 1) and the AA Final Examination (Part 2).

Outline Description of Course: The First Year studio aims to prepare students for the complexities of the professional, critical and cultural activities associated with architectural innovation and experimentation. Students gain knowledge, skills and experience in a strategically diverse range of design ideas, agendas and interests from which they begin to form their own architectural identities and personalities. In the Intermediate and Diploma Schools, independent units pursue highly individual design agendas addressing contemporary architectural and urban projects, culture and programmes. Studio work is supported by Complementary Studies courses in History and Theory, Technical, Media and Professional Studies.

Course Structure: Each academic year is organised around a year-long Design Studio supported by Technical Studies (TS), History & Theory Studies (HTS) and Media Studies (MS). In the Intermediate and Diploma Schools students apply to join a design unit on the first week of the year and then choose from among the list of Complementary Courses. The topics of Complementary Courses offered changes annually.

First Year

Title	*Taught*
Design Studio	Full Year
First Year History & Theory Studies	Autumn/Spring
First Year Technical Studies	Autumn

and 4 out of the 10 following courses in Media Studies:

The Violet Hour	Autumn/Spring
Translation Object to Drawing	Autumn
Life Drawing For Architect	Autumn
Painting Architecture: First Year	Autumn
Materiality of Colour	Autumn
Video: First Year	Autumn
One-To-One Instruments	Spring
Life Drawing	Spring
Re-Painting Architecture	Spring
Colour and Light	Spring

<u>AA Intermediate</u>

Second Year

Title	*Taught*
Design Studio	Full Year
History & Theory Studies Second Year	Autumn/Spring
Technical Studies TS2 Structures	Autumn
and choose one of the following as TS2 Option	Spring
Materials	
Environmental Engineering	

and one of the following for Media Studies:	Autumn
Coding as thought	
Drawing(s) animating	
Tagging Contours	
Customized Computation	
Rendering Environments	
Painting Architecture: Intermediate	
Embodied Landscapes	
Physico-Logical Parametrics	
Public On Demand	
Wire Form	
All Fake / Part I	
and one of the following for Media Studies:	Spring
Emergence	
Pending Structures	
Tagging Contours	
Driving Miss Data	
Rendering Environments	
Voxel Cathedrals-Contoured Embodiment	
Architectural Geometry	
Publish On Demand	
Video: Intermediate	
Skin Form	
All Fake / Part II	

Third Year

Title	*Taught*
Design Studio	Full Year
History & Theory Studies Third Year	Autumn/Spring
TS3 Structures	Autumn
TS3 Design Project	Full Year
Professional Practice	Autumn

AA Diploma

Fourth Year

Title	*Taught*
Design Studio	Full Year
and two out of the following options for History & Theory Studies:	Autumn
The Project of Architecture	
Don’t Look Now	
Curating Fashion	
The History of Homecoming	
Eight Lectures on Everything Zaha Hates	
Ornament: Reconstructing Architecture’s Battle Royal	
Wandering the Open Plan	
Projective Cities	
Polity and Space	
Anti-(Anti-) Rationalism	
Booma: The Bookspace of OMA	
Cold War Architecture and its Ghost	
Landscape and Mobility	
Myths and Theories of Sustainable Design	
and two out of the following options for Technical Studies:	Spring
Process in the making Small in Large-The Interrelation of Component and System	
Studies in Advanced Structural Design	
Technology Transfers or Technomimetics	
Sustainable Urban Design	
Environmental Modelling and Simulation	
Form Energy and Environment	

Fifth Year

Title	*Taught*
Design Studio	Full Year
History & Theory Studies *(same options as Fourth Year)*	Autumn
Technical Studies TS 5	Full Year
Future Practice	Autumn

Learning Outcomes: The AA School gives students the opportunity to create their own agendas by selecting among a great range of units and modules, thus encouraging creativity, exploration and innovation as major ingredients of their architectural training. The programme provides opportunities for students to develop and demonstrate appropriate knowledge and understanding according to the requirements of the Royal Institute of British Architects and Architects Registration Board Prescription of Qualifications (RIBA - ARB Criteria for Part 1 and Part 2).

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Environmental design has been taught uninterruptedly at the AA Undergraduate School since the mid-1950's. This has involved its adoption as the main field of study by specialised units, as well as the provision of courses offered more widely across the School as part of Technical Studies. Interest in sustainable environmental design is currently high across the Undergraduate School. However, the manner in which it is pursued varies both between and within different parts of the School. There are currently several design units, in both Intermediate and Diploma Schools, embracing aspects of sustainability into their research agendas. Students from these units will generally strive to acquire the necessary technical knowledge and computational skills by relevant courses offered within the School.

At Second Year of AA Intermediate, **Environmental Engineering** is a term-long course introducing students to the broad and fast evolving role of environmental engineering in architecture, aiming to inspire them to develop environmental engineering concepts for their own projects as well as teaching fundamental principles. Lectures demonstrate ways in which cutting edge technologies and computer simulations can be used to develop design concepts through an iterative process of ‘virtual prototyping’, similar to design methods already used for many years in the car and aircraft industries. Extensive use is made of case studies to illustrate the principles and techniques.

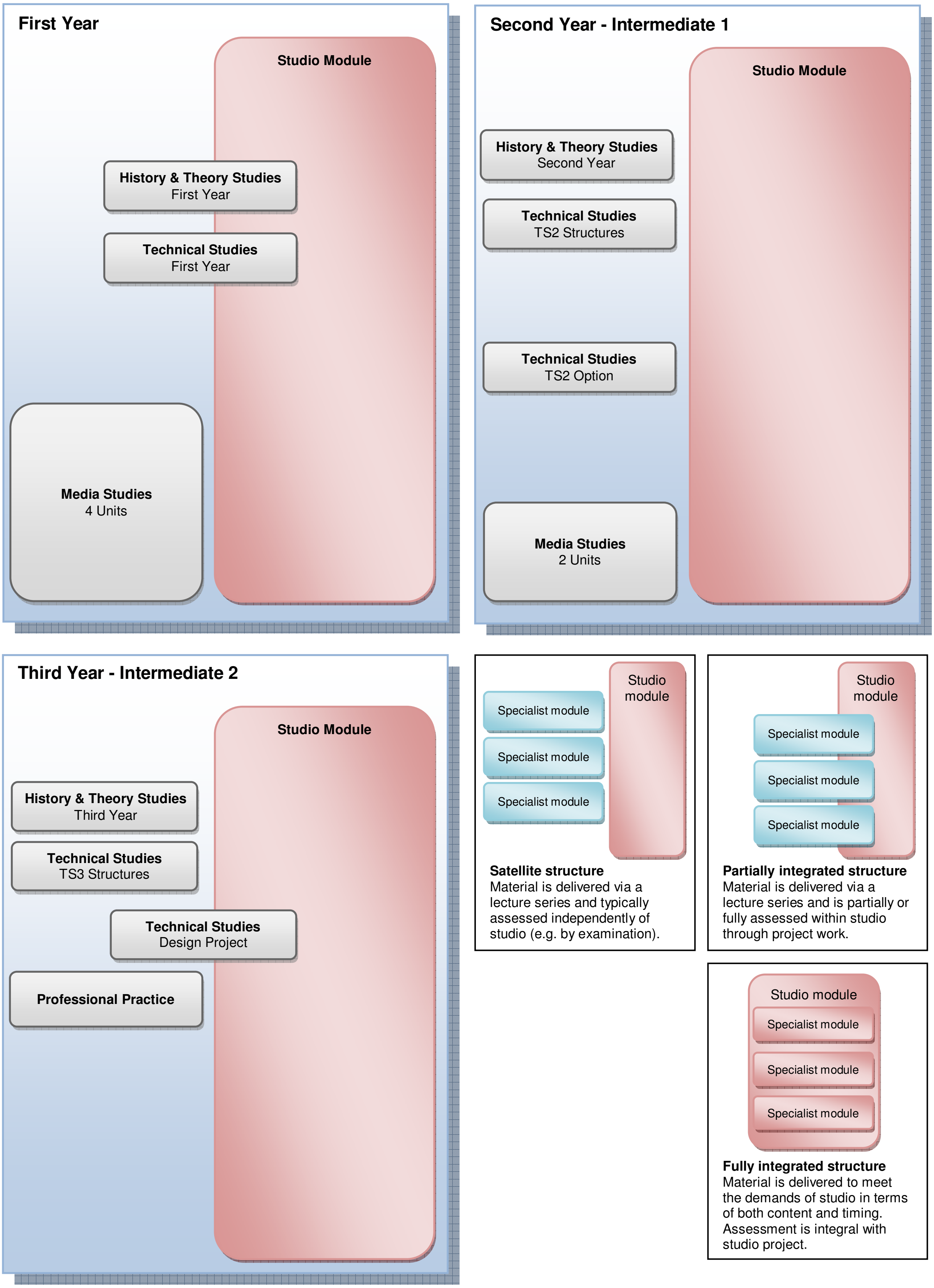
In AA Diploma School, the course on **Myths and Theories of Sustainable Architecture** is an Autumn Term course shared with the AA Graduate School's Master's programme in Sustainable Environmental Design. The course can be taken by 4th and 5th year Diploma students as a History & Theory Studies option. It introduces key concepts and criteria of sustainable environmental design providing cognitive grounding and a critical framework for design research and applications.

In the Spring Term, 4th year students have a choice of three term-long environmental design courses offered under Technical Studies. **Sustainable Urban Design** examines concepts and technologies associated with the idea of the sustainable city. It begins with an examination of urban morphologies and densities, particularly in relation to energy. The design of individual buildings is studied in this context with a view to how they can “sit lightly” on the earth. Evolving technologies such as photovoltaics and wind turbines are presented in some detail. The urban effects of spatial planning, materials, light and water are studied. Movement systems and biodiversity are presented briefly.

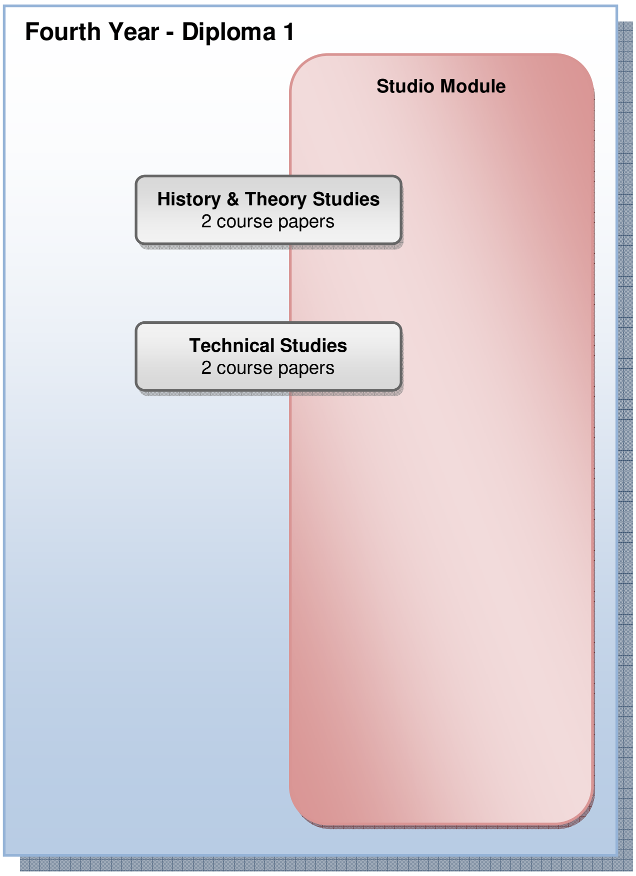
Environmental Modelling and Simulation is a hands-on course on the use of environmental design software. The course starts with an overview of the tasks that such software is designed to serve and the use that can be made of these tools before, during and after design. The course deals with the generation and assessment of climate data and the simulation of solar, thermal and lighting processes in and around real or virtual buildings. The submission for the course is in the form of an Applications Workbook analysing and informing conditions relating to students' studio projects.

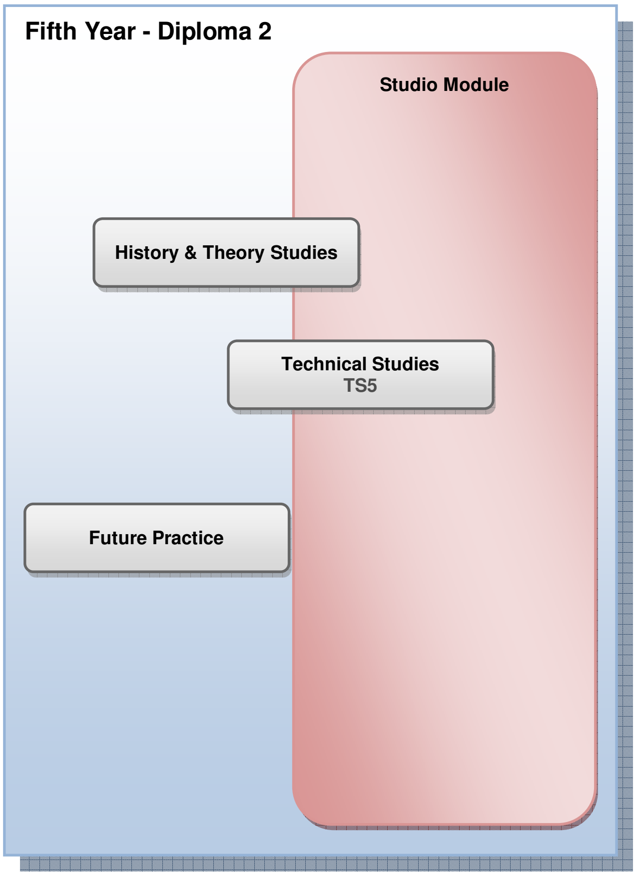
Diploma students can also take the course **Form Energy and Environment**, which reviews the development of building skins and influence on occupants’ comfort and carbon-footprint. Diverse methods of exploiting natural forces are presented through real projects. The application of computer modelling tools is illustrated with completed buildings that benefited from modelling. Students undertake a design assignment researching building case studies or conceiving a futuristic building that extends the design and social boundaries.

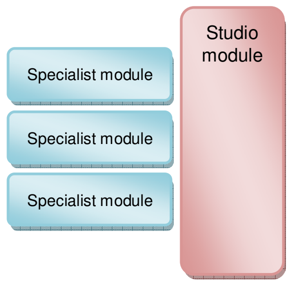
Integration of Environmental Design with Studio – AA Intermediate



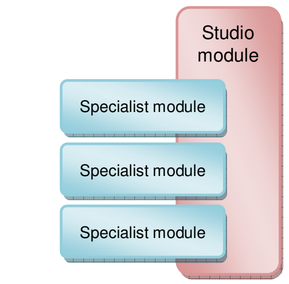
Integration of Environmental Design with Studio – AA Diploma



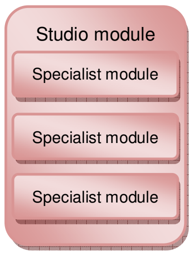




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

The importance given to specific topics and approaches depends greatly on the design teachers involved and on the studio agendas set by the units each academic year. Amongst the strengths and opportunities:

Strengths:

- Available History & Theory Studies, Technical Studies and design unit options allow interested students to acquire good working knowledge of concepts, tools and architectural potential of sustainable environmental design;
- Flexible course structure allows fast adjustments to new requirements both between and within academic years;
- Given the School's reputation for anticipating architectural movements, students are expected to take every opportunity for producing outstanding pieces of work.

Opportunities:

- Students come to the AA to explore the most advanced design techniques; there is great potential for exploring sustainability as a design generator.

SOURCES AND REFERENCES

Architectural Association School of Architecture website: www.aaschool.ac.uk
Academic Surveys and Feedback

ARCHITECTURAL ASSOCIATION SCHOOL OF ARCHITECTURE

ENVIRONMENT & ENERGY STUDIES PROGRAMME

Master of Science / Master of Architecture in Sustainable Environmental Design

Level: Postgraduate (MSc / MArch Sustainable Environmental Design; 12/16 months full time)

Accrediting Body: Open University Validating Services

Educational Aims: The main research object of the AA School's Master's programme in Sustainable Environmental Design is the relationship between architectural form, materiality and environmental performance, and how this relation should evolve in response to climate change and emerging technical capabilities. Observation, measurement, and computer modelling and simulation are fundamental techniques that underpin the design research undertaken within the programme. These are applied at various levels of detail and intensity aiming to extend the understanding of theoretical principles and inform the design process. Eligible applicants can opt either for the Master of Science (MSc) or the Master of Architecture (MArch) options. The MSc option runs over 12 months (from October 2009 to September 2010 in this academic year) and is offered to both architects and engineers. It provides the conceptual, experiential and analytical skills needed for engaging in sustainable environmental design research and practice, making extensive use of advanced digital tools and seeking a creative synthesis between physics, engineering and architecture. The MArch option is addressed to architects and teachers of architectural design. Its 16-month duration (from October 2009 to January 2011) enables the exploration of detailed design agendas that can include the realisation of experimental structures.

Outline Description of Course: The taught programme is structured in two parts. The first part (Phase I, October-April) is common to both the MSc and MArch candidates and is structured around a series of joint studio projects undertaken in teams combining the two groups. Projects are supported by weekly lectures, seminars and workshops. These review theories and practices of sustainable design, present case studies by leading researchers and designers, define performative criteria for different building types and climates and provide training in the use of environmental simulation tools and design analysis techniques. The second part of the course (Phase II, May to end of September 2010 for the MSc, May 2010 to end of January 2011 for the MArch) is organized around candidates' dissertation projects. MSc dissertation projects combine design research with analytic work and case-studies related to the programme's areas of research and candidates' professional interests and backgrounds. Topics for dissertation projects are decided half way through the programme duration and the work is developed over the last two terms under the supervision of the programme's regular teaching staff.

Course Structure: A total of 180 credits is required for the MSc / MArch in Sustainable Environmental Design. Course work is assigned by academic term. Credits are distributed by term as shown below. Students must attend all of the lecture series and other events of the taught programme and earn the required credits by successful completion of cross-course course work.

Breakdown of Course Credits

Title	*Credits*	*Taught*
Project 1	25	Autumn
Research Paper 1	10	Autumn
Technical Studies 1	10	Autumn
Project 2	25	Spring
Research Paper 2	10	Spring
Technical Studies 2	10	Spring
Dissertation Project	90	Summer
Credit Total	**180**	

Learning Outcomes: On successful completion of the MSc / MArch in Sustainable Environmental Design, participants will be able to:

Knowledge and understanding:

- Demonstrate knowledge and understanding of key concepts of sustainable environmental design
- Demonstrate familiarity with building energy modelling and simulation tools and understanding of their applicability to inform design decisions
- Identify and characterise significant architectural typologies and built precedents
- Demonstrate critical understanding of generic environmental attributes of historic and contemporary buildings

- Take a critical position in relation to wider issues and objectives of sustainability
- Take a critical position in relation to parallel contemporary tendencies in architecture and urbanism

Subject specific skills and attributes:

- Undertake critical reviews and appraisals of key technical and theoretical aspects of environmental sustainability in architecture and urban design
- Plan, implement, process and interpret fieldwork in buildings and outdoors using specialist instruments and data acquisition techniques
- Use specialised analytic tools and performance assessment techniques to inform design decisions and assess the environmental impact and performance of buildings and urban spaces
- Identify, compare and assess environmental attributes of buildings using on-site observations and measurements, as well as comparative performance data and calculated results
- Assess the potential offered by new materials and technologies
- Formulate environmental design guidelines and proposals for new or existing buildings taking account of climate, site and building occupancy
- (MArch) Develop and test original design applications

Transferable Skills and Attributes

- Use appropriate analytic tools and other research techniques to formulate and test research hypotheses
- Engage in environmental research as a member of an interdisciplinary team
- Use a variety of media to communicate effectively with clients and colleagues
- Continue expanding their knowledge using the skills acquired

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

In the first two terms of the academic year, the lecture input is designed to provide a common cognitive background and a first set of skills and tools that students can apply on course work and dissertations. In addition, lectures address current issues and professional concerns, and provide overviews of research directions pursued by staff and by the field as a whole. The following are courses offered in 2009-10:

Myths & Theories of Sustainable Architecture. Key concepts and performative criteria are introduced in this course, providing the cognitive grounding and critical framework needed for design research and applications.

Environmental Design Primer. The course deals with key topics in building science focusing on current thinking and research in sustainable environmental design as it applies to architecture and urbanism. Lectures look at the relationship between climate and architectural evolution; people, buildings and sustainability; occupant environmental comfort and thermal performance of buildings; daylight and architecture; daylight, artificial light, and energy; natural and mechanical ventilation; health and energy expenditure in buildings and other design-related topics.

Lessons from Practice. The course looks at historical and contemporary approaches using built examples from the research and practices of the programme's teaching staff as well as guest lecturers to discuss design concepts and environmental performance in practice. Visiting contributors include UK and international practitioners with a stated commitment to environmentally responsive architecture.

Environmental Analysis Tools. This is a technical course on methods and tools applied before and during design to test ideas and environmental targets, simulate and compare the likely performance of alternative designs, assess predictions of environmental conditions against measured data and benchmarks, fine tune design proposals and inform final design decisions.

Design Research Workshop. This is a hands-on workshop that provides training on application of the digital tools and procedures introduced by the Environmental Analysis Tools course. The weekly workshop follows from each session of the Tools course, helping to build the necessary knowledge and experience in stages under close supervision. The tools covered by the workshop include scientific instruments and survey techniques for use on fieldwork, as well as digital tools applied to the modelling and simulation of environmental processes and to form generation. The sequence in which different tools are introduced mirrors their application on the year's projects.

Productive Research. The purpose of this seminar is to foster the development of the research skills required for studio projects and professional work in this Master's programme. These include selecting topics for research papers and dissertation projects, writing of technical papers and reports for presentation and publication, and developing a visual language for communicating the principles and outcomes of sustainable environmental design.

Team Projects: In the Autumn Term, building studies around London combine occupant and designer interviews with on-site observations and environmental measurements. Measurements taken on-site provide inputs with which to calibrate digital models. These are then applied to perform simulations of environmental performance as a first stage of parametric analysis and design research. The theoretical knowledge, analytic tools and instrumentation required for project work are introduced by the taught programme in its weekly lectures and workshops. Lectures are mostly concentrated on 2 days a week allowing candidates to devote most of the rest of the week to studio work. The findings of the Autumn Term's fieldwork and environmental performance studies provide the starting points for the following term's design research agendas. In the Spring Term, the studio aims to explore innovative as well as performative designs, addressing climate change, maximizing use of natural resources and aiming at zero carbon buildings. Project teams can select urban sites in different climatic regions as the locations of individual design schemes.

Dissertations are the vehicles for undertaking a significant piece of research that reflects the programme's areas of research and students' personal interests, background, special skills and plans for the future. For the MSc, this should combine design research with analytic work and case studies that may involve field studies, as well as analytic work using environmental modelling and simulation tools. For the MArch, the dissertation project must include an original design application that should be researched and developed in some detail over a longer period of time. Seminars on the selection and planning of the Dissertation Project are held at key points during the year. Topics are agreed with the programme's teaching staff in the course of tutorials. Supervision of dissertation work is through regular individual tutorials.

STRENGTHS AND OPPORTUNITIES

Strengths:

- High level of motivation;
- Access to a broad range of case studies for carrying out fieldwork, relating first hand observations with measurements and analytic work;
- Close links with practice;
- Strong presence in national and international events.

Opportunities:

- International student body creates networks for future collaborations;
- From very early-on, students acquire skills that enable the undertaking of ambitious research.

SOURCES AND REFERENCES

AA Environment & Energy Studies Programme website: www.aaschool.ac.uk/PORTFOLIO/sed.htm
Academic Surveys and Feedback

UNIVERSITY OF BATH

DEPARTMENT OF ARCHITECTURE & CIVIL ENGINEERING

Bachelor of Science with Honours + MArch in Architecture (6 years)

Level: Undergraduate (BSc Hons, 4 years) + Graduate (MArch, 2 years)

Accrediting Body: RIBA (Royal Institute of British Architects), ARB (Architects Registration Board)

Educational Aims: The education of holistic-thinking graduates in the built environment is based on the simple philosophy that if architects and civil engineers are to work together then they ought to be educated together. In the undergraduate program (Bachelor of Science), architects will acquire a profound flair for innovative design of buildings, looking to structure and environmental control to inform their design. All three professional parts of architectural education are taught in the Department, all accredited by RIBA/ARB.

Outline Description of Course: The BSc degree in General Architectural Studies (Part One, 4 years) is a thin-sandwich course which offers students an opportunity to combine academic study with a placement in practice. The first year is full-time and there are placements in both the second and the third year. Students can choose to spend the third year, or part of it, on an Erasmus exchange in a participating School of Architecture in Europe. The MArch degree (Part Two, 2 years) provides analytical, communicative, and projective skills to architects with a final interest in the city as a field of action for architects. Within an overall framework dedicated to refining core architectural design skills, the course aims to assist students to develop a critical perspective. The Department also offers a postgraduate certificate in Professional Practice (Part Three, 1 year). The programme has short periods of residence at the University of Bath and leads the candidates through the necessary education in order to be able to achieve the ‘Architect’ status.

Course Structure: Each year consists of 60 credits, normally 30 credits for each semester. Specifically:

Year 1 (BSc): The first semester is a joint foundation studio with engineering students, in which students acquire basic skills in drawing and basic instruction in construction, structures and environmental engineering. In the second semester, the architectural students work four days a week in the design studio, which focuses on architectural history, composition and representation.

Year 2 (BSc): Gives the students a wide range of new skills to prepare them for their first placement. It expands the student’s range of skills in architectural drawing and model making. It also expands the student’s experience of buildings in context.

Year 3 (BSc): Some of Bath's students choose the Erasmus Exchange option in year 3. As a consequence of the exchange, there is a break in the progression of taught units during third year and the opportunity is taken in the design studio to engage in work that supports the wider learning of architecture-related skills.

Year 4 (BSc): A major design project involving collaboration in multi-disciplinary teams with engineering students takes place in year four, addressing the technological issues which underpin architectural design. The second semester project allows each student to develop their own project brief. This final project draws together the learning outcomes from the previous years and allows the students to demonstrate their knowledge, awareness, understanding and ability of a broad range of Part One criteria and to integrate these criteria within a coherent architectural design. The year is also regarded as preparation for the MArch.

Year 5 (MArch): Students register in October and complete either Placement MArch or Urban Studies, as well as Management 5. In Design Studio 5, the emphasis is on individual projects ranging from private to public buildings. Lecture courses are integrated with design project work wherever it is feasible to do so. The Dissertation is introduced during the second semester and supervisions are held during the second half of the semester to ensure that students can pursue effective research during the vacation period.

Year 6 (MArch): After a period of uninterrupted Dissertation writing, students produce a design project analysis based on site visits. From this analysis, different strategies and project briefs are explored. Group and individual design strategies are developed, and individual integrated designs for buildings on selected sites are devised. An appropriate holistic response to context, construction and materials is sought. The year is also regarded as preparation for the professional RIBA Part 3 examination.

<u>Bachelor of Science (4 years)</u>

Year 1 (*Compulsory Units*)

Code	*Title*	*Credits*	*Taught*
AR10003	Building environment 1	6	Autumn
AR10014	Detailed design 1	6	Autumn
AR10015	Design studio 1.1	9	Autumn
AR10313	Structures 1A	6	Autumn

AR10342	History and theory of architecture 1.1	3	Autumn
AR10016	Design studio 1.2	18	Spring
AR10040	History & theory of architecture 1.2	3	Spring
AR10041	Sustainability in the built environment	3	Spring
AR10362	Practice, management and law 1	3	Spring
AR20009	Computer aided design 1	3	Spring
Credit Total	**60**		

Year 2 (*Compulsory Units*)

Code	*Title*	*Credits*	*Taught*
AR20012	Detailed design 2	3	Autumn
AR20017	Design studio 2.1	15	Autumn
AR20081	Structures 2A	3	Autumn
AR20297	Environmental design	3	Autumn
AR20343	Computer aided design 2	3	Autumn
AR20364	History and theory of architecture 2	3	Autumn
AR20064	Professional placement 1	30	Spring
Credit Total	**60**		

Year 3 (*Optional Units*) - Students must take between 0 and 1 Unit from this group

Code	*Title*	*Credits*	*Taught*
AR30075	Erasmus exchange semester 1	30	Autumn

(*Optional Units*) - *Students must take between 0 and 3 Units from this group (unless on Erasmus Exchange)*

AR30019	Design studio 3.1	18	Autumn
AR30093	Urban studies	6	Autumn
AR30341	History & theory of architecture 3.1	6	Autumn

(*Optional Units*) - *Students must take 1 Unit from this group*

AR20065	Professional placement 2	30	Spring
AR30243	Erasmus exchange semester 2	30	Spring
Credit Total	**60**		

Year 4 (*Compulsory Units*)

Code	*Title*	*Credits*	*Taught*
AR30021	Design studio 4.1	21	Autumn
AR30039	History and Theory of architecture 4	6	Autumn
AR30053	Practice, Management and Law 2	3	Autumn
AR30022	Design studio 4.2	30	Spring
Credit Total	**60**		

MArch in Architecture (2 years)

Year 1 (Compulsory Modules)

Code	*Title*	*Credits*	*Taught*
AR40340	Professional studies: management, practice and law	6	Autumn
AR40105	History and theory of architecture and urban design	6	Spring
AR40300	Design studio 5	18	Spring
AR40363	Environment and sustainability	6	Spring

(*Optional Units*) - Students must take 1 Unit from this group

AR40097	Placement MArch	24	Autumn
AR30298	Urban studies option	24	Autumn
Credit Total	**60**		

Year 2 (Compulsory Modules)

Code	*Title*	*Credits*	*Taught*
AR40106	Dissertation (MArch)	12	Autumn
AR40107	Design studio 6.1	12	Autumn
AR40108	Design studio 6.2	30	Spring

(*Optional Units*) - Students must take 1 Unit from this group

AR40209	History and Theory of Architecture	6	Autumn
AR40210	Conservation of historic buildings	6	Autumn
Credit Total	**60**		

Learning Outcomes: The learning outcomes of the course are stated in the individual unit descriptions and are designed to be in accordance with the RIBA/ARB Criteria for prescribed qualifications. As such, the learning outcomes employ the terms ‘knowledge’, ‘awareness’, ‘ability’ and ‘understanding’ as defined in these professional criteria for accreditation and qualification:

- Knowledge and understanding: a good level of design ability, and in particular with regard to designing buildings holistically.
- Intellectual Skills: a good level of knowledge of the history and theory of architecture in general and associated techniques and technologies, and an ability to express this through drawings, in verbal discussion and in writing.
- Professional Practical Skills: A general understanding of the role and potential of the architect in society and in the building process; and competence in the integrated design of complex types of building, presented through elegant architectural propositions.
- Transferable/Key Skills: An understanding of the role of design as a means of synthesising complex ideas and technologies.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

At first year of the Bachelor of Science, **Building Environment 1** is an Autumn Term module providing a basic vocabulary that enables discussion of environmental issues. Students become aware of the physical and environmental factors influencing the body and are introduced to the principal variables in the design of the physical environment. The use of calculations at a basic level enables students to make informed decisions about the orientation of buildings, the choice of building envelope and basic construction in order to achieve a satisfactory internal environment. On successful completion of this unit, students are able to assess an external climate and explain the consequences for the design of buildings. They are able to demonstrate how changes to the building design and construction affects the environmental conditions within a building. The course covers topics such as climate, thermal environment, thermal comfort, heat losses, heat gains, condensation risk, daylight and acoustics. The assessment of this unit is by written examination.

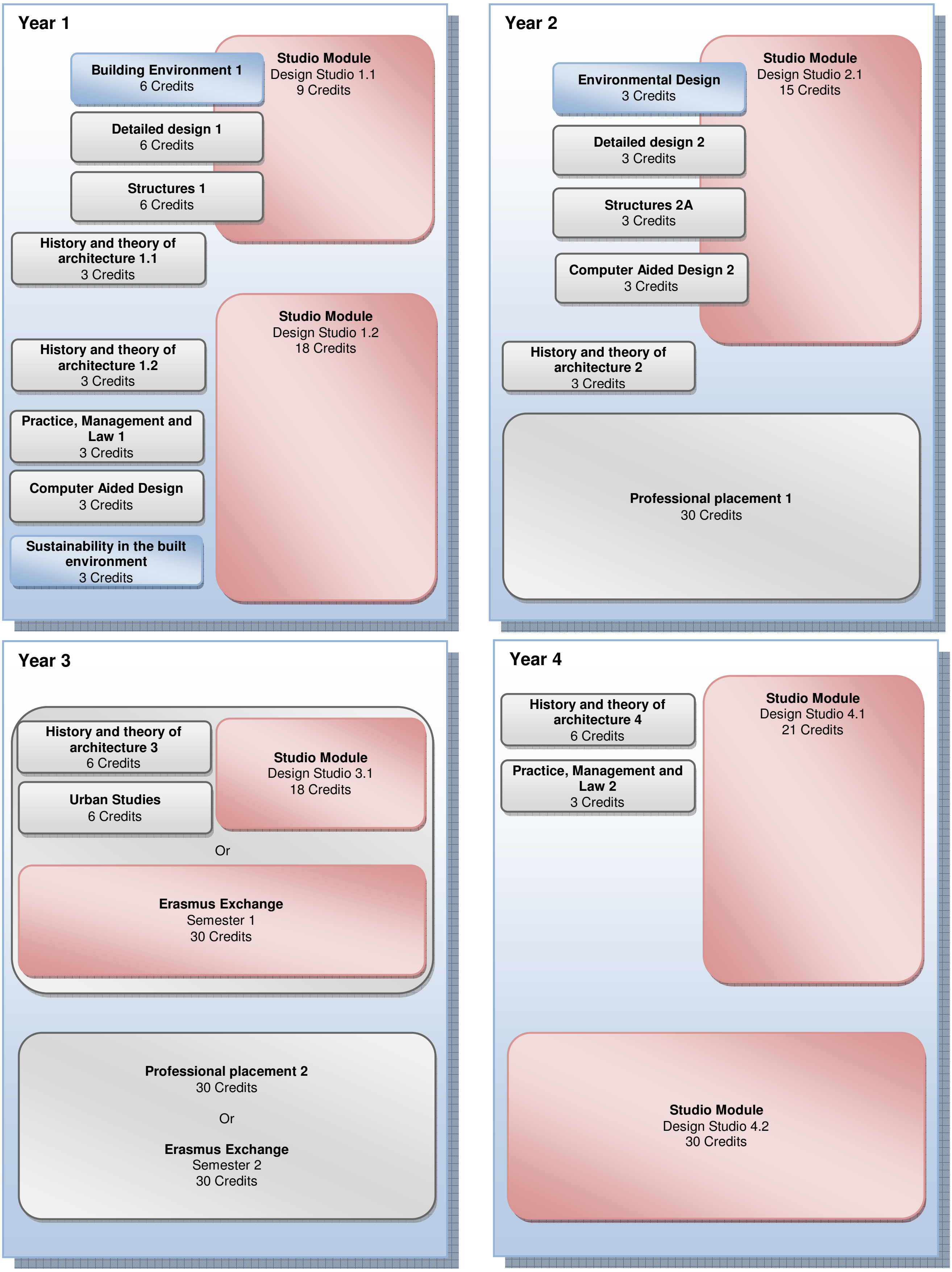
During the second semester of the first year, students engage in the study of historic buildings in the module **Sustainability in the Built Environment.** They learn how vernacular architectural forms are the response to climate on buildings, and how materials and devices are used to change the microclimate inside the house (e.g., use of wind towers, thermally massive construction, etc.). Examples from cold, temperate, hot-arid, and tropical climates are considered. Integration of architecture and structure in environmental design, and low carbon materials in modern construction are also addressed by this module.

In the second year of the BSc, **Environmental Design** is a 3-credits six-month unit that is partly integrated in the Design Studio and aims to provide the basic principles of environmental design with the objective of minimising the impact of buildings on the environment while maintaining human well-being within the building, primarily through passive means. Formal lectures deal with modifications of local climate by topography, passive heating and cooling, ventilation and indoor air quality, daylighting design, atria and simplified modelling techniques for buildings' energy consumption. Tutorials are provided and the students are assessed on course work and on the knowledge demonstrated by their design projects.

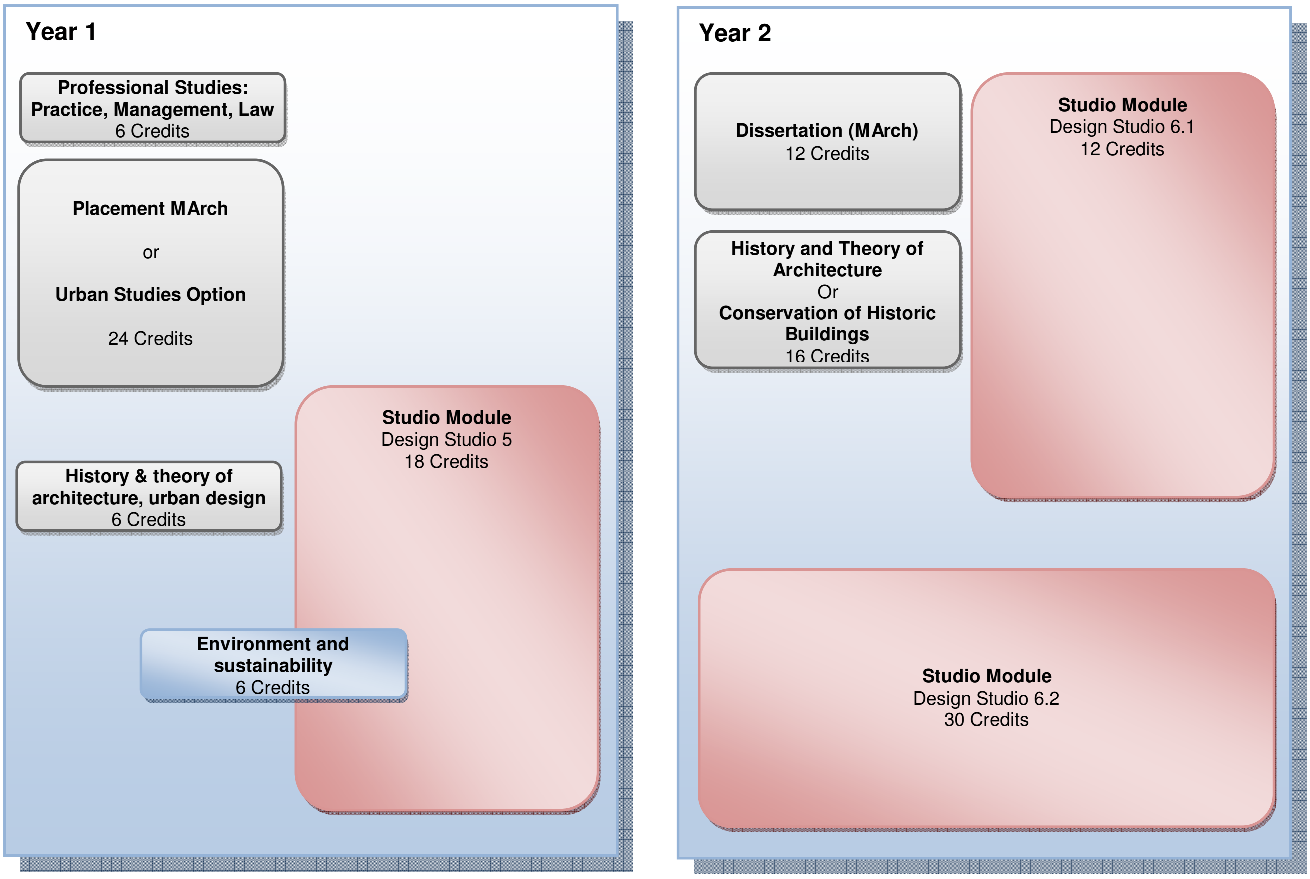
During the third and fourth years there is no specific taught unit on environmental design. The topic does, however, form part of the contents of other units and the design studios.

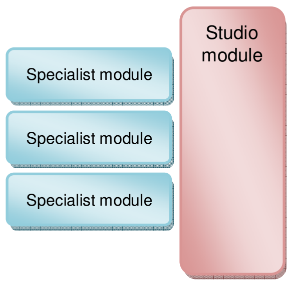
On the first year of the MArch, **Environment and Sustainability** is a Spring term unit which focuses on the physical environment around buildings and the appropriate measures for modifying this environment through passive and active, visual and technical means. In addition, it introduces principles of sustainable environmental urban design, and it develops an awareness and enthusiasm for building design and construction using natural materials and current methods and techniques. The unit is structured on lectures covering: prevalent landscape and ecological attitudes; principles of sustainability in the urban context; environmental impact of building materials; selected natural alternatives and methods (stone, earth, lime, natural fibres, green oak and round pole construction, bamboo, etc.); recycled natural products; natural building materials and building regulation requirements. All the lectures relate to the context of the urban situation being studied in Design Studio 5. Tutorials develop individual and group responses to such issues by students in the context of design problems that are part of the studio work. Coursework is the base for assessment.

Integration of Environmental Design with Studio - Bachelor of Science

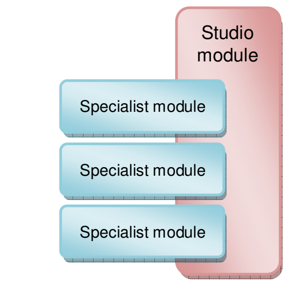


Integration of Environmental Design with Studio – MArch in Architecture

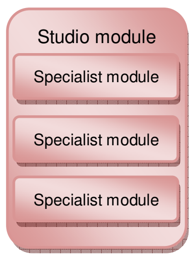




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

The BSc / MArch programme in Architecture at Bath University intends to combine a high level of technical training in a practice-oriented curriculum. Allowing a participative collaboration with engineers is an important objective of this course. At first year, both future architects and engineers share common subjects and learn how to work together. In subsequent years, environmental design is taught, together with structures and construction, in the first semester. In the later part of the years the curriculum is more concentrated on studio teaching. There appears to be a strong reliance on professional placement and participation in Erasmus exchange programmes, as a result of which it seems possible for students to spend as much as half of their studies away from the School and still achieve their degree.

Strengths

- High technical content of the academic agenda, including Environmental Design, from first year;
- Strong connection with practice allows applied knowledge and learning-by-doing as well as smooth transition to professional world;
- Sharing of taught modules with the Engineering Department reinforces the technical training of architects as well as providing a good basis for communication and collaboration between the disciplines from the outset.

Opportunities:

- Collaboration between architects and engineers from early on in their studies can be of benefit to both professions. Bath University engineering graduates are characterised by innovative thinking and a creative approach, while architects who studied at Bath possess a strong technical education.

SOURCES AND REFERENCES

Department of Architecture & Civil Engineering web site: www.bath.ac.uk/ace/
Academic Surveys and Feedback

UNIVERSITY OF CAMBRIDGE
DEPARTMENT OF ARCHITECTURE

Bachelor of Architecture with Honours (3 years)

Level: Undergraduate (BA Tripos Hons 3 years)

Accrediting Body: RIBA (Royal Institute of British Architects), ARB (Architects Registration Board)

Educational Aims: The Architecture degree (called Tripos at Cambridge) is academic in its approach. Students are expected to master the technical subjects but they are also expected to acquire a much deeper understanding of the theoretical, historical and cultural context of architecture than is generally required at other schools in UK. As a whole, the course aims to foster the skills that will enable an individual to continue to learn and develop throughout his or her future career, whatever that might be. The BA (Hons) course provides exemption from ARB/RIBA Part 1. Successful students have the option to study elsewhere or continue their studies towards an MPhil or PhD degree. The Department's new two-year MPhil in Environmental Design (Option B) is a Candidate Course for 'Validation' by the RIBA.

Outline Description of Course: The three year BA (Hons) course combines both arts and sciences. As such, it provides a unique range of skills which lead to a wide range of careers, not just architecture. The first year of the BA provides a critical introduction to the course as a whole. The year ends with an examination for Part 1A of the Cambridge Tripos, after which students can opt to move to another subject. The second year is much more challenging than the first. Students are expected to have developed ways of working that allow them to keep-up with the pace. The year ends with an examination for Part 1B of the Architecture Tripos. In the third year, students are introduced to the basics of professional practice and to methods of procurement and contractual issues, thus also getting prepared for a year-out to be spent with a professional architectural firm. By the third year, students are expected to be able to demonstrate that they have mastered all the various aspects of the course. The year ends with an examination for the Part II of the Architecture Tripos leading to the University of Cambridge BA (Hons) degree and to ARB/RIBA Part 1.

Course Structure: Each year consists on a Design Studio, which weights 60% of the final mark, and lecture courses which may or may not be integrated within Studio (40%). All the students follow the same structure with the only option of choosing one of the three studio units in years two and three.

Bachelor of Architecture (3 years)

Year 1

Title	*Weight*	*Taught*
Studio	60%	Full Year
Introduction to Architectural History	8%	Full Year
Introduction to Architectural Theory	8%	Full Year
Fundamental Principles of Construction	8%	Full Year
Fundamental Principles of Structural Design	8%	Full Year
Fundamental Principles of Environmental Design	8%	Full Year
Total Weight	**100%**	

Year 2

Title	*Weight*	*Taught*
Studio	60%	Full Year
Studies in architectural history	8%	Full Year
Theories of architecture, urbanism and design	8%	Full Year
Principles of Construction	6%	Winter
Fundamental Principles of Structural Design	8%	Full Year
Fundamental Principles of Environmental Design	8%	Full Year
Case Studies	2%	Autumn
Total Weight	**100%**	

Year 3

Title	*Weight*	*Taught*
Studio	60%	Full Year
Dissertation	20%	Full Year
Advanced Studies	5%	Autumn/Winter
Introduction to the Principles of Professional Practice	5%	Winter
Case Studies	5%	Winter
Architectural Engineering	5%	Full Year
Total Weight	**100%**	

Learning Outcomes: The programme provides opportunities for students to develop and demonstrate appropriate knowledge and understanding, intellectual and cognitive skills, professional and practical skills and transferable/key skills.

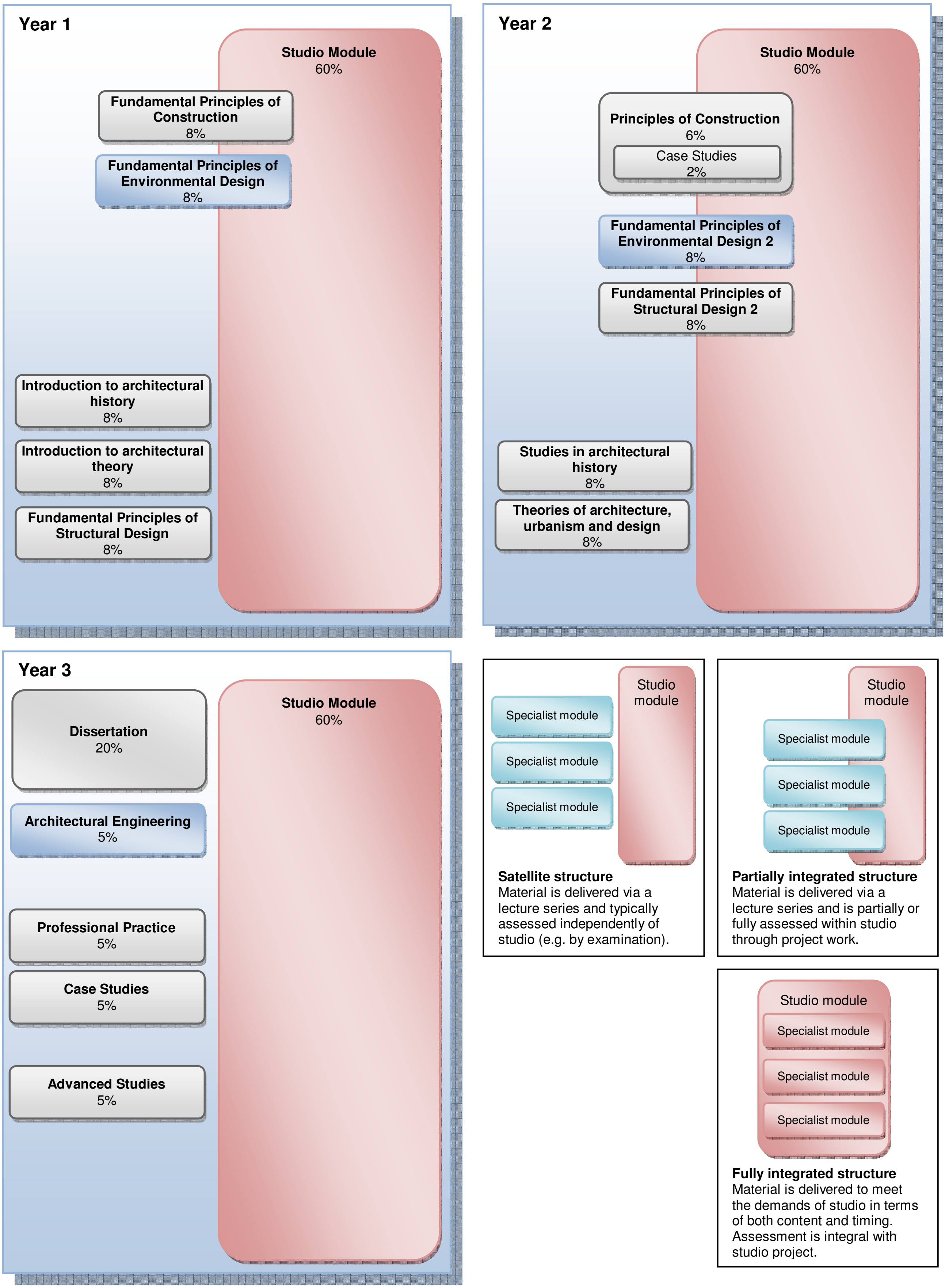
EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

On the first year of the BA, the course on **Fundamental Principles of Environmental Design** is a year-long module which aims to introduce the role of environmental issues in design, encouraging an overall awareness of how these inform design decisions in the light of the broad principles involved. The course aims to demonstrate why such issues are of relevance and interest to designers. It discusses environmental issues at the global, local and internal level and assesses their qualitative role in the perception of space in the built environment. Through vernacular, historic and modern examples, the significance of environmental issues is appraised in conjunction with an introduction to the basic principles of environmental science. In the first term, the weekly teaching format consists of a lecture followed by an exercise class which allows the principles introduced in the lecture to be applied. In the second and third terms, workshops are undertaken in connection with students' studio projects, thus allowing issues raised in the lectures to be explored through design. Site visits to buildings are also arranged. These allow students to judge for themselves how environmental issues have been addressed on specific projects. In addition to an examination paper, there are four coursework assignments related to the main studio design project workshops: Case study analysis 5% (hand-in December); Microclimate analysis 10% (hand-in March); Heliodon studies 15% (hand-in March); Servicing strategy 10% (hand-in May). The final examination paper represents 60% of the assessment.

In the second year of the BA, **Fundamental Principles of Environmental Design 2** is a year-long module that focuses on developing basic scientific understanding of passive, low-energy building design, tackling the most energy-consuming aspects of a building, namely ventilation, heating and cooling. The course is delivered through weekly lectures, each of which is followed by an exercise class. In the Winter Term, supervisions are available on students' studio projects to help with their design and with the preparation of their project reports. Assessment is entirely on students' performance in the written examination at the end of the year (100%).

In third year of the BA, **Architectural Engineering** is a project-based course run jointly with the Department of Engineering. Third year Architecture students work in teams of 4-6 with fourth year Engineering students, and there is a mixture of team work during class-time and individual work outside class. The student teams engage with real design projects, creating plausible designs based on calculations for light, energy, heat and structure that are undertaken jointly with the engineering students. The assessment is based entirely on coursework (100%).

Integration of Environmental Design with Studio - Bachelor of Architecture



STRENGTHS AND OPPORTUNITIES

Strengths:

- Ongoing funded research in environmental design provides access to new knowledge and expert consultants;
- Environmental teaching is well informed by research and practical design experience.

Opportunities:

- Better use of in-house research and design expertise;
- System-level view should be further developed to identify design solutions that can bring a radical reduction of environmental impacts.

SOURCES AND REFERENCES

Cambridge University - Department of Architecture website: www.arct.cam.ac.uk/Arct/Home.aspx
Academic Surveys and Feedback

UNIVERSITY OF CAMBRIDGE

DEPARTMENT OF ARCHITECTURE

Master of Philosophy - MPhil Environmental Design (Option B, 2 years)

Level: Graduate (MPhil, 2 years)

Accrediting Body: RIBA (Royal Institute of British Architects), ARB (Architects Registration Board)

Educational Aims: The MPhil (Option B) is a new degree (introduced in 2008-09) intended to combine a graduate research degree with a professional Part 2 qualification. It is currently 'Prescribed' by ARB as a Part 2 Course and is a Candidate Course for 'Validation' by the RIBA. It is a 2-year programme and its first cohort will graduate in 2010. As a research-based degree, its principle output is the Design Thesis, a rigorous piece of design research.

Outline Description of Course: This is a research degree as well as a design-based course with an emphasis on Environmental Design. Students are expected to address issues such as lighting, thermal performance, acoustics and ventilation in an integrated comprehensive design for a building of sufficient complexity for the ARB/RIBA Part 2. It extends over two academic years and includes a period spent by students in Placement Learning with an approved architects' practice. Placements commence after the second term of the first year. Following three terms in placement, candidates return for a third and final term of full time study in the Department to complete the Design Thesis.

Course Structure: In the Autumn and Winter Terms (known as Michaelmas and Lent at Cambridge) of the first year, the focus is on design research and on developing a research topic for the Design Thesis. Studio projects are undertaken in parallel to weekly taught courses and class exercises on the principles and practice of sustainable environmental design. Student placements with architectural practices start in the Summer (Easter) Term of the first year. Students spend the following three terms away from the Department returning at regular intervals for seminars, tutorials and reviews. Progress is closely monitored by the students' supervisors throughout the placement period. Students return to the Department of Architecture full-time to complete their Design Thesis over the final term of their second year.

MPhil (Option B) Environmental Design (2 years)

Year 1

Title	*Taught*
Design Studio	Full Year
The history and theory of environmental design	Autumn
Lighting in architecture	Autumn
Thermal performance	Autumn
Ventilation	Autumn
Acoustics	Winter
Energy demand and supply	Winter
Comfort and health	Winter
Urban	Winter
Research methods	Winter
Placement Learning in Practice	Spring

Year 2

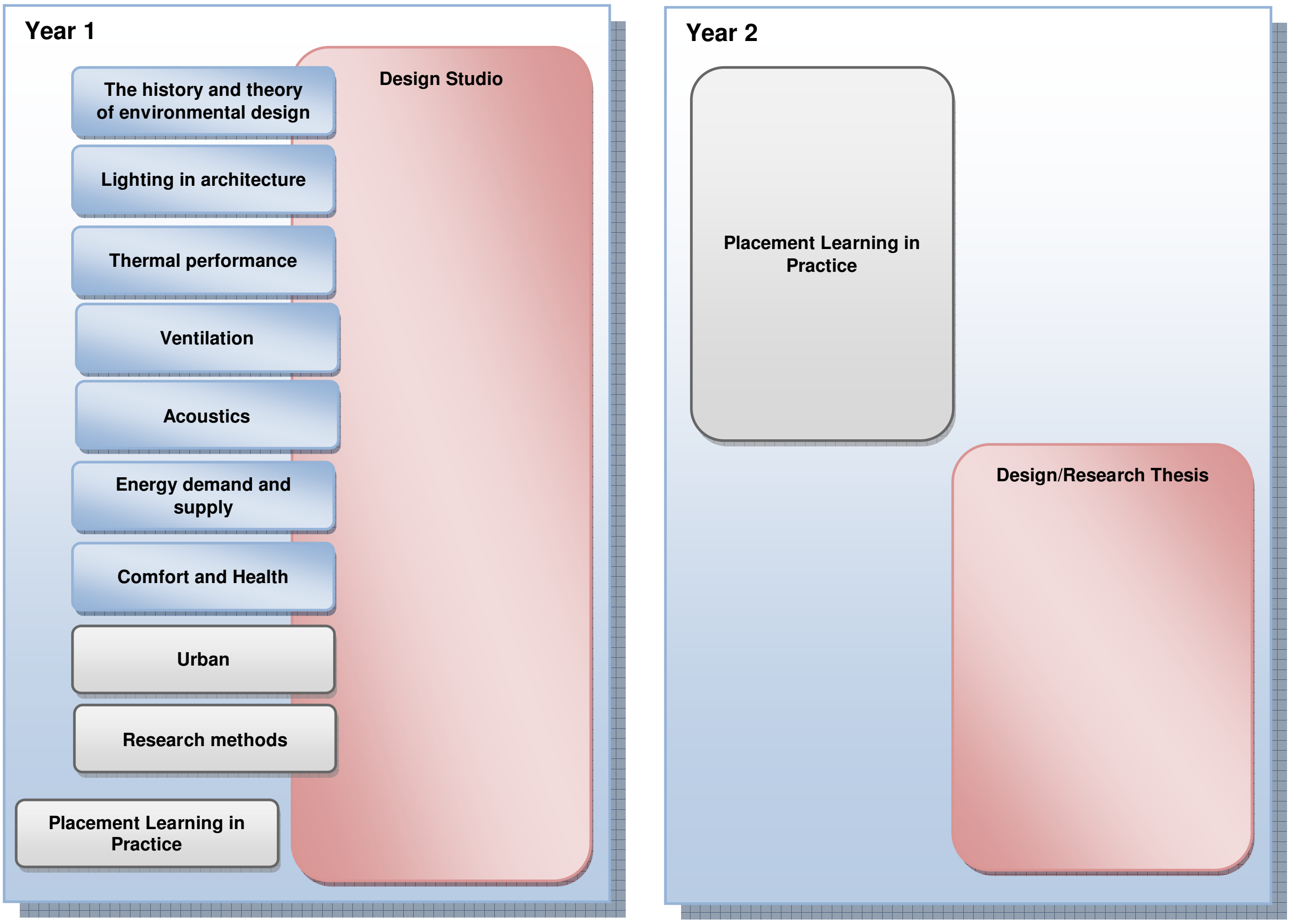
Title	*Taught*
Placement Learning in Practice	Autumn/Winter
Design/Research Thesis	Spring

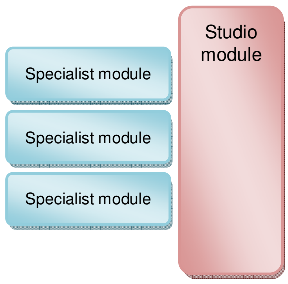
Learning Outcomes: The programme responds to the RIBA - ARB criteria for Part 2 (see Appendix) and covers issues such as the urban environment, daylight design and energy modelling.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

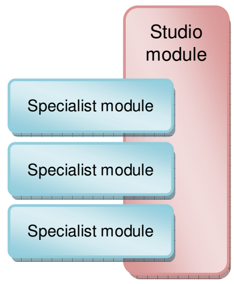
As a research degree in Environmental Design, the whole course has a strong emphasis on topics such as thermal performance, daylighting and ventilation. As a studio-based design course, it seeks the expression of environmental design requirements in architectural design. Weekly lectures and special topic conferences provide the technical input on the principles and practice of environmental design. Students are encouraged to attend the weekly Martin Centre research seminars that cover a wide range of topics relating to funded research, PhD projects and post-doctoral studies undertaken within the Department of Architecture. Courses can also be taken in conjunction with the Department of Engineering, which is also involved in extensive research on aspects of sustainable environmental design.

Integration of Environmental Design with Studio - MPhil (Option B)

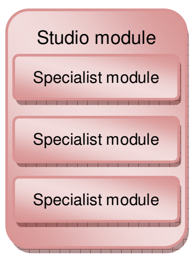




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Strengths:

- Good staff-student ratios owing to small size of student cohort;
- Draws upon a considerable number of in-house and visiting staff with great deal of experience in research, teaching and practice of sustainable environmental design.

Opportunities:

- Forming closer links with environmentally-committed practices.

SOURCES AND REFERENCES

Cambridge University - Department of Architecture website: www.arct.cam.ac.uk/Arct/Home.aspx
Academic Surveys and Feedback

CARDIFF UNIVERSITY

WELSH SCHOOL OF ARCHITECTURE

Bachelor of Science in Architectural Studies + Master of Architecture (5 years)

Level: Undergraduate (BSc, 3 years) + Graduate (MArch, 2 years)

Accrediting Body: RIBA (Royal Institute of British Architects), ARB (Architects Registration Board)

Educational Aims: The Welsh School of Architecture (WSA) offers all the qualifications necessary to become a registered architect in the United Kingdom, and has a reputation for producing graduates with the ability to cope well with the diverse demands of practice. In particular, the School emphasises a holistic, integrated approach to design, based on both a thorough understanding of how buildings are made and how they perform. This is founded on the physical and the cultural context within which buildings are produced and inhabited.

Outline Description of Course: The Bachelor of Science / Master of Architecture is a 3+2 years degree that provides a thorough grounding in architectural design. The course is strongly studio-based, and students are encouraged to develop conceptual ideas and technical skills through an understanding of architecture as the 'art of building'. Both traditional and digital media are used to explore, develop and present projects, and the studio work is supported by taught modules on architectural technology, architectural history and analysis, landscape and urban design, and building economics and professional practice. The BSc satisfies Part 1 of the UK professional qualification requirements for architects, validated jointly by the Architects Registration Board (ARB) and the Royal Institute of British Architects (RIBA). Provided a suitable Honours standard is achieved in the BSc, the course leads to the MArch scheme of study and eventual qualification for the profession of architecture. The MArch (Master of Architecture) is a unique degree scheme, taken after the BSc (or equivalent qualification from another university). It satisfies Part 2 of the UK professional qualification for architects, and is validated by the RIBA and ARB.

Course Structure: The Welsh School of Architecture operates a ‘Year’ system, as distinct from the “Unit” system. Each year, students undertake a series of design projects, regularly tutored and reviewed by the school’s staff and visiting part-time tutors. These projects are designed to provide the required skills, values and attitudes to help students obtain their final degree. In addition, there are a series of timetabled taught modules which aim to provide the necessary knowledge and understanding of the context within which architecture sits. These taught modules are an important element of the course and in many cases will inform the design project work. The BSc in Architectural Studies is a three-year modular, undergraduate degree course. Each year attracts 120 credits, through combinations of single, double, or multiple modules. Architectural Design is the focus of the course, as reflected by the 80 credits assigned to it in each year. The remaining 40 credits are allocated to modules in subjects associated with the cultural and professional context of architecture, and to building technology. During the first and second years, the emphasis of the studio teaching alternates between a concern with the practical ‘making’ of architecture and with its broader physical, social and intellectual contexts. In the third year, these concerns come together in two semester-long projects. The MArch is a two-year degree that combines experience in practice with challenges in advanced architectural design. The first year of the MArch (year of "Education in Practice") is spent predominantly in architectural practice. It includes three short courses, held in the School, and has a modular structure of associated coursework. The second year of the MArch is spent full-time in the School and takes students to an advanced level of architectural design. It offers an intense and lively forum for the exploration and discussion of contemporary issues in architecture, and includes courses in building economics and professional practice Those wishing to extend their postgraduate education can additionally pursue MPhil or postgraduate taught programmes at Cardiff, which offer ideal opportunities to acquire advanced, specialist expertise in particular aspects of architecture. Students opting for this further MSc-level study can still complete their professional registration alongside their peers, following a further year in practice.

Bachelor of Science in Architectural Studies (3 years)

Year 1

Code	*Title*	*Credits*	*Taught*
AR1001	Architectural Design 1	80	Full Year
AR1002	Architectural Technology 1	10	Winter
AR1003	World Architecture	10	Autumn
AR1004	Architecture since 1940	10	Autumn
AR1005	Architecture from Pre-History to Industrial Revolution	10	Winter
Credit Total	**120 Programme Credits**		

Year 2			
AR2001	Architectural Design 2	80	Full Year
AR2002	Architectural Technology 2	20	Autumn / Winter
AR2003	Western Architecture 1835-1939	10	Autumn
AR2004	Cities & Landscape	10	Winter
Credit Total	**120 Programme Credits**		

Year 3			
AR3001	Architectural Design 3	80	Full Year
AR3002	Architectural Technology 3	20	Autumn / Winter
AR3003	Issues in Contemporary Architecture	10	Autumn
AR3004	Practice, Management & Economics	10	Winter
Credit Total	**120 Programme Credits**		

<u>Master of Architecture (2 years)</u>

Year 1 *(Education in Practice)*			
AR4001	Management and Communication	10	Autumn / Winter
AR4002	Project Initiation	20	Autumn
AR4003	Research Methods	10	Winter
AR4004	Practice Experience	40	Autumn / Winter
AR4005	Design Technology in Practice	10	Autumn
AR4006	Design in Practice	30	Autumn / Winter
Credit Total	**120 Programme Credits**		

Year 2			
AR5001	Design Thesis	80	Full Year
AR5002	Dissertation	30	Autumn
AR5003	Practice, Management and Economics	10	Winter
Credit Total	**120 Programme Credits**		

Learning Outcomes: The learning outcomes of the course are stated in the individual unit descriptions and are designed to be in accordance with the ARB/RIBA Criteria for prescribed qualifications. On completion of the BSc / MArch programme students should be able to:

Knowledge and understanding:
- Show an understanding of complex spatial, social, poetic and experiential architectural relationships in buildings and urban spaces
- Demonstrate in-depth understanding of building structure, constructional methods and environmental design strategies and service systems
- Demonstrate an understanding of development economics and budgetary control and their relation to design decisions

Intellectual Skills:
- A systematic understanding of knowledge and a critical awareness of current problems and/or new insights as informed by theories and practice of architectural design and construction
- A comprehensive understanding of research techniques in architecture and the architectural design of complex projects
- Originality in the application of knowledge together with a practical understanding of how established techniques of research and enquiry are used in the systematic and methodical act of evidence-based design to create and interpret knowledge in the discipline

Transferable Skills:
- To manage learning needs in preparation for qualification
- Time management
- Clear communication through report writing and briefing documents
- Demonstration of independent learning ability
- Work effectively as part of a group and in consultation with specialists
- Clearly communicate intentions, processes and solutions through visual, oral and written presentation.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Environmental Design is integrated into broader modules which comprise structural and constructional systems. At first year of the Bachelor of Science, the **Architectural Technology 1** module introduces students to the concept of design for technical performance at a domestic scale. In this module, students familiarise with the requirements for occupant comfort in and around buildings, the principles of climatic modification by the building fabric and the principles of energy conservation, among other issues.

In the same year's module **World Architecture**, students explore techniques for drawing and modelling the physical form and performance of simple buildings. The aim is to understand how buildings modify climate.

In the second year of the Bachelor of Science, the module **Nature, the Environment and Sustainability** is fully integrated in the Design Studio. The Design Studio Unit promotes architectural design as a research activity, encouraging students to investigate through their design work: design ideas, precedent, 'type' and 'taxonomy', urban context, materials, construction, environmental design, building services, accessible design or building products.

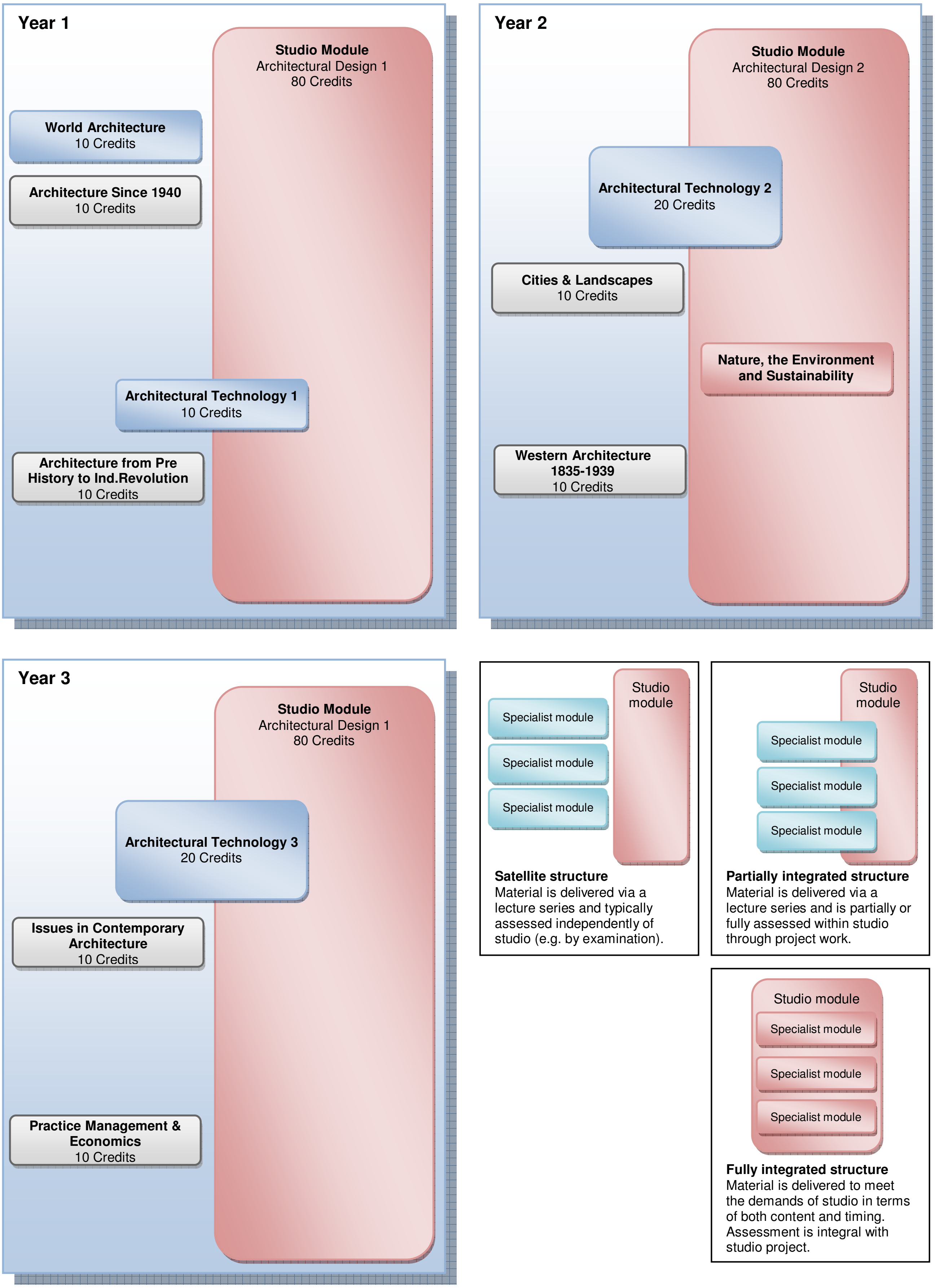
A second module of technology, **Architectural Technology** 2, is taught during this year. Concepts and principles of technical performance are explored for a medium scale project (multi-storey housing, libraries or schools). Students become familiar with specific software (for instance, Ecotect) to assess daylighting and acoustic performance of their designs. They also learn the principles governing heating systems, energy use and noise control. The module is partly integrated in the Design Studio.

In the third year of the BSc, environmental design input is given by the **Architectural Technology 3** module, which helps students to extend their exploration of designing for technical performance to complex and medium rise buildings.

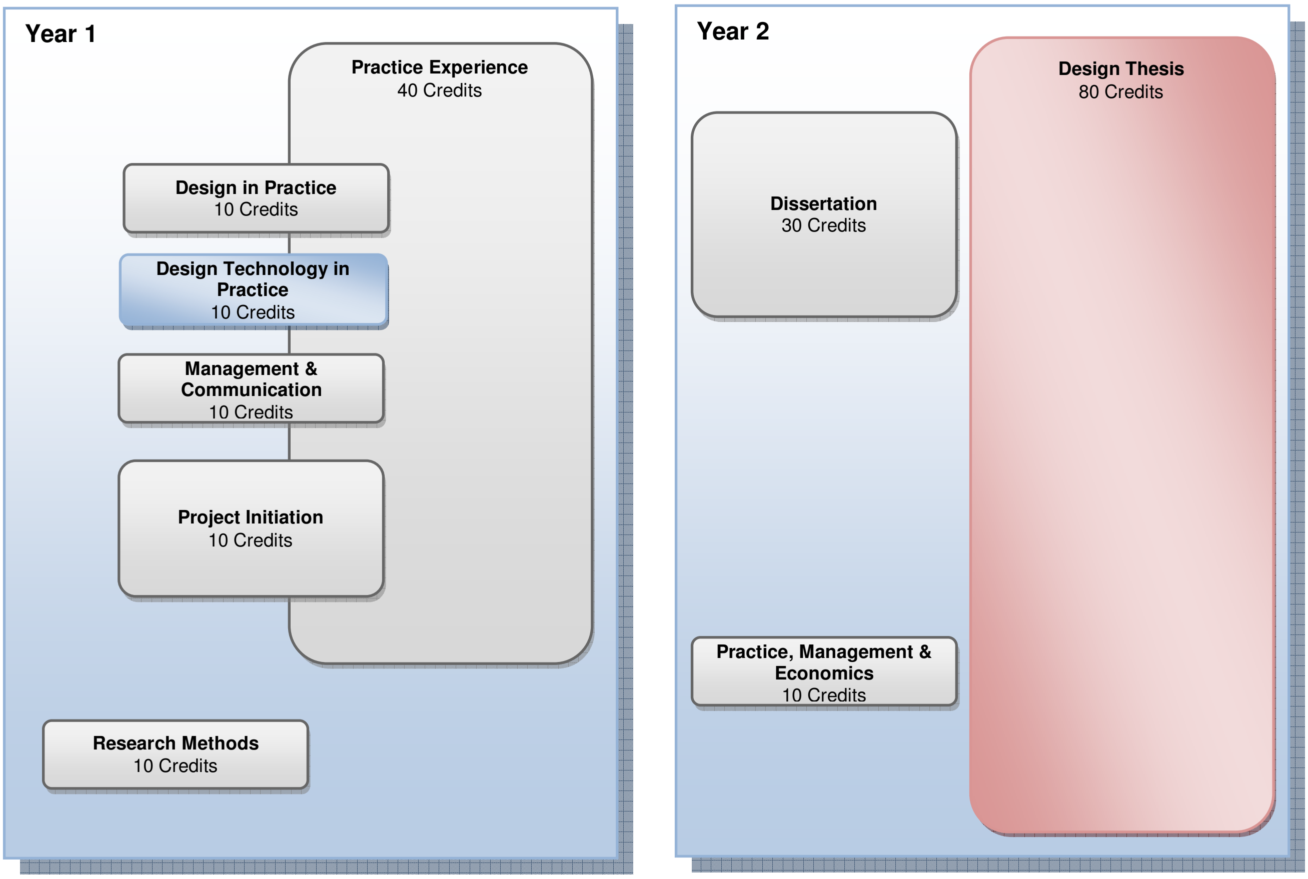
The first year of the Master of Architecture is mainly devoted to professional practice experience. This is part of the module **Design Technology in Practice** and the learning method is through placement in an office as well as by literature review, which focuses on contemporary themes including climate change and sustainable environmental design.

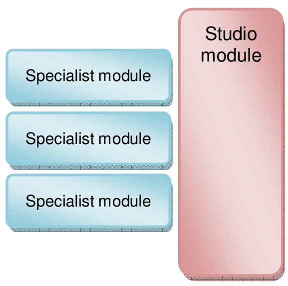
In the second year of the MArch, the academic and research agenda is created by students who are free to choose a dissertation topic of their interest.

Integration of Environmental Design with Studio - Bachelor of Science in Architectural Studies



Integration of Environmental Design with Studio – Master of Architecture





Satellite structure
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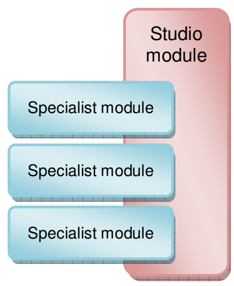

Partially integrated structure
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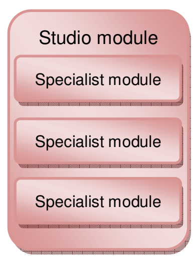


Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Although it does not represent a theme which is introduced independently, Environmental Design is presented in strong integration with the concurrent Architectural Design modules. In the last two years of studies at the MArch level, students expand and consolidate knowledge and understanding of technology in practice. Amongst the strengths and opportunities of the curriculum on offer:

Strengths:
- A staged approach from first to third year in the teaching of the principles of sustainable environmental design;
- Teaching is based on research conducted within the department;
- Combination of long design projects with technical teaching.

Opportunities:
- The School's active involvement in research;
- Making findings of research more accessible to undergraduate students.

SOURCES AND REFERENCES

Welsh School of Architecture website: www.cardiff.ac.uk/archi
Academic Surveys and Feedback

CARDIFF UNIVERSITY

WELSH SCHOOL OF ARCHITECTURE

MSc in Theory and Practice of Sustainable Design / MSc in Environmental Design of Buildings / MSc in Building Energy and Environmental Performance Modelling

Level: Postgraduate (MSc; 12 months full-time, 24 months part time, 36 months distance learning)

Accrediting Body: Not applicable

Educational Aims: These three Master of Science programmes offered by the Welsh School of Architecture address the impact that the built environment has on the sustainability of the planet and its inhabitants. These MSc courses are offered to practitioners who have some involvement in the production or management of the built environment. All three MSc programmes aim to respond sympathetically to current trends towards green approaches to design, under which professionals must develop their awareness of the ways buildings can affect the environment. They also provide options for specialization while sharing a common fundamental background. Common aims of the three MSc programmes are: to meet the learning needs of students from diverse academic, professional, and national backgrounds; to address theory and practice of sustainable design concepts as a context for development of specific knowledge; to prepare students for adopting the role of an environmental designer in the building team, and adapting to changing demands on this role as sustainable policies are increasingly supported by the public and by governments. Specific aims of the MSc programmes are:

MSc in Theory and Practice of Sustainable Design

- To develop students' vision and understanding of the principles and application of sustainability in global and local contexts and across social, environmental and economic boundaries.
- To develop knowledge, understanding and skill needed to facilitate and engage in the design, procurement, and construction of a holistically sustainable built environment.

MSc in Environmental Design of Buildings

- To develop knowledge and ability needed to design healthy, comfortable and secure environments in and around buildings that place a minimal strain on global resources.
- To encourage an understanding of both the principles and application of the subject, using project work to emphasise practicalities and develop necessary working skills.
- To address the different requirements for environmental design raised by the world's diverse climates.

MSc in Building Energy and Environmental Performance Modelling

- Understanding of the principles of science, physics, mathematics and technology which are fundamental to computer modelling and simulation.
- Delivery of the theory and practice of the application of computer modelling and simulation to the design of the built environment.
- Formulation of appropriate models in response to specific performance problems and generation of reasonable conclusions and recommendations from simulation results.
- Capacity to generate written reports that communicate the results of analysis clearly and concisely, and in a manner appropriate to their intended audience.

Outline Description of Courses: The MSc in Environmental Design of Buildings was established over 15 years ago. The other two MSc programmes were introduced some 5 years ago to meet changing needs of students and the profession. The programmes now evolve taking advantage of synergies whilst maintaining their distinctions. This format fosters contact between students on the three courses, and between local and distance students taking advantage of the variety of their backgrounds. Shared material is delivered in core modules in the taught part of the courses during the first semester. These modules are attended by students from all three courses. Teaching resources include lectures, set texts, case studies, seminars, workshops, course work, computer modelling, physical modelling, group tutorials and student presentations. Taught material in core modules has been developed for computer-aided learning, providing particularly valuable support to students whose first language is not English. Project work gives students opportunities to apply what they have learned in a specialist professional context. The projects are generally sufficiently flexible to allow students to follow their own interests and strengths. Study visits are arranged to buildings of interest and of relevance to the programmes. The final module is a research dissertation, designed as a period of more independent study, in which students report on an investigation that they have conducted under supervision into a research question that interests them.

Course Structure: The structure is common to all three MSc programmes. In common with most taught Master programmes in the UK there are two stages, a taught stage and a dissertation stage. The taught stage occupies students in the first two thirds of the session. Taught modules include core modules common to all three MSc programmes, and specialist modules offered by each MSc programme. Specialist teaching modules build on the fundamentals introduced in the core modules opening the door for specialist research at the dissertation stage. Specialist project modules demonstrate how to interpret the core knowledge in the pursuit of specialist ambitions. The credit system adopted is shown below.

MSc Core modules (common to all three MSc programmes)

Title	*Credits*	*Taught*
Site and Environment	10	Autumn
Earth and Society	10	Autumn
Building Fabric	10	Autumn
Performance Evaluation	10	Autumn
Low Carbon Footprint	10	Autumn
Efficient Services	10	Autumn
Dissertation	60	Summer

Total Credits 120 Core Module Credits

Specialist modules

<u>MSc in Theory and Practice of Sustainable Design</u>

Title	*Credits*	*Taught*
Sustainable Building	10	Spring
Building Procurement and Performance	10	Spring
Sustainable Design Practice	40	Spring

Total Credits 120 Specialist Module Credits

<u>MSc in Environmental Design of Buildings</u>

Title	*Credits*	*Taught*
Outside Inside	10	Spring
Passive Design	10	Spring
Environmental Design in Practice	30	Spring
Environmental Design Application	10	Spring

Total Credits Specialist Module Credits

<u>MSc in Building Energy and Environmental Performance Modelling</u>

Title	*Credits*	*Taught*
Building Performance Modelling	20	Spring
Environmental Design Modelling	10	Spring
Explorations in Modelling	40	Spring

Total Credits Specialist Module Credits

Credit Total 180 (60 Common Modules + 60 Specialist Modules + 60 Dissertation)

Learning Outcomes:

Knowledge and understanding:

- Demonstrate systematic knowledge in a selected aspect of the subject area
- Undertake a critical evaluation and analysis of a body of knowledge, or an original contribution to knowledge, in the subject area of the scheme of study
- Interpret cogently and convincingly the results of the research in relation to the research objectives
- Demonstrate understanding of the material taught in the supporting modules through its application
- Demonstrate an advanced understanding of how to estimate a building's access to wind and sun
- Show an advanced understanding of how to use a building's form and fabric to harness wind and sun

Specific skills:

- Define objectives pertinent to the field and make an effective plan for pursuing them
- Apply established techniques of research and enquiry productively in pursuing research objectives
- Devise effective methods of harnessing and moderating the existing outside environment
- Integrate daylighting, passive heating and cooling strategies in a single proposal for a particular brief
- Specify closely the environmental requirements for a given activity

- Make appropriate provision for the building fabric and services to achieve the environmental requirements
- Select and deploy appropriate output from the environmental software used in the course to demonstrate achievement of environmental performance
- Argue how the planned and accidental operation of a building by its occupants might affect its environmental performance

Transferable skills:

- Exercise initiative and personal responsibility in planning and implementing the research
- Communicate the aims and methods and results of the research with clarity and in a style appropriate to the expected audience
- Show a thorough and systematic approach to planning, implementing and reporting the research.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Common Structure / Core Modules:

Site and Environment (10 credits): The module discusses basic physics needed to understand physical environments in general, climatic processes involved in the local environment of a site, procedures for analysing environmental data to provide designers with objectives, and the physical needs that users have for their environments. Successful environmental design must start with an understanding of the ambient environment, of how it arises, of its short and long term variation, of its effects on comfort, and of how it can be harnessed and moderated.

Earth and Society (10 credits): This module introduces the principal concepts of sustainability and the values, beliefs and assumptions that underpin them. It considers the historic development of the 'green' movement and how social frameworks, which influence people's behaviour and lifestyles, impact on sustainability as well as introducing climate change as an important context for sustainable development. It identifies different positions relating to sustainability adopted today, both at a theoretical and practical level, and encourages students to question these as well as their own views. It also ensures an awareness of sustainability at a variety of development scales, from individual buildings through communities to the broader urban scale, including health and comfort in the built environment. The module provides a structure for students to develop, discuss and formulate their personal sustainability standpoint.

Building Fabric (10 credits): A building's fabric provides the means for forming an enclosure and separating it from the external environment. It can therefore act as a shelter from external environmental conditions, or a means for moderating and taking advantage of them, in order to improve comfort within buildings. Understanding the principles by which a building interacts with the external environment through its fabric is therefore key in understanding building performance. This module introduces those principles, as well as novel and established techniques to achieve a successful design for comfort, health and energy efficiency.

Performance Evaluation (10 credits): In order to assess the potential performance of building designs, knowledge of the applicability and utility of modelling methods and tools is required. This module introduces a number of modelling methods available to the students, in order to equip them with the fundamental skills required to undertake performance evaluations on their own designs.

Low Carbon Footprint (10 credits): Low carbon design requires a holistic approach to the energy use of a building. Designers need to understand how buildings use energy and to supplement this understanding with evidence on energy use from the field. They need to be able to work with targets for building design, such as zero carbon standards, and with ways of off-setting energy consumption with renewables.

Efficient Services (10 credits): The design of 'environmentally-friendly' buildings depends critically on the choice of appropriate servicing strategies - an inappropriate servicing strategy can negate all the work undertaken on the form and fabric of the building. This module explores the principles behind current low energy solutions to servicing strategies, and deals with basic application information and strategies. The course is designed to complement information provided in all the other modules.

Dissertation (60 credits): In this module, students choose some aspect of the programme's subject that needs further study and conduct academic research in order to make an advance in knowledge. This helps them to consolidate their capacity for independent study; to develop a critical stance towards standards of research supporting new contributions to knowledge; and to learn some of the techniques needed to conduct academic research proficiently.

Specialist Modules:

MSc in Theory and Practice of Sustainable Design

Sustainable Building (10 credits): Sustainable building design aims to create resource-efficient buildings that are comfortable and healthy places to live and work. Materials, water and energy are used for the construction and the running of buildings and the use of resources can be associated with environmental and social impacts. Sustainable design ensures that the impacts associated with resources are kept to a minimum while also considering issues of light, temperature, indoor air quality and psychological aspects of buildings that affect health. This module focuses on design techniques that minimise resource use, while considering the need to create healthy environments.

Building Procurement and Performance (10 credits): This module focuses on sustainable buildings in use, as well as the processes required to deliver buildings which will perform as anticipated. In addition, it aims to introduce case studies and methodologies for post occupancy monitoring, in the context of targets set through modelling and occupant interaction with buildings. Sustainable development requires the collaboration of all parties involved in the construction process, from the clients, planners and designers to the contractors, subcontractors and suppliers. This module introduces the roles of the different parties involved in the construction process and the approaches that can be adopted to achieve sustainable buildings in use. Research and monitoring methods applicable at both building and community scale are introduced considering health, comfort, and wider building performance factors including energy, water, light, noise and waste.

Sustainable Design Practice (40 credits): The project module allows students to apply principles of sustainable design learned in the taught modules to a live situation. It provides an opportunity for professionals from different disciplines in the built environment to find out how each of them defines and approaches problem solving in relation to sustainable design, and to explore new working relationships which require new ways of thinking. Holistic thinking is encouraged through integrated action, with the emphasis on an individual's transformation through collaboration rather than on team-working itself. This is fostered by a learning-by-doing approach within which a critical reflective learning process is employed. The module incorporates a single development project in co-operation with a local/regional authority, development agency, community group or practice. Students form multi-disciplinary groups, liaising with officials and with an identified client. Depending on the subject and / or building type, there is indirect or direct participation of user and community groups. The project is a mutually beneficial activity, with the 'live-project supplier' gaining a significant input, and the students learning from engaging with a real problem.

MSc in Environmental Design of Buildings

Outside Inside (10 credits): Earlier modules have introduced the fundamentals of environmental design to the student. One of the objectives of an environmental approach is to adapt the ambient environment to make more desirable living conditions: the designer starts with a given climate and tries to achieve specified environmental targets. This module offers advanced treatment of aspects of the environment outside and inside: of both the climatic environment and the internal building environment. Included in this, is the main treatment of the acoustic environment offered in the course.

Environmental Design Practice (30 credits): One of the aims of this module is to provide students with the opportunity of learning how to apply the ideas taught in class to problems which, whilst not real, exercise a similar range of skills to a real problem. The knowledge they require is taught in the core modules that run in parallel, and which students share with other degree schemes. Another aim of the module is to channel the understanding and skill that students gain from these core modules into problems that call on the more specialist perspective adopted in their specialist area of study in the environmental design of buildings. Since the students are from varied professional backgrounds with different practice needs to meet, another aim is to keep the project brief flexible enough for students to be able to choose problems that suit this variety.

Environmental Design Application (10 credits): The students taking the previous project module were able to apply the ideas delivered in the parallel core modules to their specialist interest of environmental design. This module allows them to apply the more advanced ideas that they learn in the specialist teaching modules at the end of Stage One. The knowledge they require will be taught in those modules, so that this module can focus more closely on its application to problems which, whilst not real, exercise a similar range of skills to a real problem. One of the aims of the module is to provide students with the opportunity of testing out their ability to apply in practice what they have learned in class and of learning the skills involved in doing so.

MSc in Building Energy and Environmental Performance Modelling

Building Performance Modelling (20 credits): This module expands the knowledge and skill-set of the student in two key modelling areas, dynamic thermal modelling and Computational Fluid Dynamics modelling. These two areas are arguably the most important in the development of a sustainable built environment, and so form the core of the specialisation of this MSc. Both areas are studied in terms of their theoretical and mathematical backgrounds, of their applicability to problems in the built environment, and of appropriate methodologies of application

Environmental Design Modelling (30 credits): An aim of this module is to provide students with the opportunity of learning how to apply the ideas taught in class to problems which, whilst not real, will exercise a similar range of skills to a real problem. The knowledge they require is taught in the shared modules. Another aim is to channel the understanding and skill that students gain from these core modules into problems that call on the more specialist perspective adopted in their specialist area of study in the environmental design of buildings.

Explorations in modelling (10 credits): The main aim of this module is to provide the opportunity for the student to study and develop skills in using a modelling method not otherwise featured in the scheme. This may be a software package not previously discussed, a method in a modelling area not explored in the main scheme, or even involve the development and testing of a new method. Students focus on a simulation method individually and produce a written report on the application of that method to the assessment of the performance of building and/or environment. The method to be studied is selected by the student in conjunction with the module tutor. The students are guided and supported by a member of staff in their study. Topics may be restricted to those where support is possible, although the material is largely self-taught.

STRENGTHS AND OPPORTUNITIES

Strengths:
- Close links between related Master programmes;
- Strong connection with research and access to new information and tools;
- Specialization stages allow more time to explore narrow topics in depth.

Opportunities:
- Exploiting synergies between related programmes;
- Providing the knowledge and tools for innovative in-depth explorations.

SOURCES AND REFERENCES

Welsh School of Architecture website: www.cardiff.ac.uk/archi
Academic Surveys and Feedback

GLASGOW SCHOOL OF ART
MACKINTOSH SCHOOL OF ARCHITECTURE

Bachelor of Architecture with Honours + Diploma in Architecture (6 years)

Level: Undergraduate (BArch, 3 years) + Graduate (DipArch, 2 years)

Accrediting Body: RIBA (Royal Institute of British Architects), ARB (Architects Registration Board)

Educational Aims: The Mackintosh School's approach to research and teaching is about how buildings and places are made and used. The undergraduate programme gives a thorough grounding in the practice of architecture that grows from a wide skill base. 'Building in the City' is the theme of the diploma programme which gives the opportunity to exercise architectural design skills at a high and demanding level. The Mackintosh also offer a post-graduate programme which is international and interdisciplinary, specialising in urban design, urban building, energy and environment, digital creativity, architectural and urban history and creative urban practices. At the Mackintosh School of Architecture, the emphasis is on student-centred active learning, which means involving students in a wide range of learning experiences and exercises where the individual is encouraged to develop his own direction and solutions. The School provides the teaching required for registration as an architect in the United Kingdom, and its courses are validated by the Architects Registration Board (ARB) and the Royal Institute of British Architects (RIBA).

Outline Description of Course: The programme of study is organised over six years, delivered through two academic degrees (BArch and DipArch). The programme includes design, construction, structures, environmental science, history, sociology, economics, law and management, as well as skills in hand and computer-aided drawing, three-dimensional visualisation, model-making and workshop techniques, photography, audiovisual and verbal presentation, and core skills including problem-solving and working with other people. In addition to studio-based work, there are lectures, seminars and practical courses taught by both full-time and visiting lecturers. Students may also become involved in research, competitions and live projects working with the Glasgow Urban Laboratory – a partnership with the City of Glasgow and the Lighthouse, Scotland's Centre for Architecture, Design and the City, that was founded and is led by the MSA.

Course Structure: The BArch course leads to an Ordinary or Honours degree and to exemption from Part 1 of the ARB/ RIBA Examination in Architecture at the end of Year 3 full-time study or Year 4 part-time study. The full-time mode takes a minimum of three years for the ordinary degree and four years for the Honours degree. Full-time students are required to undertake a year of practical training in an approved architect's office between Years 3 and 4. The decision on whether a student progresses to Year 4 Honours study is made at the end of the Year 3 and is based on attaining a certain standard in studio work and examinations. The Diploma in Architecture programme at the Mackintosh School of Architecture is designed to provide the necessary educational framework for students who intend to enter the architectural profession, and confers exemption from Part 2 of the ARB/RIBA Examination in Architecture. The first year of the Diploma gives the opportunity to extend design skills within a rigorous creative studio and to explore architecture as a response to the contemporary issues. The second year of the Diploma entails one major project, a Design Thesis.

<u>Bachelor of Architecture with Honours</u>

Stage 1

Title	*Taught*
Design Studio	Full year
History and Environment	
Built Environment	
History	
Architectural Technology	
Principles of Buildings	
Structures	
Environmental Design	

Stage 2

Title	*Taught*
Design Studio	Full year
History and Environment	
Built Environment	
History	
Architectural Technology	
Structures	
Principles of Buildings	
Environmental Design	

Stage 3

Title	*Taught*
Design Studio	Full year
History and Environment	
Built Environment	
History	
Architectural Technology	
Principles of Buildings	
Structures	
Environmental Design	

Diploma in Architecture (2 years)

Stage 4

Title	*Taught*
Design Studio	Full year
Urban	
Housing Studies	
Economic Aspects of Urban Building	
Architectural History and Theory	
Professional Studies 4	
Research Project 4	

Stage 5

Title	*Taught*
Final Thesis Design	Full year
Technical Study	
Research Project 5	

Learning outcomes: The learning outcomes of the course are stated in the syllabus of each year or stage. On completion of each stage, students should be able to:

Knowledge and understanding:

- Stage 1: Use space, natural light, structures and materials to create enclosures
- Stage 2: Use technology as a means of architectural expression; understand issues such as the landscape and the city, energy, scale, public visibility, threshold, materials and assembly techniques.
- Stage 3: Demonstrate understanding of theoretical issues and the architectural expression of public realm
- Stage 4: Explore architecture as a response to the city and contemporary issues, urban design and regeneration planning
- Stage 5: Personal study of a topic chosen by the student

Intellectual Skills:

- Stage 1: Skills to visualise and describe ideas and designs
- Stage 2: Get independence to investigate, experiment, and to express own ideas and criteria
- Stage 3: Develop self-motivation and self-criticism
- Stage 4: Strategic and critical thinking and a personal approach to design
- Stage 5: Research methods and critical thinking

Professional Practical Skills:

- Stage 1: Understand how buildings are made, how they work and how they are experienced; design buildings that respond to their sites
- Stage 2: Manual and computer skills for representing ideas
- Stage 3: Experience of working in multi-disciplinary teams prior to first year of practical experience
- Stage 4: Emphasis on drawing and model making as means of rigorously investigating, clarifying and developing a design
- Stage 5: Develop organizational skills and good time management

Transferable / Key Skills:

- Resolution of complex organisational problems
- Work effectively as part of a multidisciplinary group and in consultation with specialists.
- Strategic and critical thinking.

EXECUTIVE SUMMARY - **Environmental Design in the Academic Curriculum**

On the Bachelor of Architecture, the design studio forms the main core of each year of study (Stage) supported by two complementary areas, namely **History and Environment** and **Architectural Technology**. The latter comprises the technical studies and is divided in three modules: Principles of Buildings (construction), Structures and **Environmental Design**. In this organisation, environmental design is introduced from the start of the BArch following a holistic approach and encompassing aspects such as passive design, energy efficiency and comfort. However, special emphasis is given to architectural design as a basis for sustainability. In the first two years, the modules run independently from the design studio with lectures and assessed course papers, whereas at Stage 3 it is partly integrated, with inputs from the lectures being applied to the studio designs. At Diploma level, there is no taught course on Environmental Design

Basing on the programme of the BArch, over the **First year** (Stage 1), students are encouraged to explore ways of manipulating space, controlling natural light, making structures and using materials to create enclosure. They build skills using a sketchbook, computer, camera, workshops and lighting laboratory. These skills are tried and tested through a sequence of small-scale design tasks. Typically, the first term focuses on developing skills to visualise and describe ideas and designs. Design programmes explore how buildings work and how they are experienced. In the second term, students look at how buildings are made and how they stand up. The third term brings together the skills learned by designing a small building that is a response to its site.

In **Second year** (Stage 2), the skills acquired are developed more fully and applied in a series of design projects of increasing complexity. The technology of building becomes an inherent part of each design and a means of expression for architectural ideas. Typically, there are three main projects in the year: the first, a sequence of explorations in drawing and programme; the second, a simple building in a small town; and the third, a small sketch project, which explores the placement of a small building in a sensitive environment. These projects raise issues about the landscape and the city, energy, scale, public visibility, threshold, materials and assembly techniques. Projects are used as opportunities to focus on architecture as both place and space maker. Manual and computer skills for representing ideas are honed to match the programme content.

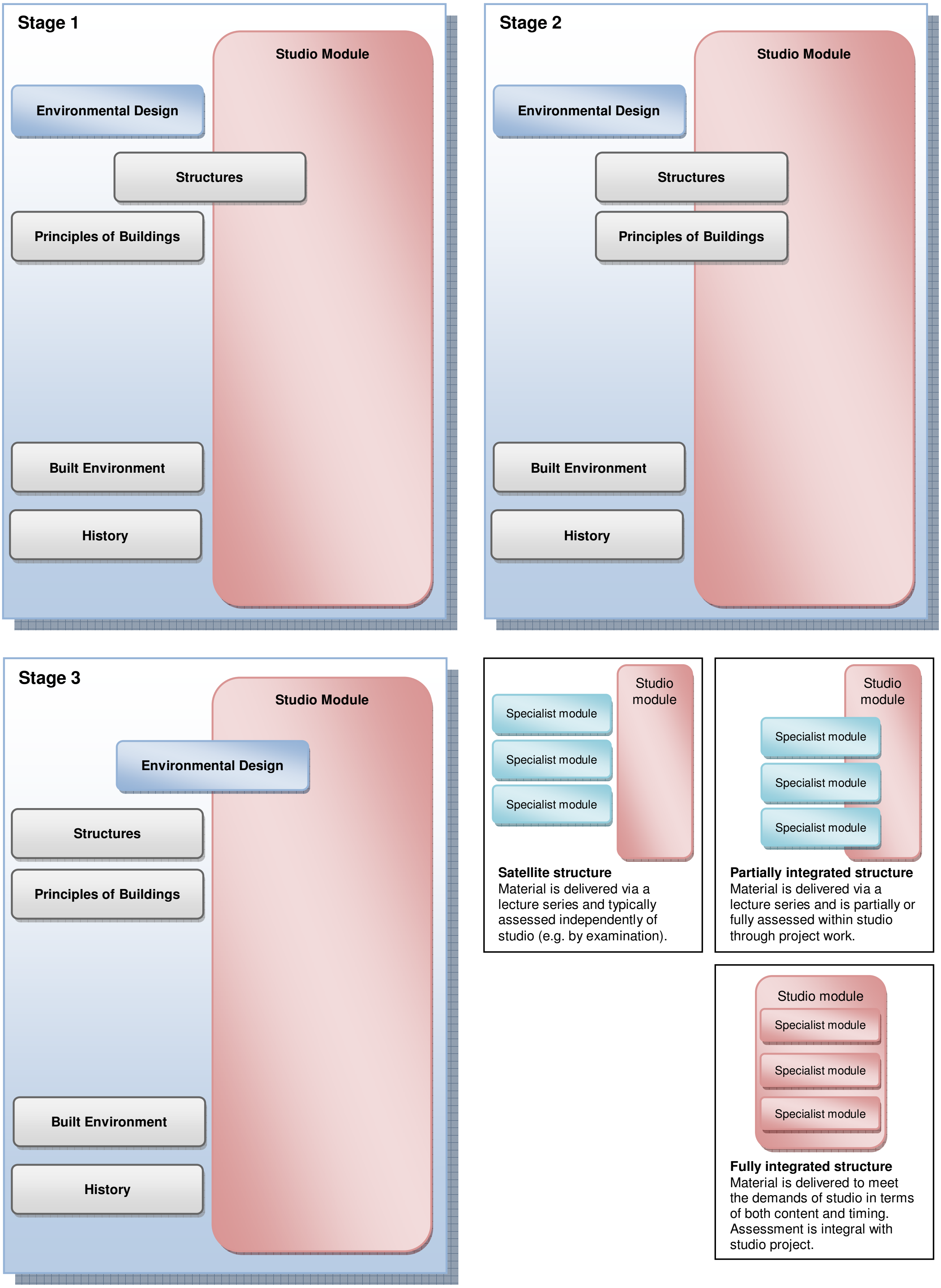
The **Third year** (Stage 3) is a culmination of the first two years of study, giving students the opportunity to extend and demonstrate their creative skills and design potential, and to prepare for a year of practical experience in an architect's office. Self-motivation and self-criticism develop as students begin to find their direction as designers. The opportunity to work in groups is a feature of the entire course but comes to the fore with the chance to work as part of a 'design team' with students of engineering and quantity surveying in the 'interact' project. The design tasks require the resolution of more complex organisational problems and theoretical issues and raise questions about the architectural expression of the public realm.

Year Four (Honours) is the opportunity for students to extend design skills within a rigorous creative studio and to explore architecture as a response to the contemporary issues. As one of the UK's most architecturally stimulating cities, and with pressing social concerns, Glasgow is used as a test bed for new ideas. Strategic and critical thinking and a personal approach to designing is encouraged through the studio-projects. Emphasis continues to be placed on drawing and model making as means of rigorously investigating, clarifying and developing a design.

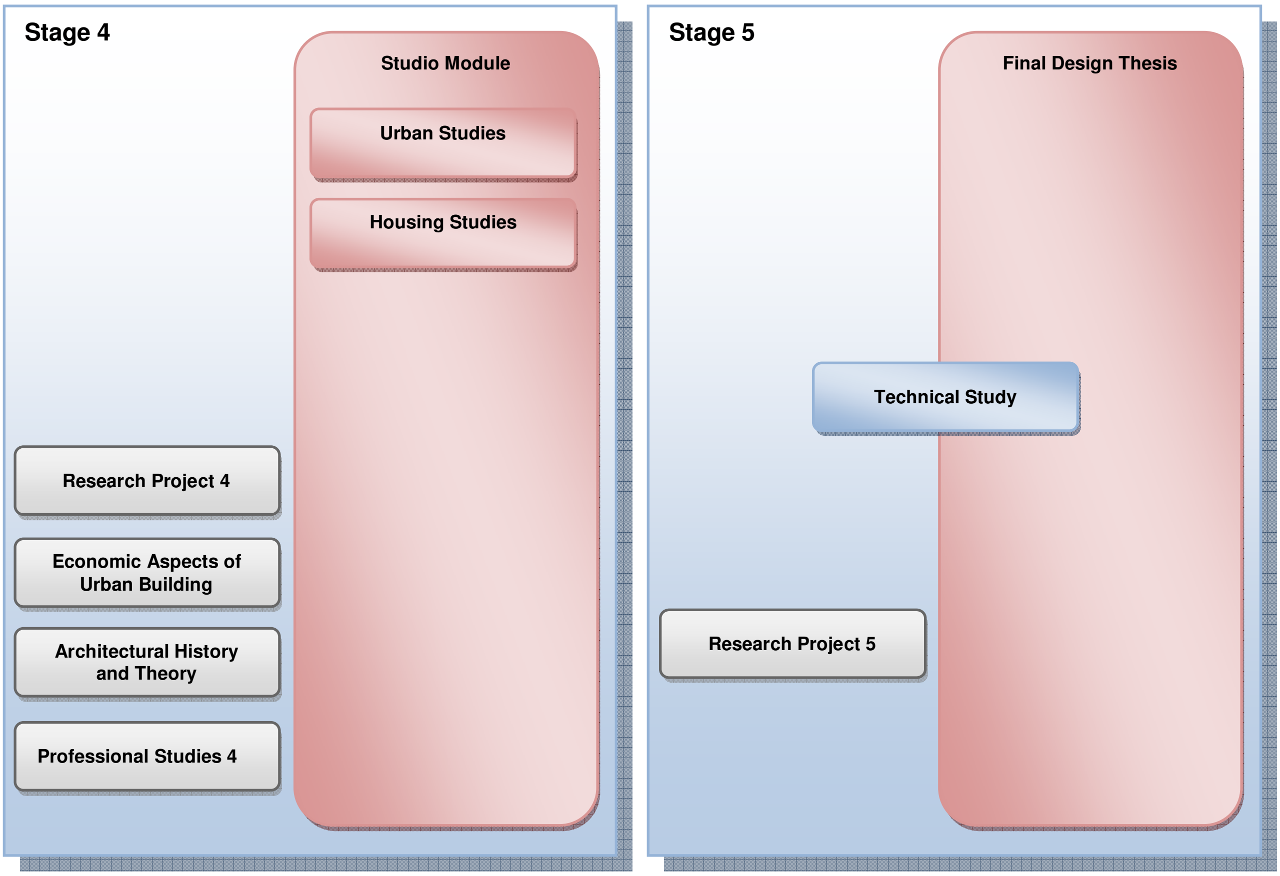
At Diploma level, **Year One** (Stage 4), as in Year Four (Honours), uses Glasgow as a test bed for exploring new design ideas. This is a preparation for the extended independent study of the final year Thesis Design. The projects typically include the design for a mixed use neighbourhood, high density housing, and the design of a cultural building within the inner city. Some projects are undertaken as group work while others are used to develop individual design skills.

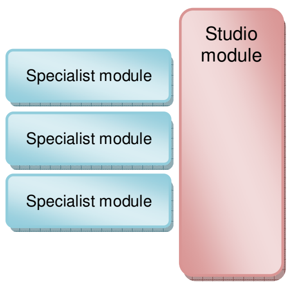
Year Two (Stage 5) of the Diploma entails one major project, a Design Thesis, which encompasses all the ambition, dreams and accumulated skills expected of students nearing the completion of their education. The Thesis is a vehicle for personal study, in which the topic is selected by the student in accordance with her/his particular interests and developed in association with the tutoring staff. Projects explore a variety of site conditions, from urban centres to rural sites dealing with spectacular landscapes. The project is developed through from concept to design in detail.

Integration of Environmental Design with Studio - Bachelor of Architecture

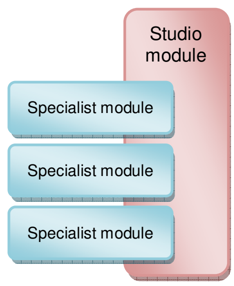


Integration of Environmental Design with Studio - Diploma in Architecture

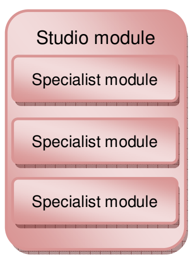




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Strengths

- Early introduction of environmental design in close support of the design programme;
- Assessed pieces of work in relation to Environmental Design.

Opportunities

- Collaboration with University of Glasgow Department of Civil Engineering enables multidisciplinary studio work and integrated proposals.

SOURCES AND REFERENCES

Mackintosh School of Architecture website: www.gsa.ac.uk/architecture
Academic Surveys and Feedback

OXFORD BROOKES UNIVERSITY

SCHOOL OF THE BUILT ENVIRONMENT- DEPARTMENT OF ARCHITECTURE

Bachelor of Architecture with Honours + Diploma in Architecture (6 years)

Level: Undergraduate (BArch, 3 years) + Graduate (DipArch, 2 years)

Accrediting Body: RIBA (Royal Institute of British Architects), ARB (Architects Registration Board)

Educational Aims: What will be the shape of our future towns and cities? What role will architects play in rethinking the way we live and the way we adapt to changing economic and cultural contexts? What challenges will architects face in the creation of appropriate, sustainable and beautifully designed environments? The study of architecture is all-encompassing. It is about understanding people, and the physical and cultural contexts within which we live. It requires creative artistry and scientific rigor. It involves innovative thinking and rethinking, communicating in a three-dimensional context, and generating and applying ideas in the context of a vibrant design culture. Architects need a broad knowledge not only of contemporary practice, but also of our architectural heritage. They have to know how buildings work and how to investigate innovative structural and material solutions. They do not work alone, and they need to understand how their role interacts with others in order to bring about good buildings and good design, in many different contexts. The study of architecture provides a direct route into professional practice. Achievement of the Honours degree Part 1 programme (Bachelor of Architecture) is the prerequisite qualification for progression through a total of five years' study (Diploma in Architecture) and two years' practice which lead to registration as an architect in the UK. The BArch / DipArch course provides a curriculum that meets the Architects Registration Board prescription of qualifications for ARB-RIBA Part 2.

Outline Description of Course: Teaching is centred on the design studio, supported by a range of related subjects in technology, practice, the histories and theories of architecture and design, and digital culture. The 3-year full-time BArch course engages students in learning about the architectural design process, through the investigation of architectural issues such as the representation of ideas, the relationship between human scale and the scale of inhabited spaces, the impact of landscape and cityscape on the design of buildings, and the integration of design concepts with material form and structure. Students are encouraged to bring their own experience and cultural awareness to this process. Studio culture comprises group and individual tutorials, and presentations and discussions of ideas and forms of representation. Other subjects develop through lectures and seminars, group and individual presentations and a written dissertation in the final year. The course is very wide-ranging in content, and at all time the students are encouraged to bring their own judgment, experience and newly acquired skills to bear upon the consideration of design. In Year 1, students work on simple design projects to develop their three-dimensional visual perception and to improve communication techniques such as drawing, computing, and model-making. This part of the course aims to bring all students to a shared level of knowledge, understanding and skill in design. In Years 2 and 3 more advanced projects are set in the context of individual design units, while working to common teaching objectives. Each of these has its own distinctive approach, determined by the ideas and agendas of the teaching staff. At the same time, modules in key subjects such as history and theory of architecture and building technology provide a wider understanding and inform the project work. During Year 3, students write a dissertation on a historical or theoretical subject of their choice. After the BArch, most students go on to a placement year in practice (Year Out) before returning for a further two years of study for the DipArch. The DipArch programme comprises two parts: a design and technology stage (first year, full-time mode) and a research into design stage (second year, full-time mode). The DipArch is a student-led programme in which students can choose different combinations of design studios, specialisations and options.

Course Structure: Oxford Brookes operates the European Credit Transfer System (ECTS). All undergraduate single modules are equivalent to 7.5 ECTS credits and double modules to 15 ECTS credits.

<u>Bachelor of Architecture with Honours (3 years)</u>

Year 1 (*Compulsory Modules*)

Code	*Title*	*Credits (ECTS)*	*Taught*
U30000	Introduction to Architectural Design (Studio)	15	Terms 1&2
U30001	Architectural Design in Context (Studio)	15	Terms 3&4
U30004	Architectural Representation	7.5	Full year
U30006	Architecture and Society	7.5	Terms 1&2
U30007	Introduction to Architectural History and Theory	7.5	Terms 1&2
U30008	Introductory Technology	7.5	Terms 3&4
Credit Total	**60 ECTS**		

Year 2 (*Compulsory Modules*)

Code	*Title*	*Credits (ECTS)*	*Taught*
U30020	Technology and Sustainability	7.5	Terms 1&2
U30021	Architectural Design 1: Landscape (Studio)	15	Full year
U30022	Architectural Design 2: Technology (Studio)	15	Full year
U30023	Digital Culture	7.5	Full year
U30024	Cities, Culture and Society	7.5	Full year
U30025	Issues in Architectural History	7.5	Terms 3&4
Credit Total	**60 ECTS**		

Year 3 (*Compulsory Modules Degree and Honours*)

Code	*Title*	*Credits (ECTS)*	*Taught*
U30031	Architectural Design 3 (Studio)	15	Full year
U30033	Advanced Technology	7.5	Full year
U30024	Preparation for Practice	7.5	Terms 3&4
(*Compulsory Modules Honours*)			
U30099	Dissertation	15	Full year
U30092	Architectural Design 4 (Studio)	15	Full year
Credit Total	**60 ECTS**		

Diploma in Architecture (2 years)

Year 1 Design Studios (*to choose one*)

Code	*Title*	*Credits (ECTS)*	*Taught*
P30001	Design Studio (DS1-5)	40	Full year
P30005	Construction	5	Full year
P30006	Environmental Design	5	Full year
P30007	Structures	5	Full year
P30008	Practice and Management	5	Full year
Credit Total	**60 ECTS**		

Year 2 Research into Design

Code	*Title*	*Credits (ECTS)*	*Taught*
P30009	Design Specializations (Studio)	15	Full year
P30008	Thinking Architecture	5	Full year
P30600	Major Study*	40	Full year
Credit Total	**60 ECTS**		

**Major study is one of the alternative six pathways declared in the Personal Information Portal of the Oxford Brookes University. However it is showed as a compulsory module by the Built Environment Department*

Learning Outcomes: The Bachelor of Architecture / Master of Architecture course gives a strong emphasis to research activity in order to equip students with the latest insights and knowledge. The programme is constantly reworked in the light of the latest research findings undertaken within the School. On the BArch Part 1, research-based input is found in generic subjects such as history and theory, technology and sustainable construction, and also in specific studios such as the Development and Emergency Practice (DEP) studio that is based on the Master programme of the same name. Upon successful completion of the programme, students will demonstrate appropriate knowledge and understanding, intellectual and cognitive skills, professional and practical skills, transferable skills according to the requirements of the Royal Institute of British Architects and Architects Registration Board Prescription of Qualifications (RIBA - ARB criteria for Part 1 and Part 2).

EXECUTIVE SUMMARY – Environmental Design in the Academic Curriculum

At first year of the Bachelor of Architecture, **Introductory Technology** is a semester-long module (Terms 3 and 4) that provides an overview of aspects of construction, structures and environmental science. The module intends to establish an appreciation of basic concepts, in order to provide a foundation for subsequent technology modules, and to provide students with requisite technical skills in support of design activities. Lectures about environmental science introduce aspects of technology within a design context, and provide a basic fundamental framework for further technical study and architectural design, linking the technical project work to the design studio. Students attending this module are expected to acquire knowledge of the theories and principles of environmental technology and an understanding of the impact of design decisions on the natural world and its resources.

In the first semester of the second year (Terms 1 and 2), **Technology and Sustainability** is a semester-long module with emphasis on understanding buildings through research and development of case studies. In this module, students develop a critical approach to building construction, structures and environmental design. The course covers the areas of technical theory, technical design and the relationship of technology and architectural design. Lectures in environmental science and technology along with associated seminars and workshop sessions further develop design methodology and the understanding of basic principles, and introduce some simple predictive techniques.

A studio-based module of the second year of BArch, **Architectural Design 2: Integrating Technology** intends to introduce and examine issues that arise from the integration of elements of building technology, although specific content and nature of the project are determined by each design unit in relation to a series of theoretical interests. An awareness of the issues raised by considerations of building performance and the selection of appropriate technological solutions for structures, construction and environmental servicing is one of the learning outcomes of this module.

In third year, **Advanced Technology** further explores topics introduced in first year. The environmental science and technology component of the course is concerned with the prediction of the effects of design decisions and the integration of environmental servicing with construction, structure and architectural design.

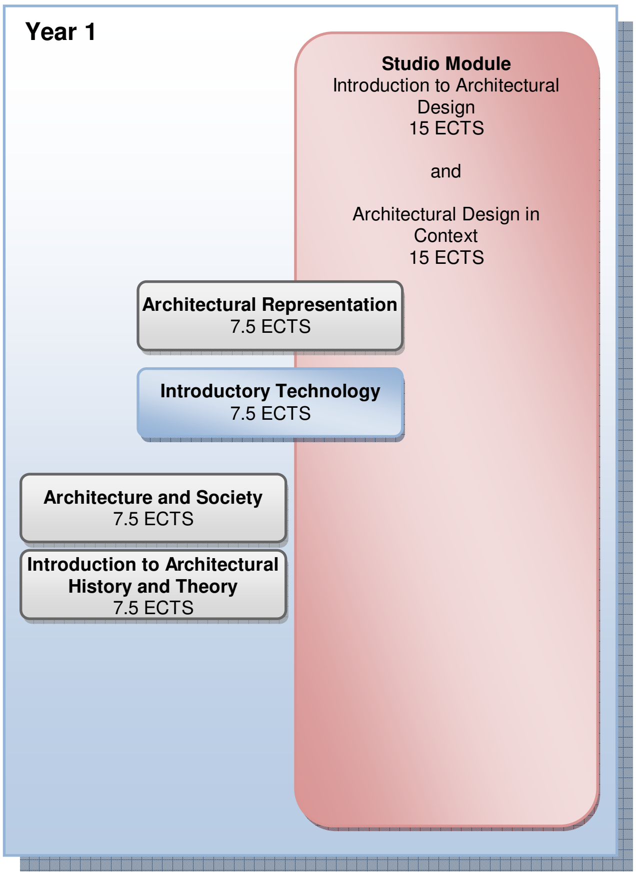
At **Diploma** level, the **Design Studios** have control over project work. Each also has a different view of architectural culture and promotes different design methods. During the design and technology stage (first year of DipArch), the design work is developed into technically ambitious architecture and becomes the subject of integrated technical studies.

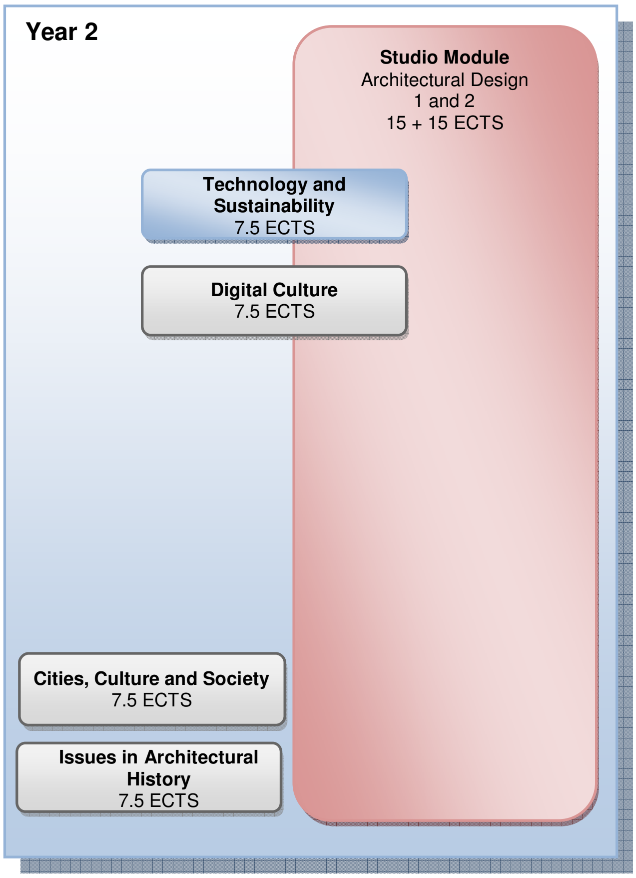
Environmental Design is one of those technical studies modules and provides an opportunity to demonstrate how an understanding of environmental aspects can work in harmony with an architectural scheme, adding to the design through sensitive manipulation of light, heat and sound. Alongside this, an awareness of how the physical and programmatic elements of the scheme affect the wider environment needs to be made explicit as part of a sustainability strategy.

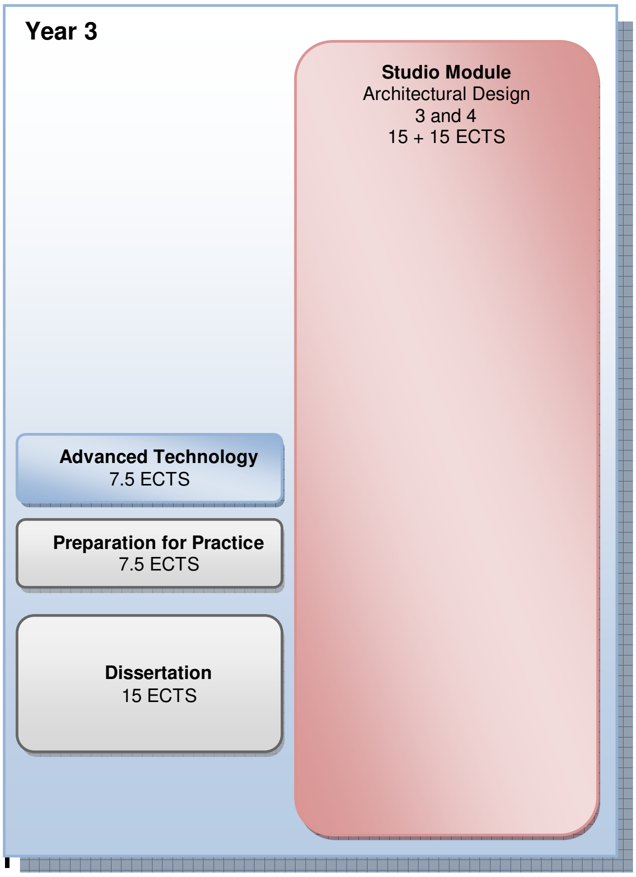
The **Research into Design Stage** (or year 2 of Diploma) has a strong emphasis on acquiring specialised knowledge in an architecturally important field of study and utilising that knowledge in design projects. This is done by taking modules from the Department of Architecture's range of Master courses in conjunction with dedicated design studio courses. These packages of modules are called Design Specialisations (DS).

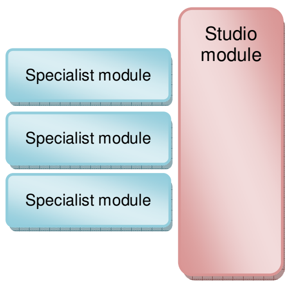
Environmental design is mainly taught in the Design Specialisation **Sustainable Building: Performance and Design**. It aims to engage students with principles of social and environmental sustainability in the built environment by addressing community, resource efficiency and quality of life issues at a masterplan and individual building level. It provides students with the knowledge, skills and tools to be able to design, plan, evaluate and advise on the creation of low-carbon, sustainable buildings, as well as evaluate the environmental impacts of their decisions.

Integration of Environmental Design with Studio - Bachelor of Architecture









Satellite structure
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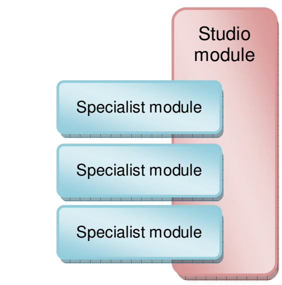

Partially integrated structure
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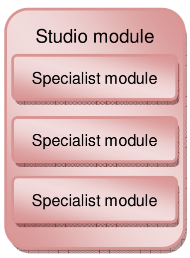
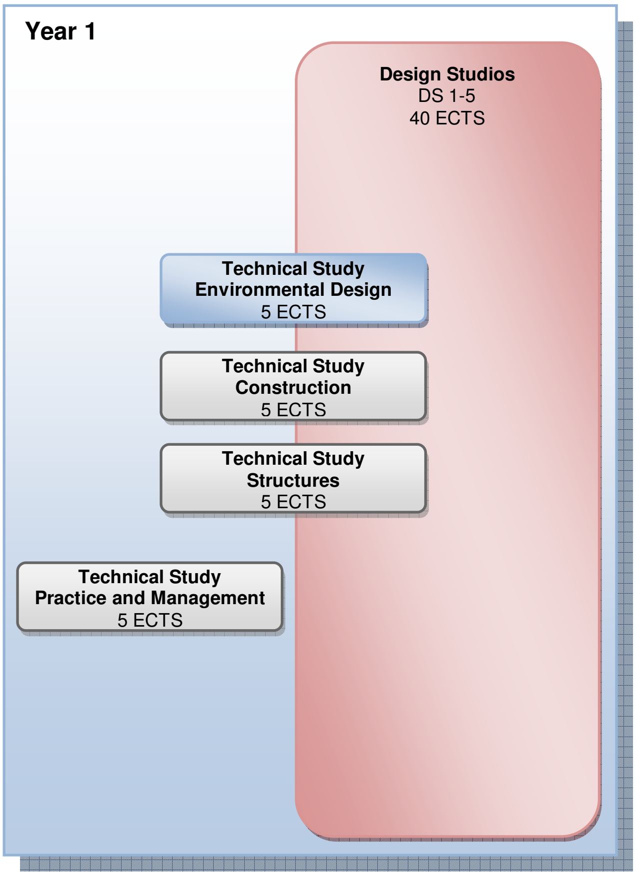
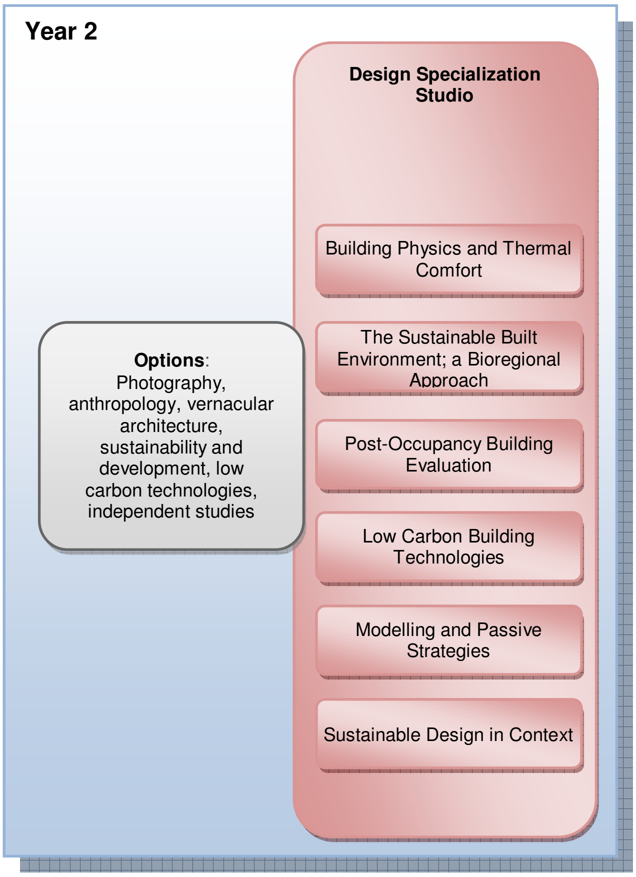
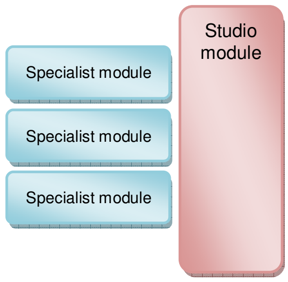


Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

Integration of Environmental Design with Studio – Diploma in Architecture







Satellite structure
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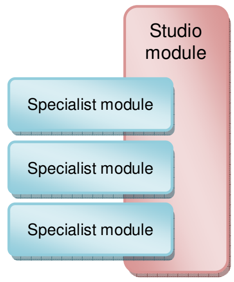

Partially integrated structure
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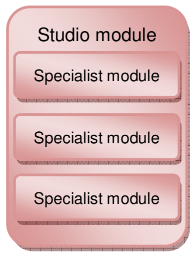


Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Within the BArch / DipArch course, environmental design is integrated at each stage as a complementary technical study. In addition, some of the studios place larger emphasis on the implementation of these principles to the design project. However, this varies according to the personal preferences and level of expertise of the studio teachers. As a minimum, a partially-integrated structure is applied during the first three years (BArch), where contents are delivered via lectures, although environmental knowledge and skills are partially assessed in studio through project work (around 50% of the final mark). On the DipArch, environmental teaching is partly integrated within design modules in the first year, moving on to a fully integrated structure in final year. Amongst the strengths and opportunities:

Strengths:
- Emphasis given to zero carbon design;
- Introduction of environmental design concepts from early stages;
- Excellent provision in the curriculum to address skills / literacy in topic modules;
- Use of technologies to support group work.

Opportunities:
- In-depth analysis of specific technical aspects drawing from ongoing research at the School to address specific aspects of the design project.

SOURCES AND REFERENCES

Department of Architecture website: www.brookes.ac.uk/schools/be/about/architecture
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Architects Registration Board (ARB) - Royal Institute of British Architects (RIBA)

The Architects Registration Board (ARB) was established by an Act of Parliament, the Architects Act, in 1997. The ARB is the statutory body responsible for keeping a Register of Architects and for determining the standards of education and professional competence required for registration as an Architect. It is also the competent authority for Europe in UK with the mandate to implement the EC Architects Directive, which specifies the core areas and duration of study required for European recognition of a qualification in Architecture. Students who have successfully completed Parts 1, 2 and 3 of validated courses become eligible to be registered to practice as an Architect in the UK (and must register if they wish to practice under the title of Architect.) 'Architect' is a protected title in UK, and individuals wishing to practice, or carry on a business, under any name, style or title containing the word 'Architect' are required to register with ARB.

Individuals who have gained prescribed qualification outside the recognised British higher education system, and those that are not recognised by the Professional Qualifications Directive 2005/36/EC, are required to pass an Examination for Equivalence to Prescribed Qualifications appropriate to their level of qualification and experience before they can apply for registration with ARB. All parts of the Examination for Equivalence to Prescribed Qualifications are owned and administered by ARB.

The Royal Institute of British Architects (RIBA) is a professional institute for architects with a long-standing involvement in promoting high quality and innovative architectural education. Through validation, it identifies courses and examinations which achieve the standards necessary to prepare students for the professional practice of architecture. Students who have successfully completed Parts 1, 2 and 3 of validated courses are eligible for Chartered Membership of the Institute. The RIBA provides support for around 40,500 members worldwide in the form of training, technical services, publications and events, and setting standards for the education of architects, both in the UK and overseas. RIBA works with governments to improve the design quality of public buildings, new homes and new communities. Its annual award schemes recognise outstanding architecture and culminate in the RIBA Stirling Prize. The RIBA hosts exhibitions, archives, talks and shared study facilities and helps the public to learn more about the built environment through information services, websites and a library that includes a collection of books, photographs and manuscripts.

Under provision of the EC Architect's Directive 2005/36/CE, architectural qualification granted in one of the European countries may be accepted by the ARB-Architects Registration Board and RIBA. Architects qualified via the EU Directive need not to sit the Part 3 Professional Practice Examination in order to register. However, the RIBA recommends that EU Architects still undertake Part 3 as a useful introduction to UK building legislation and contracts. EU qualified architects may join the RIBA after a period of five year's approved professional practice in the European Union, as documented by a comprehensive curriculum vitae. However, in order to reduce this required period of professional experience, EU qualified architects who undertake and pass a recognised UK Part 3 examination may join the RIBA immediately afterwards. Architects qualified outside of the European Union must undertake assessment with the Architects Registration Board to gain equivalence to Part 1 and Part 2 and complete a minimum of 24 months experience (including 12 months in the UK) before they can undertake Part 3 and join the ARB register.

Accreditation of Academic Curricula

The RIBA validates courses at over 40 schools of architecture in UK, after a visit by the Visiting Board that happens periodically every 4 years and establishes the effectiveness of courses and examinations in achieving the standards necessary to prepare students for the professional practice of architecture. Architecture is however taught in different ways across UK, although most of the studies are based on the central role of the design studio for coursework, tutorials and critiques. Some schools do provide opportunities for hands-on building projects, whilst some may offer specialist areas of study or have developed strengths in particular subjects, such as environmental design and energy efficiency.

Conditions for Professional Qualification

In United Kingdom, the achievement of professional qualification involves academic study and professional experience within a practice and takes at least seven years to compete. This includes three key stages of study on recognised courses. The typical route to qualification as an architect starts with a RIBA Part 1 course, which consists in a university undergraduate degree such as a 3-year full-time Bachelor of Arts (BA), Bachelor of Science (BSc) or Bachelor of Architecture (BArch). Part 1 is aimed at developing a broad range of skills and architectural understanding. Some Part 1 graduates gain further qualifications in specialist related fields such as planning, urban design or conservation.

After Part 1, students must undertake a Stage 1 Professional Experience (paid) Year Out, usually in an architectural office registered in the UK or Europe. Students have to record their experience via the PEDR (RIBA's Professional Education and Development Resource), which is also monitored by a Professional Studies Advisor (PSA) from their University and an employment mentor from their practice. The year out may be substituted by a relevant corresponding examination set by the ARB.

At completion of the year out, students are entitled to enrol in a RIBA Part 2 course, which consists in a 2-year full time degree, whose denomination varies from school to school (e.g. Diploma, MArch, etc.). The RIBA Part 2 course enhances the architectural knowledge of students and broadens their competence in terms of project complexity.

After Part 2, graduates undertake a Stage 2 Professional Experience in an architectural practice of duration of minimum one year, in order to make up two years recorded work experience in total. Graduates will take on more responsibility and begin studying aspects of practice management and law on a Part 3 programme. Also this year out may be substituted by a relevant corresponding examination set by the ARB.

The RIBA Part 3 qualification is finally assessed basing on a professional practice examination which tests prospective practitioners on the knowledge, understanding and skills acquired from the professional training experience. The following elements are required to gain qualification:

- Minimum 24 months of logged professional experience (at least one must be after the 2nd degree);
- Professional CV and career evaluation;
- Case Study;
- Written Examination;
- Oral Examination.

Having gained the Part 1, 2 & 3 qualifications, graduates can register with the title of Architect with the Architects Registration Board (ARB) and also apply to become a Chartered Member of the RIBA.

The standards for education are set out in the document, *Prescription of Qualifications – ARB Criteria*, while those for practice are laid down in the *Architects' Code: Standards of Conduct and Practice*.

Prescription on Qualifications: ARB/RIBA Criteria (2002)

Selected Excerpts:

(The full document is available on http://www.arb.org.uk/qualifications/arb_criteria/default.php)

"*The prescription of qualifications is key to ARB's dual mandate, to protect the consumer and to safeguard the reputation of architects*". […]

"*In carrying out its duty to prescribe qualifications, ARB publishes criteria, which set out the minimum levels of awareness, knowledge, understanding and ability that students of architecture must acquire at key stages in the process of qualifying as an architect. These criteria form the basis upon which ARB makes decisions as to whether or not qualifications can be prescribed*". […]

"*These new criteria differ to those previously published in that:*

– Separate requirements for Parts 1, 2 and 3 are clearly stated stipulating the progression required between these three key stages of an architect's education.

– Greater emphasis is placed on knowledge and understanding of Technology and Environment and the ability to integrate this within design projects.

– Management, Practice and Law has a higher profile at Parts 1 and 2 than previously.

– The opportunity to pursue related, specialised and optional studies is stipulated as a requirement of the criteria.

The ARB and the Royal Institute of British Architects (RIBA) have agreed to hold these criteria in common" […] (a corresponding document is published as 'RIBA Criteria for Validation').

INTRODUCTION

"*The criteria, below, describe the requirements for the prescription of Part 1, Part 2 and Part 3 qualifications in architecture by the Architects Registration Board. The criteria incorporate the relevant requirements of the UK Quality Assurance Agency (QAA) and EU Directive and are considered under five thematic headings: Design, Technology and Environment, Cultural Context, Management Practice and Law, and*

Communication. No weightings are given to the separate themes with the exception of Design, which is to constitute at least half of assessed work at Part 1 and Part 2." […]

TERMINOLOGY

"*The terms awareness, knowledge, understanding and ability are used in the criteria to indicate the level of achievement required in each theme and student progression through the course of study.*" […]

"*The academic portfolio is a comprehensive chronological record of a student's design project work together with all course work, including reports, dissertations, sketch books and any other evidence of work, (with project briefs and examination papers), that have been assessed as part of the course leading to an award of Part 1, 2 or 3.*" […]

PART 1

Criteria for Part 1 are listed under the following headings: Part 1: Design; Part 1: Technology and Environment; Part 1: Cultural Context; Part 1: Communication; Part 1: Management Practice and Law. The only criteria that explicitly refer to awareness, knowledge, understanding and ability of environmental design are the following:

"*Part 1: Technology and Environment*

At Part 1 students will demonstrate, within coherent architectural designs and academic portfolio, the ability to integrate knowledge of:

– The principles of building technologies, environmental design and construction methods, in relation to:

– human well-being

– the welfare of future generations

– the natural world

– consideration of a sustainable environment

– use of materials

– process of assembly

– structural principles

– The impact on design of legislation, codes of practice and health and safety both during the construction and occupation of a project."

PART 2

Criteria for Part 2 are listed under the following headings: Part 2: Design; Part 2: Technology and Environment; Part 2: Cultural Context; Part 2: Communication; Part 2: Management Practice and Law. The criteria that explicitly refer to awareness, knowledge, understanding and ability of sustainability environmental design are the following:

"*Part 2: Design*

At Part 2 students will produce and demonstrate coherent and well resolved architectural designs that integrate knowledge of:

– The social, political, economic and professional context that guides building construction

An understanding of:

– Briefs and how to critically appraise them to ensure that the design response is appropriate to site and context, and for reasons such as sustainability and budget

[…]

Part 2: Technology and Environment

At Part 2 students will demonstrate, within coherent architectural designs and academic portfolio, the ability to integrate knowledge of:

– The principles and theories associated with visual, thermal and acoustic environments

– Climatic design and the relationship between climate, built form construction, life style, energy consumption and human well-being

Understanding of:

– Building technologies, environmental design and construction methods in relation to:

– human well-being

– the welfare of future generations

– the natural world

– the consideration of a sustainable environment

– The impact on design of legislation, codes of practices and health and safety both during the construction and occupation of a project

And ability to:

– Devise structural and constructional strategies for a complex building or group of buildings, employing integrative knowledge of:

– structural theories

– construction techniques and processes

– the physical properties and characteristics of building materials and components and the environmental impact of specification choices

– the provision of building services".

[…]

PART 3

Criteria for Part 3 are listed under the following headings: Context of Practice; Management of Architecture; Management of Construction; Practice Management and Business Administration.

No explicit mention is made on principles and criteria that guarantee a sustainable development of the built environment in terms of energy efficiency, management of resources, and so on.

SOURCES AND REFERENCES

RIBA Website: www.architecture.com
ARB Website: www.arb.org.uk

Extra-European Countries

Australia

DEAKIN UNIVERSITY

SCHOOL OF ARCHITECTURE AND BUILDING

Bachelor of Design (Architecture) + Master of Architecture (5 years)

Level: Undergraduate (BDA, 3 years) + Graduate (MArch, 2 years)

Accrediting Body: Australian Institute of Architects (AIA), Architects Registration Board of Victoria (ARBV), Architects Accreditation Council of Australia (AACA)

Educational Aims: Deakin's Architecture programme comprises two degrees that can be taken over five years: the 3-year Bachelor of Design (Architecture) followed by the 2-year Master of Architecture. The programme allows students to explore ideas imaginatively and develop their own potential to design beautiful environments. Sustainable architecture is an essential component of the programme and is supported by special research in this area. Architecture students at Deakin University have the distinct advantage of taking some classes in cooperation with students of the Construction Management programme, in order for them to learn to work with allied professions in the building industry from an early stage. This experience equips students with the skills for working effectively in professional life. The Master of Architecture is designed to respond to global changes in architecture education, ensuring that students are fully equipped with the up-to-date skills required by the modern architect, nationally and internationally. Students gain highly developed skills and knowledge in design computing technologies, information transfer and complex project design, addressing practice in different cultural conditions and employing performance measured sustainable design. In addition to the Bachelor of Design (Architecture) + Master of Architecture route, Deakin offers a distinctive Bachelor of Design (Architecture) / Bachelor of Construction Management combined 5-year degree (or 4-year under the accelerated programme) followed by the 1-year Master of Architecture (Design). The Master of Architecture (Design) degree has been designed to allow incorporation of the final units that fulfil the academic requirements needed for professional accreditation and registration of applicants. Graduates of this programme are likely to be offered careers in the built environment field with many options in areas of architecture and project management.

Outline Description of Course: The Bachelor of Design (Architecture) places emphasis on real application, allowing students to learn and apply architectural principles from day one. Students explore architectural ideas, history, philosophy, design and communication as well as building science and technology. The course is designed to meet the needs of students who ultimately intend to complete the Master of Architecture and practice architecture, but alternative teaching units may be taken if students wish to pursue a different career direction. Some of the units included in the course comprise Graphic and Coded Communication, Building Materials Science, Architecture Design, Computer Aided Modelling and Construction and Structures. The Master of Architecture degree has been designed to allow incorporation of the final units which are demanded to fulfil the academic requirements needed for professional accreditation and registration of graduates. The course is available to students who have completed an accredited three-year program in Architecture. Alternatively, the Master of Architecture (Design) is available to students who have completed an accredited four-year program in Architecture (e.g., combined degree), or to qualified practicing architects or architecture academics who may wish to upgrade their qualifications.

Course Structure: To satisfy the requirements for the Bachelor of Design (Architecture) degree, a student must complete at least 24 credit points, of which at least 6 must be at level 3 and no more than 10 must be at level 1. All core units must be completed. All students are required to complete at least one wholly online unit. The Master of Architecture requires students to complete 16 credit points of study (two years of full-time study or part-time equivalent) including 14 core units and two electives, one of which has to be in History and Theory. For the Master of Architecture (Design), students need to complete 8 credit points of study.

<u>Bachelor of Design in Architecture (3 years)</u>

Year 1

Code	*Title*	*Credits*	*Taught*
SRA143	Art and Society	1	Trimester 1
SRD163	Architecture Design 1A	1	Trimester 1
SRT153	Building Material Science	1	Trimester 1
SRC163	Graphic and Coded Communication	1	Trimester 1
SRA010	Safety Induction Programme	0	Trimester 1
SRD164	Architecture Design 1B	2	Trimester 2
SRT151	Construction and Structures	1	Trimester 2
SRC221	Computer Aided Modelling	1	Trimester 2
Credit Total	**8 Programme Credits**		

Year 2

Code	*Title*	*Credits*	*Taught*
SRA215	Utopian Ideals in the Modern World	1	Trimester 1
SRD263	Architecture Design 2A	1	Trimester 1
SRT251	Construction and Structures 2	1	Trimester 1
SRA224	Australasian Architecture	1	Trimester 2
SRD264	Architecture Design 2B	2	Trimester 2
SRT257	Building Environmental Studies 1	1	Trimester 2
Optional/Elective Unit		1	Trimester 1
Credit Total	**8 Programme Credits**		

Year 3

Code	*Title*	*Credits*	*Taught*
SRC362	Project Documentation	1	Trimester 1
SRD363	Architecture Design Studio 3A	2	Trimester 1
SRT358	Building Environmental Services	1	Trimester 1 (Online)
SRD364	Architecture Design 3B	1	Trimester 2
SRT351	Construction and Structures 3	1	Trimester 2
Optional/Elective Unit		1	Trimester 2

Plus another elective unit to be chosen from the following:

SRA323	Contemporary Architecture	1	Trimester 2
SRA341	The City	1	Trimester 2
Credit Total	**8 Programme Credits**		

<u>Master of Architecture (2 years)</u>

Year 1

Code	*Title*	*Credits*	*Taught*
SRA760	Urban Ecologies	1	Trimester 1
SRM750	Built Environment Professional Practice	1	Trimester 1
SRT757	Building Systems and Environment	1	Trimester 1
SRD763	Architectural Design in Urban Contexts	1	Trimester 1
SRT750	Sustainable Futures	1	Trimester 2
SRQ762	Cost Planning	1	Trimester 2
SRD764	Urban Design Studio	1	Trimester 2
Optional/Elective Unit		1	Trimester 2
Credit Total	**8 Programme Credits**		

Year 2

Code	Title	Credits	Taught
SRV799	Built Environment Integrated Project	1	Trimester 1
SRR782	Thesis Preparation	1	Trimester 1
SRD765	Architectural Design and Resolution	1	Trimester 1
SRD766	Architecture Design Masterclass	2	Trimester 2
SRR711	Thesis	2	Trimester 2
Optional/Elective Unit		1	Trimester 1

One history/theory elective (to be taken in Year 1 or Year 2) has to chosen from the following:

SRA742	Urban Perspectives	1	Trimester 1
SRA743	Trans-National Mega Projects	1	Trimester 2
Credit Total	**8 Programme Credits**		

Learning Outcomes: The Bachelor of Design (Architecture) – Master of Architecture programme is accredited (within Australia) by the Australian Institute of Architects, the Architects Registration Board of Victoria and the Architects Accreditation Council of Australia. Graduates will be required to complete an additional two years of work experience under the supervision of a registered architect in order to present for registration with the Architects Registration Board of Victoria and the Australian Institute of Architects.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

In the first trimester of Year 1 of the Bachelor of Design (Architecture), **Building Materials Science** introduces students to the properties of materials used in a wide range of building applications (e.g. timber, concrete, metals, stone and ceramics, plastics, glass, etc.). Topics include the chemical and physical properties of materials and the procedures for their selection. The environmental significance of materials is also considered within the framework of sustainability and embodied energy. The module is assessed by tutored exercises (25%), the submission of a report (25%), and a final examination (50%).

In Year 2, at 2nd trimester, **Building Environmental Studies 1** investigates the climatic and environmental factors that influence the design and construction of buildings in the context of ecologically sustainable development. Topics include heat loss and gain, thermal comfort, ventilation, condensation, solar patterns and shading, passive and active heating and cooling systems, and general energy conservation strategies. The use of software to produce energy ratings and life cycle assessments for simple buildings is introduced. The assessment implies a trimester-long project which requires multi-disciplinary teams of three to six students (from architecture and construction management) to analyse and improve upon the resource efficiency of houses designed by eminent local professionals (50%) and a final examination (50%).

In Year 3, **Building Environmental Services** is an on-line unit which investigates the range of building services used primarily in commercial buildings, including HVAC (heating, ventilation and air conditioning), electrical systems, vertical transportation and fire services. Topics cover design and installation principles, control systems, commissioning and testing requirements, and performance expectations. Alternative approaches with lower environmental impact and the roles and responsibilities of the various services consultants are also discussed. Tutorials include computational methods for assessing a peak heating and cooling load and estimation for the size of equipment and supply reticulation. Assessment is composed of tutored exercises (20%), an assignment based on building services integration (40%) and an exam (40%).

At Master level, in Trimester 1, **Building Systems and Environment** examines thermal, visual and aural environments through a series of case studies and practical applications. During the course, students: analyse building envelope materials and assemblies to respond to different climatic conditions and enhance thermal comfort; appraise lighting concepts as well as colour classifications; analyse the application of daylight modelling and lighting installation design with emphasis on integration control, computational methods and software application; engage in discussion of aural environment and acoustic design with regards to reverberation times and speech intelligibility, suitable material selection, noise problems, sound transmission through structures, and environmental noise control. Computational methods are also introduced to support effective decision making to improve built environment performance. Assessment is conducted via tutored exercises (30%), an individual report (35%), and a case study (35%).

Sustainable Futures (Year 2, Trimester 2) investigates contemporary building design in the context of the use of technology and environmental impact. The integration of building structure, envelope, services and fit-out are considered holistically from the perspective of architectural merit and resource sustainability. The use of building technology to improve occupant comfort and material use, energy consumption and ventilation performance is explored through case studies and research findings. Other topics include life cycle assessment, fluid mapping tools and trends in biomimicry and sustainable architecture. The unit is assessed via tutored exercises (20%), an assignment of system integration (40%) and a final case study (40%).

Further to specialist modules, sustainable environmental design issues are also introduced within a number of design/urban design modules. Amongst others, at Bachelor level, **Architecture Design 1B** (Year 1) introduces important aspects of architecture and its composition with the aim of producing meaningful and sustainable designs. Specific consideration is given to cultural, social, material and environmental requirements and awareness of heating, cooling and daylighting as well as consideration of structural, constructional and envelope systems. In Year 2, **Architecture Design 2B** focuses on the relationship between tectonics and architectural design through a series of interrelated projects. Major areas of exploration include site analysis, ecologically sustainable design and designing collaboratively. Design is explored across a broad range of scales, and includes representational and simulated modelling. Consideration is given to cultural, social, material and environmental requirements and the importance of historical precedent. In **Architecture Design 3B** (Year 3), issues of sustainability in design and within society are also used as the ethical basis for some of the design projects. At Master level, in Year 1, **Urban Ecologies** introduces a broad critical analysis of the contemporary social, economic and environmental challenges that shape Australia's built environment and considers various strategies for forming new or regenerating existing urban territories. The unit immerses students in analysis of a complex urban project addressing the multiple scales, ecologies, infrastructure conditions, building types and material expressions. In Year 2, **Built Environment Integrated Project** aims to integrate knowledge and skills developed in other units through the resolution of the design of a complex architectural project within the context of international contemporary practice. The unit builds upon the concept of urban ecologies and sustainable urban development as students synthesise social, cultural, environmental, information and economic objectives within a design management process. Design collaboration methodologies are introduced to create an authentic learning experience of the key activities of strategic and functional brief development to achieve client requirements. The process of resolution is undertaken via weekly workshops with trigger guest lecturers from experts in several knowledge areas. Such integrated and collaborative approach is finally exploited in the conduction of the students' **Thesis** and in the **Architecture Design Masterclasses**.

Integration of Environmental Design with Studio – Bachelor of Design (Architecture)

Year 1 – Trimester 1

- **Building Material Science** 1 Credit
- **Studio Module** Architectural Design 1A 1 credit
- **Art and Society** 1 Credit
- **Safety Induction Programme** 0 Credits
- **Graphic and Coded Communication** 1 Credit

Year 1 – Trimester 2

- **Construction and Structures 1** 1 Credit
- **Studio Module** Architectural Design 1B 2 credits
- **Computer Aided Modelling** 1 Credit

Year 2 – Trimester 1

- **Utopian Ideals in the Modern World** 1 Credit
- **Studio Module** Architectural Design 2A 1 Credit
- **Construction and Structures 2** 1 Credit
- **Elective** 1 Credit

Year 2 – Trimester 2

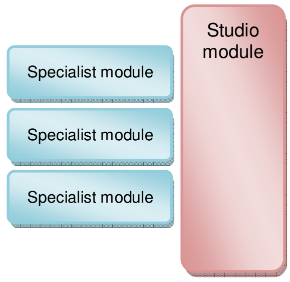
- **Building Environmental Studies** 1 Credit
- **Studio Module** Architectural Design 2B 2 credits
- **Australasian Architecture** 1 Credit

Year 3 – Trimester 1

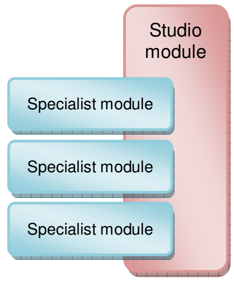
- **Building Environmental Services** 1 Credit
- **Studio Module** Architectural Design 3A 2 Credits
- **Project Documentation** 1 Credit

Year 3 – Trimester 2

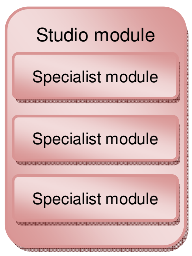
- **Construction and Structures 3** 1 Credit
- **Studio Module** Architectural Design 3B 2 Credits
- **Elective** 1 Credit
- **Elective (The City or Contemporary Architecture)** 1 Credit



Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).

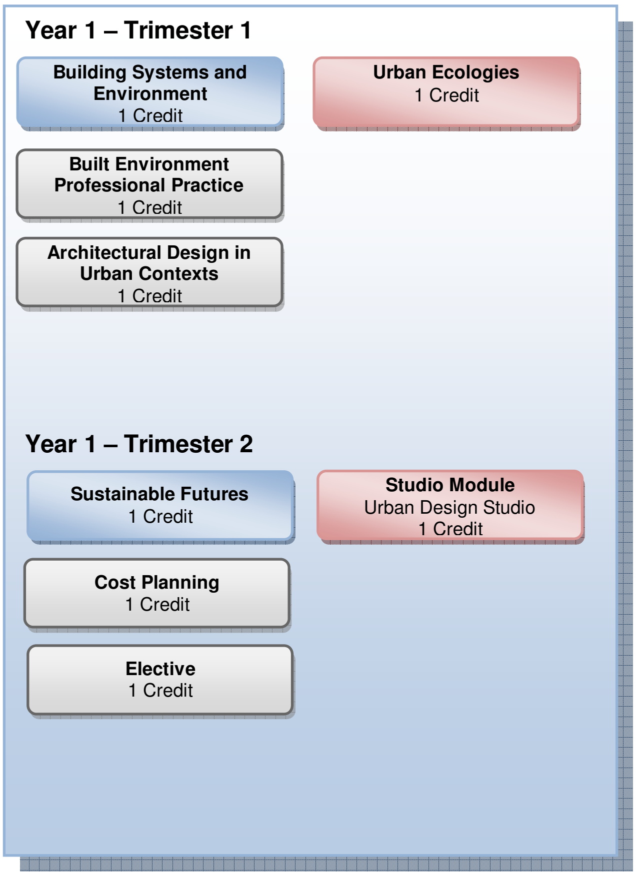


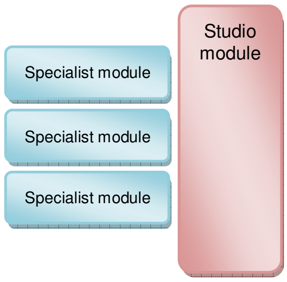
Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



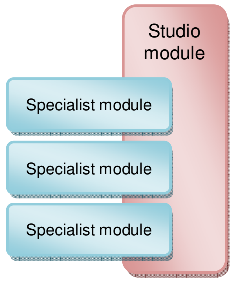
Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

Integration of Environmental Design with Studio – Master of Architecture

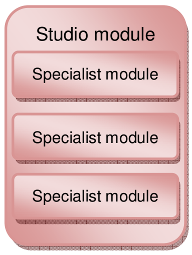




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

In addition to the accredited Bachelor of Design (Architecture) + Master of Architecture programme, Deakin offers a distinctive Architecture/Construction Management course which can be taken in 5 years (or 4 years under the accelerated curriculum) and that is then followed by a 1-year (8 credits) Master of Architecture (Design). This alternative path guarantees the formation of graduates which are prepared to work with allied professions in the building industry from the early stages. This collaborative and inter-disciplinary approach represents one of the main features of the courses offered at Deakin, whose strengths and opportunities can be synthesised as follows:

Strengths:

- Sustainable environmental design represents a core issue within the curricula on offer and significant resources are invested in its integration throughout the curriculum;
- Specific emphasis to the themes of sustainable design is given within the undergraduate degree where the contents imparted in satellite lectures are transferred in design studio teaching;
- The teaching of sustainable environmental design is particularly strong in the fields of passive design, energy efficiency, occupant comfort and social sustainability;
- The teaching is consistent in technical, theoretical and design disciplines, in order for sustainable environmental design not to be isolated in one single stream;
- Sustainable environmental design is seen throughout the school as a theme that can represent a significantly important creative input in design and there is no resistance in its integration in design application;
- An attempt has been made to pair up a lecture-based unit focusing on building environmental studies with a design studio unit to make sure that technical theory is applied in practice.

Opportunities:

- Exploration and analysis of heritage and application of sustainable environmental design in practice could bring the academic curriculum closer to the reality of professional activity.

SOURCES AND REFERENCES

School of Architecture and Building website: www.deakin.edu.au/scitech/ab
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Australian Institute of Architects (AIA)

The Australian Institute of Architects (AIA) is a professional body for architects in Australia. Prior to August 2008, its name was the Royal Australian Institute of Architects. Its mission is to:

- advance architecture
- represent the profession
- preserve professional integrity
- serve and promote interests of the membership
- foster public appreciation of architecture
- advance the standards of architectural education, training, practice and research
- recognise and reward architectural merit.

The AIA is a professional association representing the interests of its members. It provides services to its members in the form of continuing education, recommending standards of professional conduct, representing the profession in the political arena, and other matters of interest to the members of the organisation. AACA and AIA have formed joint working parties to address issues of common interest such as professional indemnity insurance and continuing professional development. AIA also works in collaboration with key stakeholder groups as well as the organisation's National Executive and National Board to regularly update public policies related to the built environment.

Amongst the policies and resources published by AIA:

SUSTAINABILITY POLICY

Selected Excerpts:

"*Urgent action is needed as we face the challenges presented by climate change. The commercial and residential building sectors offer significant potential for achieving deep cuts in greenhouse gas emissions by 2050. This potential can be realised by reducing energy demand and increasing the energy efficiency of buildings. Policy frameworks must be established to achieve greater energy and resource efficiency in the building sector and to facilitate innovation in building design and procurement. Incentives to encourage the alteration, retrofitting and rebuilding of our current building stock to achieve more sustainable outcomes are needed now. The architectural profession, as a key player in the development of the built environment, must continue to show leadership. The Australian Institute of Architects advocates a range of actions for government, its members, the design and construction industry and the broader community that it believes will drive the necessary changes*".

ENVIRONMENT POLICY

Selected Excerpts:

"*In 1993, The Royal Australian Institute of Architects adopted the International Union of Architects 'Declaration of Interdependence for a Sustainable Future'. In doing so, the RAIA recognises that:*

• A sustainable society restores, preserves, and enhances nature and culture for the benefit of all life, present and future; a diverse and healthy environment is intrinsically valuable and essential to a healthy society; today's society is seriously degrading the environment and is not sustainable.

• We are ecologically interdependent with the whole natural environment; we are socially, culturally, and economically interdependent with all of humanity; sustainability, in the context of this interdependence, requires partnership, equity, and balance among all parties.

• Buildings and the built environment play a major role in the human impact on the natural environment and on the quality of life; sustainable design integrates consideration of resource and energy efficiency, healthy buildings and materials, ecologically and socially sensitive land-use, and an aesthetic sensitivity that inspires, affirms and ennobles; sustainable design can significantly reduce adverse human impacts on the natural environment while simultaneously improving quality of life and economic well being.

The RAIA affirms the responsibility of the architectural profession, as a key player in the construction industry, to embrace an integrated approach to ecological, social and economic sustainability. This should be done through individual practice and by bringing to bear our collective expertise and influence in the community. In order to achieve this, the RAIA and its members should abide by the following principles:

EDUCATE

1. Commit - Place sustainability at the core of our practices and professional responsibilities.

2. Develop - Research and develop policies, regulations, practices, products, curricula, services, standards, contracts and other mechanisms that will facilitate the implementation of sustainability.

3. Educate - Educate ourselves, our fellow professionals, the building industry, clients, building users, students, government, manufacturers and the general public about the critical importance and substantial opportunities of sustainability.

4. Formalise - Encourage policies, regulations and practices in government and the private sector of the construction industry to ensure sustainability becomes, and remains, normal practice.

5. Implement - Implement, and continually improve, subject to our professional responsibilities to our clients, sustainability in the resourcing, construction, use and reuse of buildings and the built environment."

SUSTAINABILITY RESOURCE SHEET FOR ARCHITECTS

The Sustainability Resource Sheet for Architects is updated monthly and contains links to on-line resources, education and training providers, seminars, conferences and networking opportunities. In addition, case-studies of sustainable projects and links to green organisations can be found.

BUILT ENVIRONMENT DESIGN GUIDE

Expanding for more than 14 years, the Built Environment Design Guide brings together the work of Australia's most renowned experts on sustainable built environment in one accessible resource. The guide contains over 250 peer-reviewed papers which cover general issues, specific technologies, design strategies, products and materials, and built case studies. Abstracts for each paper are listed on the 'Contents' page. Papers come with summary pages which cover key take-away points and reference.

STATUTORY CODE OF PROFESSIONAL STANDARDS AND CONDUCT

This document is prepared jointly by the Architects Accreditation Council of Australia and the Australian Institute of Architects to define the core requirements to be adopted in each State and Territory to ensure harmony and consistency in the regulation of architects throughout Australia.

Selected Excerpts:

"*STATEMENT OF PROFESSIONAL STANDARDS*

3.1 An architect must observe and apply the following professional standards in architectural practice:

3.1.1 Professional Standard 1

An architect has a fundamental and overriding obligation to serve and promote the public interest.

3.1.2 Professional Standard 2

An architect has a responsibility, where possible, to contribute to the quality and sustainability of the natural and built environment and the health and safety of the general public and in particular, to give proper consideration to the:

3.1.2.1 public interest;

3.1.2.2 natural environment whilst striving to improve the built environment and quality of life;

3.1.2.3 conservation of the nation's heritage; and

3.1.2.4 conservation of natural resources."

AIA Policy on Tertiary Education of Architects – Standards for Programs in Architecture

This policy promotes a vision of architectural education as a major change agent to re-position the profession in the 21st century and is the basis for professional recognition of all architectural education programs in Australia. It is a companion document to the accreditation procedures set out in the Australian Architecture Course Recognition & Accreditation Procedure. The policy is a fundamental component underpinning the National Visiting Panel and State Visiting Panel processes. The Australian Institute of Architects believes that architectural education is the essential foundation of the profession. The Institute's student programmes and prizes, its Archivision workshops (an annual profession/academia roundtable), and its participation in the joint accreditation and recognition process – all work towards improving standards, and encouraging an effective interface between architectural education and the profession.

Selected Excerpts:

"*3. Program Content*

Graduates exiting from an undergraduate program shall satisfy the following criteria for each component of the framework set out below. In particular architecture students must develop the ability to integrate the range of knowledge criteria set out below. It is this ability that distinguishes architects from other providers of built environment services. Integrative skills develop in complexity over an architecture course.

3.1. Design Studies and Design Integration

3.1.1 Awareness and Knowledge

i) An understanding of design procedures, systems and the history of design methods

ii) An understanding of design precedent, critique, analysis and movements in design theory

iii) An understanding of the tangible and intangible channels to architectural creativity

iv) An understanding of material sciences and construction processes.

[...]

3.2 Documentation and Technical Studies

3.2.1 Awareness and Knowledge

[...]

vi) An understanding of active and passive services systems for thermal comfort, lighting and acoustics and their relationship to natural systems

[...]

3.6 Environmental Studies

3.6.1 Awareness and Knowledge

i) An awareness of social and cultural dimensions of place

ii) An understanding of issues of ecological sustainability

iii) An awareness of issues of national and regional planning and their relationship to global and local demography and resources

iv) An understanding of passive systems for thermal comfort, lighting and acoustics and their relationship to active systems

v) An awareness of landscape design and management of natural systems

vi) An understanding of the history and practice of urban design and issues of city planning.

3.6.2 Application and Synthesis

i) An ability to define personal values systems and ethical positions

ii) An ability to inform action through knowledge of natural systems and the built environment.

[...]

Architects Accreditation Council of Australia (AACA)

The Architects Accreditation Council of Australia (AACA) is the national body formed by the registration authorities of each state and territory to consider matters of common concern or interest. The main objectives of the Council are to facilitate the recognition, accreditation and co-ordination of acceptable academic standards and registration practices in the interests of national and international professional reciprocity in architecture.

AACA is responsible for facilitating the competency based assessment (CBA) process and maintaining the National Competency Standards in Architecture (NCSA) on behalf of the profession. AACA is not itself a registration authority, but its role is the facilitation of the assessment process, which is recognised by each of the state and territory registration authorities as a prerequisite to registration. The decision to register applicants is the sole prerogative of the registration authorities in each state.

Each State and Territory of Australia has its own Architects' Board.

Conditions for Professional Qualification

In Australia, the use of the title ‘Architect’ is reserved by law to those who are registered by the statutory authorities in each state or territory. The purpose of registration and certification of the title architect is to serve the public interest by ensuring that the standards of competence required reflect consumer expectations. Registration is the formal act that recognises acceptable standards of competence and conduct and enables the name of the registrant to be entered upon a state or territory Register of Architects. Upon registration, an architect must be competent in the design, documentation and management of an architectural project which could be undertaken by an independent practitioner. That individual must also be competent to contribute to design resolution, to integration of technology and to procurement of ‘complex architectural projects’ in a range of practice models.

The pathways to registration as an architect are common in all Australian states and territories, and there are provisions for portability between the states, territories and New Zealand. Typically, an individual will have an accredited university qualification in architecture.

Generally, the following three steps outline the requirements for registration as an architect in a State or Territory of Australia. Applicants must:

1. Have a recognised academic qualification in architecture or a pass in the National Program of Assessment, or a pass in the relevant Registration Board Prescribed Examinations where offered;
2. Have a period of training through experience followed by successful completion of the AACA Architectural Practice Examination (APE); and
3. Apply for registration to the Architects' Board in the State or Territory in which registration is sought.

AACA may also formally recognise an overseas qualification in architecture as equivalent to an Australian qualification. Where no formal qualifications have been completed, an individual may undertake the National Program of Assessment (NPrA) where their knowledge and practical experience within the industry is assessed by the AACA. The final step in the pathway to registration requires all applicants to complete the Architectural Practice Examination (APE). Experience in Australia must be recorded in an AACA Log Book.

The following requirements must be taken:

A. PRACTICAL EXPERIENCE

Acceptable periods of practical experience are:

a) a minimum of 2 years experience under the supervision of an architect.

or

b) a minimum of 2 years experience, which may be in a self-employed capacity.

One year of this experience is to be subsequent to successfully completing a recognised qualification in architecture and is to be undertaken in Australia. Experience should range over all competencies. However admission to the APE is conditional upon satisfaction of the mandatory Prescribed Elements of Competency, consisting of 3000 hours of logged architectural experience at the required levels in the seven mandatory Prescribed Elements of Competency, which are:

Context 2.1	Element 2.1.2	Prepare architectural drawings with regard to the location, extent of building elements, components, finishes, fittings and systems
	Element 2.1.4	Co-ordinate the documentation of the project
Context 3.1	Element 3.1.2	Establish site conditions
	Element 3.1.4	Assess regulatory context
Context 3.2	Element 3.2.3	Prepare preliminary project evaluations, programs and feasibility studies
	Element 3.2.5	Establish requirements for, and co-ordinate, specialists
Context 3.3	Element 3.3.1	Administer a standard form construction contract

or

c) completion of an accredited qualification in architecture from an Australian school of architecture part-time or successful completion of the NPrA

And in so doing have undertaken 7 years experience within the last 10 years including:

- 3 years in an architectural practice under the supervision of an architect - one year of which must be in Australia

- 3000 hours of logged architectural experience at the prescribed levels in the seven (7) mandatory Prescribed Elements of Competency.

Other rules will apply for candidates with an accredited qualification in architecture from a New Zealand School of Architecture, candidates with overseas qualifications and candidates whose experience does not satisfy the guidelines but where exceptional circumstances can be considered. As an example, candidates whose overseas academic qualifications are assessed as equivalent to a currently accredited Australian qualification in architecture through the Review of Academic Equivalence (RAE) may claim Australian practical experience from the date of arrival in Australia.

B. ARCHITECTURAL PRACTICE EXAMINATION (APE)

After having completed the practical experience, candidates can apply to sit for the Architectural Practice Examination (APE). The purpose of this national examination is to ensure that persons applying to be admitted to the Register of Architects have an adequate knowledge and understanding of the practice of architecture in Australia and a capacity to exercise professional skill. The APE is a three-part process:

- Part 1 Logbook and Statement of Experience.
  This requires documentation of 3000 hours of practical experience across seven 'mandatory competencies' and describes that experience in a 'Statement of Practical Experience'. A satisfactory Logbook and Statement is required for eligibility to undertake Part 2.
- Part 2 National Examination Paper (NEP).
  The NEP is a 'multiple choice' examination conducted on the same day in all jurisdictions offering the exam. It normally consists of seven or eight 'scenarios' which give rise to a total of between thirty and forty possible answers some of which are correct and others incorrect. Candidates are required to identify the correct answers. To succeed in the NEP a candidate must achieve 60%.
- Part 3 Examination by Interview
  The interview is conducted by two experienced practitioners, qualified to conduct APE Interviews. Interviews are conducted over a period of approximately 45 minutes to one hour and are informed by the Logbook and Statement material submitted by the candidate. The interview will seek to confirm the experience claimed by the candidate and to consider the candidate's response to practice situations that may be beyond the candidate's personal experience.

Candidates must satisfactorily complete all three parts to pass the APE.

The APE was developed by AACA in conjunction with the Architects Registration Boards and has been in operation in the present form since 2000. It is coordinated nationally by AACA which provides all examination documents and monitors implementation and examination results. Quality assurance processes are in place for all aspects of the APE to ensure nationally consistent application of examination procedures. The examination is based upon the AACA National Competency Standards in Architecture.

The AACA National Competency Standards in Architecture are those standards which have been developed by the profession and accepted by all of the Architects Registration Boards in Australia as defining the minimum level of knowledge and experience necessary for a person to enter the architectural profession.

The National Competency Standards in Architecture (NCSA)

The NCSA is the document setting out the benchmark standards of competency against which an applicant for registration as an architect in Australia and New Zealand is measured. The current 2008 edition of this document replaces the revised 2001 edition. In the current edition there is recognition of significant changes in architectural practice since the creation of the NCSA.

The NCSA should be seen as the measure of the knowledge, skill and experience that is required of a practitioner for entry to the profession; the NCSA should not be regarded as inspirational. Details relating to the use of the NCSA in the processes leading to registration are contained in the following documents:

- National Competency Standards in Architecture Guide for Candidates (NCSA GC)
- Australian Architecture Program Accreditation and Recognition Procedure (AAPARP 01)

The processes contained in these documents require satisfaction of specific, but not necessarily all of the, Performance Criteria contained in the NCSA. The NCSA are reviewed on a five yearly cycle to ensure that they reflect significant changes in the context of architectural practice in Australia and New Zealand. In this document there is further recognition that:

- Climate change and sustainability are increasingly significant factors in the design process.

- There is increasing specialisation in architectural practice.
- ‘Traditional’ client/architect relationships should no longer be regarded as the norm.
- Procurement models have become more diverse.
- Technology has impacted upon all aspects of the provision of architectural services.

The NCSA recognises four major areas, or Units of Competency, in the competence of an architect, namely:

- Unit 1 Design
- Unit 2 Documentation
- Unit 3 Project Management
- Unit 4 Practice Management

Each Unit is further subdivided into:

- Contexts of Competency
- Elements of Competency
- Performance Criteria

Selected Excertps:

“*Unit 1 Design*

An architectural design evolves through exploration and reappraisal of a range of ideas and propositions that lead progressively to the eventual resolution of a coherent design proposal. Evidence of this progressive process must be demonstrated in each of the successive stages of Design from design concept through to schematic and detailed design. Although listed separately for convenience and reference, the Elements of design constitute a system, a set of incidents, which are dynamically related. The Elements are given in the sequence in which they often occur, but they may merge, repeat and inform one another throughout the design process and cannot be considered or assessed in isolation. Upon registration, an architect is required to demonstrate an ability to design a complex architectural project.

Context 1.1 - To create an architectural design through the exercise of knowledge, imagination, judgement and professional responsibility

Element 1.1.1 - Generate a design concept that can be realised as a building

Performance Criteria 02 - The design concept demonstrates a considered response to the physical location and addresses the relevant wider issues of urban or rural context

Performance Criteria 07 - The design concept demonstrates an understanding of relevant social, cultural and environmental issues

[...]

Element 1.1.2 - Recognise the need to sustain the natural and the built environment, and the needs and aspirations of building users and the community, in the formulation of a design concept

Performance Criteria 09 - The design concept demonstrates respect for the natural environment and awareness of the issues of sustainability

Performance Criteria 12 - The design concept demonstrates the observation of society’s values influencing health, safety, welfare and use of the built environment

[...]

Context 1.2 - To formulate an architectural design in response to a project brief, sufficient to obtain endorsement of overall objectives and design concept by a client and other interested parties

Element 1.2.1 - Interpret project brief and decide design objectives and parameters with the client

Performance Criteria 21 - The architectural design demonstrates an investigation of human, social, environmental and contextual issues

[...]

Element 1.2.3 - Develop a schematic design through a repetitive process of hypothesis, evaluation and re-appraisal

Performance Criteria 27 - The schematic design is validated by technical considerations, integrating structure, construction technologies and service systems into a functionally effective whole

[...]

Context 1.3 - To develop a detailed design which is consistent with the design concept

Element 1.3.3 - Establish requirements for building service systems

Performance Criteria 47 - The active and passive service systems selected for thermal comfort, lighting and acoustics are suitable for the occupation, function and environmental parameters

Performance Criteria 48 - The mechanical and electrical, hydraulic and transportation systems selected are suitable for the occupation, function and environmental parameters and appropriate to time constraints

[...]

Context 1.4 - To resolve a detailed design sufficient to obtain agreement and authorisation to proceed to documentation for its translation into built form

Element 1.4.1 - Progressively finalise all decisions relating to the assessment of specialist information, design detail, material choice and building costs and management strategies

Performance Criteria 52 - The detailed design demonstrates that all building elements are sufficient and appropriate for construction intentions and environmental sustainability

Performance Criteria 54 - The detailed design demonstrates the integration of specialist information and expertise"

[...]

Accreditation of Academic Curricula

The criteria for accreditation of architecture programs include documented evidence of student outcomes that demonstrates achievement of relevant competencies from the NCSA. AACA endorses the professional responsibility of tertiary institutions for the determination of course structures and teaching methods and supports those institutions in their assertion of independence in such matters.

The accreditation and recognition procedure is jointly run by the Architects Registration Boards in each State and Territory, the Australian Institute of Architects and the Architects Accreditation Council of Australia. AACA lists all courses recognised through the accreditation procedure under a system of National Competency Based Assessment of qualifications in architecture. Courses on this list are automatically accepted as meeting the first part of the National Competency Based Assessment requirements leading to registration as an architect in Australia. The accreditation/recognition procedures encompass:

- Preliminary assessment for proposed new programs or major changes to existing programs.
- Provisional recognition for new programs approaching first graduating cohort.
- Achieving and maintaining accreditation and recognition for existing programs.
- Articulation or advanced standing.
- Joint degrees - architecture programs combined with other qualifications.

The accreditation of each program in architecture is carried out on a five yearly basis with annual visits to the Schools to ensure that the standard of graduates is acceptable to the Architects Registration Boards. The accreditation visits are carried out in conjunction with the Australian Institute of Architects (AIA) which recognises programs from the Schools of Architecture for the purpose of membership of their association.

In terms of assessment of overseas qualifications in architecture, generally all qualifications in architecture obtained outside Australia must be assessed in terms of equivalence with an Australian qualification. Many intending migrants receive a provisional assessment of their qualification from the AACA as part of the evaluation of their migration application. For registration purposes, a final assessment, known as a Review of Academic Equivalence (RAE), must be made by AACA after candidates have arrived in Australia, using a system of Competency Based Assessment. The RAE is based on an interview process, in which the interviewers examine in detail the content of the course leading to the qualification to determine the extent to which it delivers the competencies required. These are contained in the National Competency Standards in Architecture and form the basis for assessment of overseas qualifications.

Alternatively, applicants may undertake the National Program of Assessment which allows to demonstrate equivalence through experience. The NPrA is recognised by all Australian registration authorities as an alternative to successful completion of an accredited professional Australian qualification in architecture. The Program takes the form of a complex Project, the responses to which must address particular competencies in the context of the NCSA and be in the form of a report and companion drawings.

Australian Architecture Program Accreditation and Recognition Procedure

This document describes the process by which architecture programs in Australia are accredited and recognised, and is published jointly (last edition 2006) by the Architects Accreditation Council of Australia (AACA) and The Australian Institute of Architects (AIA).

Architecture programs offered by universities in Australia are subject to a review process to inform Accreditation and Recognition of Architecture qualifications. The review process is jointly conducted by registration authorities and the Australian Institute of Architects through representative National Visiting Panels (NVP) which meets with universities to review architecture programs and make recommendations for accreditation and recognition of those programs. Review of programs is undertaken with close reference to both the *Architects Accreditation Council of Australia National Competency Standards in Architecture* (NCSA 01) and the *Australian Institute of Architects Education Policy*. Extracts from these documents jointly form the *Accreditation and Recognition Criteria*.

Accreditation of programs in architecture is granted by the relevant accrediting authority in each jurisdiction. Accreditation is the formal endorsement of a program by the accrediting authority and is based on the recommendation from the National Visiting Panel that the graduates from a program are deemed to have achieved appropriate outcomes from a program that complies with the criteria described in the document.

Recognition is the formal endorsement of a program by the Australian Institute of Architects that its content meets the requirements of the AIA Education Policy, and its students and graduates are eligible for membership of the AIA. In assessing the recognition status of the program for the subsequent period, the AIA is informed by the recommendations of the National Visiting Panel. While two separate outcomes are achieved through the accreditation and recognition process, this is a joint procedure and panel recommendations are made against the combined criteria. In order to obtain Accreditation and Recognition, an architecture programme has to show documented evidence of student outcomes that demonstrate:

- Achievement of relevant competencies from the current *AACA National Competency Standards in Architecture*.
- Compliance with the current *AIA Education Policy Performance Criteria*.
- Assessment methodology that allows students to demonstrate achievement of required outcomes.
- Necessary physical and human resources to deliver the program.

SOURCES AND REFERENCES

AACA website: www.aaca.org.au
AIA website: www.architecture.com.au

Brazil

UNIVERSITY OF SAO PAULO
FACULTY OF ARCHITECTURE AND URBANISM (FAU)

Bachelor of Architecture and Urbanism + Diploma in Architecture and Urbanism (5 years)

Level: Undergraduate + Graduate (BArch + DipArch, 5 years)

Accrediting Body: The Ministry of Education (MEC) for the academic course, The Federal Council of Engineering, Architecture and Agronomy (CONFEA) for professional accreditation

Educational Aims: The University of Sao Paulo (USP) is the largest institution dedicated to higher education and research in Brazil. The five-year degree Bachelor and Diploma in Architecture introduces at a theoretical level the humanities, sciences and technologies that influence the built environment, thus allowing students to acquire the necessary basic skills for building design and construction. The degree aims to form professionals in architecture and urbanism which are ready to respond to the most complex demand of society with regards to matters of public interest and environmental issues. It teaches the specific abilities that these professionals need in order to formulate and implement projects for the development of the society, for conservation and restoration of the built environment and of the urban system.

Outline Description of Course: The degree course is coordinated by the 3 Departments that together compose the Faculty FAU: Project (46 modules), History of Architecture and Aesthetics of Projects (12 modules), and Architectural Technology (43 modules). Each Department is responsible for teaching programmes as well as for research, cultural activities and community services in its area of knowledge.

Course Structure: The course is divided in 10 semesters and the students have to complete a minimum of 333 credits in that period, 36 of which in optional modules. These credits are divided in credit-class (15 hours) and credit-work (30 hours). The optional modules have to cover 8 credits in modules related to History of Architecture and Aesthetics of the Project, 20 credits in modules related to Project Design and 8 credits in modules related to Architectural Technology.

Bachelor + Diploma in Architecture and Urbanism (5 years)

Mandatory credits	Credits	Hours
Credit-class	268	4020
Credit-work	29	870
Optional credits		
Credit-class	32	480
Credit-work	4	120
Total	**333**	**5490**

Year 1

Code	*Title*	*Credits (Class/work)*	*Semester*
AUH 0150	History and Theory of Architecture I	04/00	1
AUH 0308	History of Art I	04/00	1
AUP 0608	Fundaments of Project (Studio)	16/02	1
AUT 0182	Construction I	04/00	1
AUT 0258	Environmental Comfort I - Fundaments	02/01	1
AUT 0510	Geometry Applied to Architecture	02/00	1
PCC 0201	Descriptive Geometry	02/00	1
AUH 0152	History and Theory of Architecture II	04/00	2
AUH 0514	Fundaments of Social Architecture and Urbanism I	04/00	2
AUP 0146	Architectural Project II (Studio)	04/00	2
AUP 0332	Graphic Design	08/01	2
AUP 0650	Landscape Architecture	08/01	2
AUT 0184	Construction II	04/00	2
AUT 0260	Environmental Comfort II - Ergonomics	02/00	2
AUT 0512	Architectural drawing	02/00	2
PTR 0101	Topography	04/00	2
Credit Total	**79 Credits**		

Year 2

Code	*Title*	*Credits (Class/work)*	*Semester*
AUH 0154	History and Theory of Architecture III	04/00	3
AUH 0516	Fundaments of Social Architecture and Urbanism II	04/00	3
AUP 0148	Architectural Project III (Studio)	04/01	3
AUP 0266	Urban Planning	08/01	3
AUP 0652	Landscape Planning	08/01	3

AUT 0186	Construction III	04/00	3
AUH 0236	Studies of Urbanisation I	04/00	4
AUH 0310	History of Art II	02/00	4
AUP 0268	Urban and Regional Planning I	04/01	4
AUP 0334	Visual Communication of Buildings and Cities	08/01	4
AUP 0446	Object Design	08/01	4
AUT 0188	Construction IV	04/00	4
AUT 0262	Environmental Comfort III – Lighting	04/01	4
PHD 0313	Hydraulic I	04/00	4
or			
AUT 0514	Computer Graphic Design	02/02	4
MAT 0141	Mathematics	04/02	3
Credit Total:	**84 Credits**		

Year 3

Code	*Title*	*Credits (Class/work)*	*Semester*
AUH 0238	Studies of Urbanisation II	04/00	5
AUH 0412	Studies of Cultural Heritage	04/00	5
AUP 0150	Architectural Project V (Studio)	08/01	5
AUP 0270	Urban and Regional Planning II	04/01	5
AUP 0448	Architecture and Industry	08/01	5
AUT 0190	Construction V	02/00	5
AUT 0516	Applied Statistics	02/00	5
PEF 0522	Mechanics of the Soils and Foundations	04/00	5
AEF 2601	Fundaments of Structures in Architecture	04/00	5
AUH 0240	History of Contemporary Urban Design	04/00	6
AUP 0152	Architectural Project VI (Studio)	08/01	6
AUP 0272	Urban Organisation and Planning II	08/01	6
AUT 0192	Urban Infra-structure and the Environment	04/00	6
AUT 0264	Environmental Comfort IV - Thermal	02/01	6
AUT 0266	Environmental Comfort V - Acoustics	02/01	6
PEF 2602	Structures in Architecture II	04/00	6
AUH	*Optional*	04/00	6
Credit Total:	**83 Credits**		

Year 4

Code	*Title*	*Credits (Class/work)*	*Semester*
AUH 0156	History and Theory of Architecture IV	04/00	7
AUP 0154	Architectural Project VII (Studio)	08/01	7
AUP 0274	Urban Planning	08/01	7
AUT 0268	Environmental Comfort VI – Integrated Strategies	04/01	7
AUT 0518	Project of Costs	04/00	7
PEF 2603	Structures in Architecture III	04/00	7
AUH	*Optional*	02/00	7
PEF 2604	Structures in Architecture IV	04/00	8
AUH	Optional	02/00	8
AUH	Optional	02/00	8
AUP	Optional	04/01	8
AUP	Optional	04/01	8
AUT	Optional	04/00	8
Credit Total:	**59 Credits**		

Year 5

Code	*Title*	*Credits (Class/work)*	*Semester*
AUT 0520	Professional Practice and Work Organisation	02/00	9
AUP	Optional	04/01	9
AUP	Optional	04/01	9
AUT	Optional	04/00	9
1601101	Final Design Project	04/02	9
1601102	Final Design Project	04/02	10
Credit Total:	**28 Credits**		

Learning Outcomes: The BArch + DipArch in Architecture and Urbanism programme provides opportunities for students to develop and demonstrate appropriate knowledge and understanding, intellectual and cognitive skills, professional and practical skills, transferable/key skills in a wide range of areas related to architecture and urban design, leading to professional qualification.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Environmental Design is generally not integrated within studio modules in any year at FAU. The curriculum has a satellite structure and the technical contents are delivered via a lecture series and typically assessed independently of studio (e.g. by examination or independent coursework). The teaching of building physics principles and strategies is generally taught as part of the modules offered by the Department of Architectural Technology, while themes of ecology, social sustainability and applications to real design case studies are normally introduced as part as the modules offered by the Department of Project.

Amongst the modules offered by the Department of Architectural Technology (AUT), **Environmental Comfort I - Fundaments** (AUT0258), in the first semester of the first year, introduces the concepts of comfort and energy efficiency. The module is assessed through a case study project.

In the 2nd semester of the first year, **Environmental Comfort II – Ergonomics** (AUT 0260) demonstrates the importance of ergonomics and the human factors in the built environment, whilst stimulating the perception of the impact of the physical and psychological characteristics on the performance of the building and on the satisfaction and safety of the user. The module is assessed through exam and coursework.

At second semester of the second year (semester 4 of the course)**, Environmental Comfort III – Lighting** (AUT 0262) examines light and architecture, solar geometry, natural daylighting (systems, application and dimensioning), artificial lighting (systems, application and dimensioning), and the integration of natural and artificial lighting systems. The module is assessed through exercises and exam.

In the second semester of the third year, **Environmental Comfort IV – Thermal** (AUT 0264) analyses architecture and the climate, building thermal performance and energy efficiency. The module is assessed via two exams. Simultaneously, **Environmental Comfort V – Acoustics** (AUT 0266) explores basic acoustic design principles and the use of materials. This module is assessed via a combination of an exam (33%) and coursework (66%).

In the first semester of the fourth year, **Environmental Comfort VI – Integrated Strategies** (AUT 0268) builds on the principles introduced in the previous years and focuses on their application in projects where all environmental comfort concepts are implemented simultaneously. The module is assessed through a report on case studies related to the main project (10%), an initial climatic analysis of the main project (30%) and a final project (60%). The final project is a group work and entails the design of an office building.

The Department of Architectural Technology, in addition to the above, also offers a number of optional modules that students can take throughout the duration of the course. Amongst them, **Lighting Design in Architecture** (AUT 0213) explores qualitative and quantitative aspects of lighting design aiming to emphasise its importance in architecture and building design.

Environmental Comfort – Performance of constructive components (AUT 0211) explores the constructional characteristics and detailing of several building components that can influence environmental comfort issues including acoustics, thermal and lighting. The module aims to establish a more effective relationship between analytical and experimental criteria.

Architecture, Environment and Sustainable Development (AUT 0221) introduces concepts of sustainability in the urban context. Environmental comfort in the urban space and incorporation in design are also analysed and explored. The topics discussed include theory and research and the module is assessed by seminars (20%), an exam (20%) and coursework (60%) developed in groups of 2 students.

Finally, **Designing to Meet Acoustic Regulations** (AUT 0223) discusses prevention and minimisation of acoustic conflicts in the built environment, whilst **Energy efficiency in the Built Environment** (AUT 0137) explores the national and international energy panorama, specifically analysing current tendencies in conservation of energy. Application of design methods to save energy and development of case studies represent significant parts of the module, as well as the exploration of natural and artificial lighting design via the introduction of software for simulation of building energy performance with exercises and the development of a final report.

Amongst the modules offered by the Department of Project (AUP), the **Built Environment and Sustainable Development** (AUP 0547) is an optional module that aims to develop adequate urban solutions to situations of irregularity and/or urban conflict where different social interests are affected. The module explores real case studies of urban developments that do not respond to regulations, therefore affecting ecological systems. The aim of the module consists in formulating proposals and alternatives to provide environmental quality and social inclusion.

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

The Federal Council of Engineering, Architecture and Agronomy (CONFEA)

Architecture as a profession in Brazil is accredited and controlled by the Conselho Federal de Engenharia e Arquitetura (CONFEA – Federal Council of Engineering and Architecture) and by its regional councils (CREA – Regional Council of Engineering and Architecture). The professional is denominated "Architect and Urban Designer" and one cannot be only an architect or an urban designer. Only a person with a diploma in architecture and urban design can practice architecture.

The Federal Council of Engineering, Architecture and Agronomy is the entity responsible for the regulation and final judgement of the activities related to the following professional classes in Brazil: Engineering, Architecture, Agronomy, Bachelors of Geography, Geology and Meteorology. The CONFEA holds more than 300 professional certifications at different levels (e.g., Technician, Superior, etc.). The CONFEA was founded in 1933 and it coordinates the Regional Councils. The Regional Councils of Engineering, Architecture and Agronomy (CREA) are the engineering, architecture and agronomy entities that belong to the State. These entities regulate the professionals who work in different regions. One of its missions is to defend the society from the illegal practice of the profession.

In order to achieve professional qualification, in addition to personal documents, a recently graduated architect needs to provide CONFEA with a full academic record including the disciplines undertaken, the durations of those and the marks obtained. The candidate should also supply prove that he/she has undertaken the ENADE exam (professional exam regulated by the Ministry of Education) or has obtained a qualifying stamp.

The CONFEA does not regulate architectural education but analyses the academic curriculum of each applicant to the registration and also sets minimum requirements regarding attended teaching hours. The CONFEA suggests areas of work that should be covered by architectural practice. Amongst those, specific requirements regarding principles that regulate environmental comfort are included. Specifically, the following topics are mentioned: techniques to establish the space conditions through conception, organisation and construction, climate, acoustics, lighting, ergonomic, bioclimatic architecture, building energy efficiency and arrangement of activities in the built environment.

The Ministry of Education (MEC)

The universities in Brazil are regulated and controlled by the Ministério da Educação (MEC – Ministry of Education) who recognizes accredited institutions and their courses. The MEC is a federal institution that controls the national education system in Brazil at all levels (nursery school, specialised education, graduate programmes, postgraduate programmes, professional development, research and others). All Schools of Architecture are requested to follow the recommendations below proposed by the MEC for their courses:

- A graduate course in Architecture and Urban Design should aim to form professionals that can work in a large range of activities and are capable of understanding and translating the needs of the individuals, society and communities with regards to the conception, organisation and construction of indoor and outdoor spaces. The professional should be capable of considering the urban environment, building design, landscape design, the preservation of heritage architecture as well as of the natural environment and its resources.
- The course should establish pedagogic methods that aim to develop conducts and attitudes that are responsible technically, socially and culturally. It should have as principles:
    - The quality of life of inhabitants of human settlements and the material quality of the urban environment and its durability.
    - The use of technologies with respect to social, cultural, aesthetic and economical needs as a community.
    - Ecological balance and sustainable development of the natural and the built environment.
    - The valorisation and preservation of the architecture, the urban space, the landscape and the collective responsibility.
- The course should aim to form professionals who meet the following profile:
    - Solid formation as a professional that can act on a vast range of subjects.
    - The capacity of understanding the needs of individuals, social groups and community.
    - Conservation and valorisation of the built environment.

    - Protection of the balance of the natural environment and rational utilisation of natural resources.

- The professional should have competence and ability on the following areas:
    - Knowledge of the relevant anthropological, sociological and economic aspects and of the needs, aspirations and expectations of individuals and society with regards to the built environment.
    - Understanding of the matters that inform the preservation of the landscape and the evaluation of the impact they are causing on the environment aiming to achieve ecological balance and sustainable development.
    - The ability to conceive architectural projects including urban and landscape design and to manage building construction considering durability, maintenance and legal requirements in order to satisfy cultural, economical, aesthetic, natural and individual needs.
    - Knowledge of the history of arts and aesthetics that is likely to influence the quality of the architecture, the urban and the landscape design.
    - Knowledge of theory and history of architecture, urban and landscape design, considering their creation in social, cultural, political and economic contexts aiming for a capacity of critical reflection.
    - Technical and methodological research skills and knowledge of urban planning and urban infrastructure needed to develop studies, analyses and interventions in the urban context.
    - Specialised knowledge of the cost-effective use of materials and construction techniques for the installation of services, organisation of construction sites and the implementation of urban infra-structure.
    - Knowledge of structural systems and ability to develop the structural project of buildings.
    - The understanding of the climatic conditions, acoustic conditions, lighting, energy use and the ability to use techniques associated with those issues.
    - The practice of projects and technological solutions for the preservation, conservation, restoration, rehabilitation and reutilisation of buildings and cities.
    - The ability to express ideas through drawings and geometry, and their use in other means of expression and representation such as perspectives, physical and computer modelling.
    - The knowledge of computer software applied to architecture, urban and landscape design and planning.
    - Ability to generate a full topographic report.

Every year, the *Exame Nacional de Desempenho de Estudantes* (ENADE – National Exam of the Performance of Students) is applied to a number of university degree courses aiming to assess the performance of the students and of the institutions with regards to course contents and student abilities. Students are selected to undertake the exam based on their marks and the result is shown on their academic records. The architectural courses were last evaluated in 2008. Students cannot receive their diplomas if they do not undertake the exam or receive a qualifying stamp in case they have not been selected.

The Brazilian courses will receive new accreditation from 2010 as part of a MERCOSUL agreement (MERCOSUL is the Common Market of the South, an economic, political and social integration project created by Argentina, Brazil, Paraguay and Uruguay).

SOURCES AND REFERENCES

USP Faculty of Architecture and Urbanism web site: www.fau.usp.br
CONFEA website: www.confea.org.br
Ministry of Education web site: www.mec.gov.br

Canada

McGILL UNIVERSITY

FACULTY OF ENGINEERING – SCHOOL OF ARCHITECTURE

Bachelor of Science in Architecture + Master of Architecture (5 years)

Level: Undergraduate (BSc Arch., 3 years) + Graduate (MArch, 2 years)

Accrediting Body: Canadian Architectural Certification Board, National Architectural Accrediting Board (US)

Educational Aims: The mission of the McGill University School of Architecture is to educate professionals who will contribute to socio-economic and cultural development through responsible participation in the process of design, construction and interpretation of the built environment. This mission is served with programs that meet the following objectives: develop an effective and stimulating environment for teaching, learning and research in architecture; maintain and continue to enrich an accredited program providing high quality professional education in architecture; provide post-professional programs that advance the discipline of architecture; engage in research and other professional and scholarly activities that achieve national and international recognition; publish, exhibit and disseminate the results achieved in order to advance architectural knowledge in education and practice; contribute to interdisciplinary and multi-disciplinary teaching and research programs within other units of the University and with other universities, local and international; and finally, serve the public by working with citizens' groups, local, provincial and national governments, the private sector and the profession, toward the general improvement of the built environment. At McGill, the professional degree in architecture is the MArch which is accredited by the Canadian Architecture Certification Board, and by the National Architectural Accrediting Board in the USA.

Outline Description of Course: The professional program in Architecture is divided into two parts. The first part for students entering with the Quebec Diploma of Collegial Studies in Pure and Applied Science, or equivalent, is a 3-year design-based program leading to the non-professional Bachelor of Science (Architecture). The second part of the program, for students with the BSc (Arch.) degree, is a 3- or 4-semester program leading to the professional Master of Architecture degree. The curriculum and study plan of the Bachelor of Science (Arch.) have been reorganized as part of a longer-term plan to rationalize and upgrade engineering content and to strengthen course offerings in structure, landscape, ecology and sustainable design. Two new first year courses, Architectural Structures and Digital Representation, have been added; the sequence of courses in History of Architecture has been increased from two to four; and a new second year course, Energy Environment and Buildings, has been expanded to include more material on sustainability and building systems. The curriculum of the Master of Architecture professional degree has been reorganized to shift technical content to the undergraduate program and free space for elective courses. Two courses in Urban Planning have been combined into a single expanded offering, and the new course Professional Practice I has been revised to incorporate relevant material from Professional Practice II, as well as Specifications and Building Costs and Engineering Economy. The credit weight for Design Research and Methodology, the pre-thesis studio, was raised from 4 to 6, and the credit weight of Architectural Design II, the thesis studio, was increased from 8 to 9.

Course Structure: McGill's architecture program is structured as a four-and-a-half-year, or nine-term, course of study divided into two parts. A six-term (100 credits), design-based program, leads to a non-professional degree, Bachelor of Science (Architecture). The MArch (professional degree) requires the equivalency of the BSc (Arch.) degree for admittance. There are two options for the completion of this CACB accredited degree: Design Studio – Coursework (45 credits) and Directed Research (60 credits). The first option requires a minimum of three terms (45 credits) according to an intensive design studio-based curriculum. This option is a 3-term consecutive degree (Fall, Winter, Summer) requiring full-time residence for one calendar year. The second option comprises a four-term (60-credit) programme which, as a modified version of the regular three-term stream, is based on a project-based investigation with an intensive research component. Candidates with this option engage in a project-based directed research through an approved curriculum. The option concludes with a two-term final project that includes a written component.

Bachelor of Science in Architecture (3 years)

Required non-Departmental courses	15 credits
Required Architectural courses	70 credits
Complementary courses	9 credits
Elective courses (outside the School of Architecture)	6 credits
Total	**100 credits**

Required courses
Non-Departmental Subjects Credits:

Code	Title	Credits	Taught
CIVE 284	Structural Engineering Basics	4	Fall
CIVE 385	Structural Steel & Timber Design*	3	Fall
CIVE 388	Foundations & Concrete Design*	3	Winter
CIVE 492	Structures*	2	Fall
FACC 220	Law for Architects & Engineers	3	Fall

Credit Total **15 Programme Credits**

Architectural Subjects Credits:

Code	Title	Credits	Taught
ARCH 201	Communication, Behaviour and Architecture	6	Fall
ARCH 202	Architectural Graphics and Elements of Design	6	Winter
ARCH 217	Freehand Drawing 1	1	Fall
ARCH 218	Freehand Drawing 2	1	Winter
ARCH 240	Organization of Materials in Buildings	3	Winter
ARCH 241	Architectural Structures	3	Fall
ARCH 242	Digital Representation	2	Fall
ARCH 250	Architectural History 1	3	Fall
ARCH 251	Architectural History 2	3	Winter
ARCH 303	Design and Construction 1	6	Fall
ARCH 304	Design and Construction 2	6	Winter
ARCH 321	Freehand Drawing 3	1	Fall
ARCH 322	Freehand Drawing 4	1	Winter
ARCH 324	Sketching School	1	Summer
ARCH 354	Architectural History 3	3	Fall
ARCH 355	Architectural History 4	3	Winter
ARCH 375	Landscape	2	Fall
ARCH 377	Energy, Environment and Buildings	3	Winter
ARCH 405	Design and Construction 3	6	Fall
ARCH 406	Design and Construction 4	6	Winter
ARCH 447	Lighting	2	Fall
ARCH 451	Building Regulations and Safety	2	Winter
Credit Total	**70 Programme Credits**		

Complementary courses

Students must complete 9 credits of complementaries from the following list in order to qualify for the BSc(Arch.) degree:

Code	Title	Credits	Taught
ARCH 318	Design Sketching	3	Not scheduled
ARCH 319	The Camera and Perception	3	Not scheduled
ARCH 350	The Material Culture of Canada	3	Not scheduled
ARCH 352	Art & Theory of House Design	3	Not scheduled
ARCH 363	Structure, Organization and Form	2	Not scheduled
ARCH 378	Site Usage	3	Fall
ARCH 379	Summer Course Abroad	3	Summer
ARCH 383	Geometry and Architecture	3	Not scheduled
ARCH 461	Freehand Drawing & Sketching	1	Winter
ARCH 471	Computer-Aided Building Design	2	Not scheduled
ARCH 490	Selected Topics in Design	2	Fall / Winter
ARCH 512	Architectural Modelling	3	Not scheduled
ARCH 514	Community Design Workshop	4	Not scheduled
ARCH 515	Sustainable Design	3	Winter
ARCH 520	Montreal: Urban Morphology	3	Fall
ARCH 521	Structure of Cities	3	Not scheduled
ARCH 522	History of Domestic Architecture in Quebec	3	Not scheduled
ARCH 523	Significant Texts & Buildings	3	Not scheduled
ARCH 524	Critical Design Strategies	3	Winter
ARCH 525	Seminar on Analysis and Theory	3	Winter
ARCH 526	Philosophy of Structures	3	Not scheduled
ARCH 527	Civic Design	3	Winter
ARCH 528	History of Housing	3	Winter
ARCH 529	Housing Theory	3	Winter
ARCH 531	Architectural Intentions Vitruvius-Renaissance	3	Fall
ARCH 532	Origins of Modern Architecture	3	Winter
ARCH 533	New Approaches to Arch History	3	Fall
ARCH 534	Architectural Archives	3	Not scheduled
ARCH 535	History of Architecture in Canada	3	Not scheduled

ARCH 536	Heritage Conservation	3	Fall
ARCH 540	Selected Topics in Architecture 1	3	Fall / Winter
ARCH 541	Selected Topics in Architecture 2	3	Fall / Winter
ARCH 554	Mechanical Services	2	Not scheduled
ARCH 555	Environmental Acoustics	2	Not scheduled
OCC1 442	Environments for the Disabled	2	Not scheduled

Not scheduled courses are generally offered on alternate years (the example offered refers to 09/10)
Credit Total 9 Programme Credits

Elective courses
6 credits must be completed outside the School of Architecture, subject to approval.
Credit Total 6 Programme Credits

Master of Architecture (Option 1: Design Studio – Coursework, 3 semesters)

Required courses	30 credits
Complementary / elective courses	15 credits
Total	**45 credits**

Required Courses

Code	*Title*	*Credits*	*Taught*
ARCH 550	Urban Planning and Development	3	Winter
ARCH 672	Architectural Design 1	6	Fall
ARCH 673	Architectural Design 2	6	Fall / Winter
ARCH 677	Architectural Design 3	6	Not scheduled
ARCH 674	Professional Practice	3	Winter
ARCH 678	Advanced Construction	3	Fall
ARCH 680	Field Sketching*	3	Summer

**This course includes 8-10 days of self-funded field work that normally takes place in the last week of August and is required for the Coursework option.*
Credit Total 30 Programme Credits

Complementaries / Electives
15 credits of complementaries / electives, of which a minimum of 9 credits must be from the list of architectural complementaries. A maximum of 6 credits may be completed outside the School of Architecture
Credit Total 15 Programme Credits

Master of Architecture (Option 2: Directed Research, 4 semesters)

Required courses	36 credits
Complementary / elective courses	24 credits
Total	**60 credits**

Required Courses

Code	*Title*	*Credits*	*Taught*
ARCH 550	Urban Planning and Development	3	Winter
ARCH 672	Architectural Design 1	6	Fall
ARCH 673	Architectural Design 2	6	Fall / Winter
ARCH 674	Professional Practice	3	Winter
ARCH 678	Advanced Construction	3	Fall
ARCH 681	Directed Research Project Preparation	1	Fall
ARCH 682	Directed Research Project 1	6	Fall
ARCH 683	Directed Research Project 2	8	Winter

Credit Total 36 Programme Credits

Complementaries / Electives
24 credits of complementaries / electives, of which a minimum of 15 credits must be from the list of architectural complementaries.
Credit Total 24 Programme Credits

Learning Outcomes: The Bachelor of Science (Architecture) and Master of Architecture programme offers valuable opportunities for students to develop and demonstrate high levels of comprehensive knowledge and understanding, intellectual and practical skills and transferable key skills complying with the requirements of the Canadian Architecture Certification Board (CACB), and recognized as accredited also by the National Architectural Accrediting Board (NAAB) in the USA.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Within the Bachelor of Science in Architecture, the studio-based modules **Communication, Behaviour and Architecture** and **Architectural Graphics and Elements of Design** provide an introduction to architectural design and communication skills with a series of short exercises that address light, scale, space, form and colour in the built environment, as well as program, structural system, material selection, site and climate. The course is based in the studio and includes lectures, seminars and field trips.

The **Design and Construction 1** and **2** courses explore the design of buildings. Projects examined emphasize the major social, technological, environmental, and symbolic aspects of the design process. Introduction to specific modelling, presentation, and documentation techniques enhance the course, which is based on discussions, readings, field trips and practical exercises. Students become familiar with the concept of urban agriculture and urban agriculture precedents, research methods and technology, and explore possibilities for sustainability in urban and architectural design, housing design and detailing, also becoming familiar with three-dimensional computer modelling in order to demonstrate the effect of materials, textures, colour, solar orientation/control, and lighting in the simulation and representation of their projects.

The **Energy, Environment and Buildings** course explores the interrelationship between energy, environment and buildings, addressing core concepts of sustainability, bioclimatic design, building assessment tools, the integrated design process, site analysis, water conservation, passive and renewable energy sources, healthy and low embodied energy material choices, and high quality indoor environments. Design strategies for high performance buildings are presented through case studies. The main learning outcomes are to increase awareness of sustainable design practices and to develop ecological literacy in a number of diverse and interconnected fields of knowledge, including building science, thermodynamics, material physics, economics, climatology, and human comfort. Upon successful completion of the course, students develop competencies in the following core subjects related to critical contemporary issues of sustainability: the environmental impacts resulting from building construction and operations, and in particular, the relationship to greenhouse gas emissions and climate change; principles of climate and site responsive design and the regional variations in design strategies employed; methods of environmental assessment for buildings and ability to critically evaluate the function, intent and appropriateness of various technologies; knowledge of relevant precedents (contemporary and vernacular projects) and important reference documents; awareness of the social and economic factors that influence building performance.

The **Design and Construction 3** and **4** courses offer a structured investigation of architectural concepts, including program interpretation with respect to relevant cultural, social and environmental contexts and applications of appropriate formal languages and building technologies in integrated proposals for a variety of building forms. The courses introduce the exploration of coherent concepts with respect to programmatic requirements, image and form, leading to meaningful and technologically viable building designs.

The **Lighting** course focuses on the study of lighting in an architectural context. The course stresses the integration of electric and natural light sources during the design process and places a primary emphasis upon the role light can play in shaping architecture. The course discusses different modelling approaches of lighting phenomena at the fundamental levels and work through a series of computer-based simulation exercises leading to an understanding of basic lighting design principles, lighting simulation skills, and the ability to apply them to architectural projects. Students apply their acquired simulation skills (including applications of Ecotect, Radiance and Daysim) in their ongoing studio projects. Field trips of lighting installations and manufacturing facilities will add to the topics presented in the classroom.

Amongst the Complementary and Elective courses that students can choose at both BSc (Arch.) and MArch level, **Sustainable Design** addresses sustainable design theory and applications in the built environment addressing topics from a variety of points of view (architecture, urban planning, engineering, geography, environmental studies). The objectives of the course are to clarify the key principles of sustainability, identify appropriate design methodologies, enhance inter-disciplinary communication, and develop the students' analytic and synthetic skills, by applying the principles presented to an actual project. **Environmental Acoustics** explores acoustics in architectural design, and in environmental control of buildings. The course specifically analyses acoustical requirements in the design of auditoria such as theatres, lecture halls, opera houses, concert halls, churches, motion picture theatres and studios. Principles of noise and vibration control, sound insulating in building construction are introduced, and practical methods for noise control in various types of buildings are presented. **Building simulation** provides an introduction to computer-based building simulation, fostering the development of simulation skills in a series of exercises addressing daylighting and energy use. The course teaches the underlying models used by current lighting and energy simulation tools and introduces oral and written presentations of simulation results as a basis for design decisions, discussing modelling approaches of lighting and thermal phenomena at the fundamental level.

STRENGTHS AND OPPORTUNITIES

The School of Architecture at McGill University offers the professional programs BSc (Arch.) and MArch as well as post-professional research programs, including the MArch (Post-professional) and PhDs. These programs have been conceived to respond to the needs of graduates with some professional experience who wish to acquire more specialized knowledge in architecture. The MArch (Post-professional) program reflects a McGill tradition of academic inquiry and research, and provides an opportunity for a selected number of students and staff to work together. The programs are organized in such a way as to meet the needs of the professional practitioner and the researcher, and are intended to extend traditional architectural education as well as address new issues. Amongst the strengths and opportunities of the programs on offer:

Strengths:

- Passive environmental design strategies, occupant comfort and issues of social sustainability are well introduced particularly at undergraduate level;
- Students are encouraged to explore sustainable solutions and integrated environmental design and strategies within their design studio work;
- The design of passive energy systems, landscape design and displacement ventilation systems in studio projects can give to students a broader design experience;
- McGill can benefit of a variety of instructors' expertise and research areas (health and architecture, urban agriculture and the greening of cities, history and theory, media, etc.).

Opportunities:

- The School of Architecture at McGill University is currently seeking applications for a professorial tenure-track position in environmental practices and integrative design.

SOURCES AND REFERENCES

McGill University School of Architecture website: http://www.mcgill.ca/architecture
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

The Royal Architectural Institute of Canada (RAIC)

The Royal Architectural Institute of Canada (RAIC) was established in 1907 and is a voluntary national association representing more than 3,600 architects, academics and graduates of accredited Canadian Schools of Architecture. Its vision is to build awareness and appreciation of the contribution of architecture to the physical well-being and cultural development of Canada. The Royal Architectural Institute of Canada is the leading voice of architecture in Canada and its mission is to:

- Affirm that architecture matters;
- Celebrate the richness and diversity of architecture in Canada; and,
- Support architects in achieving excellence.

RAIC sustains a set of values:

- Integrity; the RAIC conducts all its activities with the highest ethical and professional standards;
- Environmental Responsibility; the RAIC actively promotes sustainable design and operates in the most environmentally sustainable manner as possible;
- Inclusiveness; all RAIC staff and programs operate to create and maintain a common ground for architecture students, intern architects, architects in practice, retired architects and professional organizations in Canada;
- Effectiveness; RAIC programs are established with clear and measurable objectives that will bring benefit to members, enhance the profession, and improve the quality of the built environment in Canada.

Not all members of the RAIC hold accredited degrees in architecture, and not all Canadian architects are members of the RAIC. Full membership in the Royal Institute is reserved for individuals with formal defined qualifications in the field of architecture. The qualifications acceptable for full membership include:

- Active or retired members of a Canadian provincial architectural licensing organization;
- Individuals who have been certified by the Canadian Architectural Certification Board (CACB);
- Graduates of the RAIC Syllabus of Studies who have obtained CACB certification;
- Graduates from a professional degree program at a Canadian University School of Architecture on or before June 30, 1995;
- Graduates of a CACB-accredited professional degree program after June 30, 1995;
- Graduates from a foreign school of architecture at the discretion of the Board;
- On the recommendation of the Program Head, the holder of an academic appointment at a Canadian University School of Architecture.

Conditions for Professional Qualification

Each Provincial and Territorial governing body registers or licenses architects on the basis of standards of performance, developed in the public interest and approved by its professional membership, and which rely on the professional judgment of individual officers and committees of the association or institute, who regularly assess the competency of its members and prospective members. Competency standards are applied for each of the education, experience and examination requirements for registration. All provincial architectural associations have adopted Common Admission Standards to facilitate reciprocal registration/licensing from province to province. These standards include:

- Canadian Architectural Certification Board (CACB) certification (or recognized equivalent);
- Standard pre-registration experience requirements;
- Standard architectural registration examination;
- Supplementary education.

Some provincial associations may have additional requirements before registration.

To register as an Architect in Canada, applicants have to hold a Bachelor or Master degree in architecture from a university program approved by the Canadian Architectural Certification Board (CACB). An alternative way to become an Architect is through the “apprenticeship” offered through the RAIC Syllabus Program.

Following an accredited degree, applicant must have sufficient pre-registration experience. The objective of the *Canadian Experience Standard* is to ensure that the candidate has gained sufficient experience prior to registration to meet generally accepted standards of skill and competence to engage in the practice of architecture. A minimum of 5600 hours of varied experience in specified areas is required. Experience may be gained in two components: mandatory and discretionary. The entire experience requirement may be satisfied within the mandatory component, or by a minimum 3720 hours of mandatory experience and up to 1880 hours of discretionary experience. Experience in categories A, B and C is required:

- Category A: Design and Construction Documents. Total of 2800 hours required
- Category B: Construction Administration. Total of 560 hours required
- Category C: Management. Total of 280 hours required
- Experience in Category D: Related Activities is optional. Total of 80 hours permitted
- Experience may also be gained in Category E: Discretionary. Total of 1880 hours permitted.

The required cumulative total of 5600 hours and experience must be documented in the *Canadian Experience Record Book* (CERB) and evaluated by the provincial association at the end of each 900-1000 hours of experience. Experience submissions must be received within eight weeks of the date of the last entry to avoid late submission charges. For degree candidates, the experience requirement is typically gained via the *Internship in Architecture Program* which is offered through the associations of architects in each province. If accepted into the program, applicants require a “Mentor” (a licensed Architect) who will guide their work over a period of time (generally, 3 years). The Internship in Architecture Program provides a structured transition between formal education and architectural registration. The IAP contributes to the development of competent architects who can provide exemplary architectural services. A comprehensive internship program is necessary to acquire and reinforce the knowledge, integrity, judgement, skills, discipline and quest for learning that must serve the architect for a lifetime. The program objectives are to:

- define areas of architectural practice where Interns must acquire basic knowledge and skills;
- encourage additional experience in the broad aspects of practice;
- provide quality information and advice about educational, internship, and professional issues and opportunities;
- provide a uniform system for documentation and assessment;
- provide greater access to and recognition of supplementary educational opportunities;
- involve members of the profession in the development and training of future members.

At the end of the internship, in all provinces, passing a computerized exam is one of the final steps in becoming a licensed Architect. Architects in Canada are licensed at the provincial or territorial level with any of the Canadian Architectural Licensing Authorities. Every provincial association requires Interns to pass all divisions of the U.S. National Council of Architectural Registration Boards' (NCARB) Architect Registration Examination (ARE) and to satisfy its examination requirements. However, the *Examination for Architects in Canada* (ExAC) is a new examination being developed to replace the Architect Registration Examinations (ARE). The ExAC seeks to ensure relevancy, effective delivery, and administrative control of the complete professional competency testing process. The ExAC, which is composed of four sections, covers the following topic areas as set out in the IAP:

- Programming
- Site and Environmental Analysis
- Cost Management
- Coordinating Engineering Systems
- Schematic Design
- Design Development
- Final Project
- Bidding and Contract Negotiations
- Construction Phase – Office
- Construction Phase – Site
- Project Management
- Code Research

The principal sources of the examination content are the:

- Internship in Architecture Program (IAP)
- Canadian Handbook of Practice for Architects(CHOP)
- National Building Code 2005 edition.

The Canadian Architectural Certification Board (CACB)

The Canadian Architectural Certification Board (CACB) was established in 1976 by an agreement of the Councils of the *Canadian Architectural Licensing Authorities (Regulators)*, who grant it the authority to act on their behalf in assessing the educational qualifications of individuals holding a professional degree or diploma in architecture. The assessments are made in accordance with standards and procedures established by the Regulators. L'Ordre des Architectes du Québec joined the CACB in 1992, and the Northwest Territories Association of Architects in 2002. The Canadian Architectural Certification Board oversees professional programme accreditation and individual degree certification. The CACB is the sole agency authorized to accredit Canadian professional degree programmes in architecture. Since all provincial professional associations in Canada recommend any applicant for architectural registration in Canada to have graduated from a CACB-accredited programme, obtaining such a degree is an essential aspect of preparing for the professional practice of architecture. While graduation from a CACB-accredited programme does not assure registration, the accrediting process is intended to verify that each accredited programme substantially meets those standards that, as a whole, comprise an appropriate education for an architect.

The curriculum of a CACB-accredited programme includes general studies, professional studies, and electives, which together comprise a liberal education in architecture. The curriculum ensures that graduates will be technically competent, critical thinkers who are capable of defining multiple career paths within a changing societal context. More specifically, the CACB requires an accredited programme to produce graduates who: are competent in a range of intellectual, spatial, technical, and interpersonal skills; understand the historical, socio-cultural, and environmental context of architecture; are able to solve architectural design problems, including the integration of technical systems and health and safety requirements; and, comprehend architects' roles and responsibilities in society.

In general, professional accreditation signifies that an institution or programme has been evaluated by an accrediting agency and meets its established educational standards. The accrediting process requires a self-assessment by the institution or programme, an evaluation of the self-assessment by the agency, and a site visit and review conducted by a team representing the agency. The decision regarding accreditation is made by the agency's board of directors. The CACB procedures for certification, and the education standards against which qualifications are measured, have been developed in accordance with both the core principles of the *UNESCO/UIA Charter for Architectural Education* and the relevant sections of *the UIA Accord on Recommended International Standards on Professionalism in Architectural Practice*. The CACB, acting on behalf of the Regulators, is part of working agreements with the U.S. National Architectural Accrediting Board (NAAB) and the National Council of Architectural Registration Boards (NCARB), and is a signatory to the *Canberra Accord on Architectural Education*, which was ratified in 2008 for implementation in 2010.

CACB Conditions and Procedures for Accreditation (2005)

For purposes of professional degree programme review and accreditation, the CACB works in collaboration with the NAAB, its counterpart accrediting agency in the United States, and with affiliate agencies in Mexico and elsewhere, to improve the accreditation process through continual self-scrutiny and comparative study of its criteria and procedures. The accreditation mission of the CACB is derived, in the aggregate, from the combined objectives of its cosponsoring organizations, from the current standards of educational achievement defined from time to time by the officers and directors of the CACB in its Conditions and Procedures for Accreditation, and from the standards for accrediting agencies as outlined by the *Association of Accrediting Agencies of Canada* (AAAC), of which it is a founding member.

The *Conditions and Procedures for Accreditation* contain the specific means by which the CACB evaluates education toward a first-professional degree in architecture. There is a total of 12 Conditions to be met, encompassing a variety of parameters such as: Institutional Recognition, Ethical Responsibilities, Perspectives on Professional Education, Human and Physical Resources, Information Resources, Financial Resources and Administrative Structure. The last of these Conditions outlines 37 Student Performance Criteria, which are descriptive of the body of knowledge necessary for the practice of architecture, and are stated in terms of level of accomplishments (awareness, understanding, ability) that students should achieve prior to graduation. Both the CACB and the NAAB are committed to the development and use of closely parallel conditions and procedures for accreditation which are reliable and valid for the assessment of professional degree programmes in architecture and which also provide for, and encourage, the enrichment of these programmes. The CACB recognizes that the areas and levels of excellence will vary among programmes as will the approaches to meeting the conditions and reporting requirements described in the CACB Conditions and Procedures for Accreditation. Nevertheless, programmes must present complete and accurate information to demonstrate compliance with each of the twelve CACB Conditions. For the purposes of accreditation, noteworthy aspects of a programme cannot override deficiencies in other aspects.

A process is in place to review the current standards (a draft of the review is available for consultation on http://www.raic.org/resources_archives/research/ces) with changes to the text and a somewhat integrated section of performance standards (that more closely reflect those established by NAAB and NCARB).

Selected excerpts (full document is available on http://www.cacb-ccca.ca/documents):

"3.12 Student Performance Criteria

The programme must ensure that all its graduates possess the skills and knowledge defined by the performance criteria set out below, which constitute the minimum requirements for meeting the demands of an internship leading to registration for practice. The programme must provide evidence that all its graduates have satisfied each criterion through required course work. If transfer credits are granted for courses taken at other institutions, evidence must be provided that the courses are comparable to those offered in the programme. The list of performance criteria begins with fundamental skills and knowledge, continues with technical skills and knowledge, and concludes with a focus on practice and societal roles. This sequence is intended to foster an integrated approach to learning that cuts across subject categories.

[...]

For the purposes of accreditation, graduating students must demonstrate awareness, understanding, or ability in the following areas:

[...]

7. Human Behaviour

Awareness of the theories and methods of inquiry that seek to clarify the relationships between human behaviour and the physical environment.

[...]

13. Environmental Conservation

Understanding of the basic principles of ecology and architects' responsibilities with respect to environmental and resource conservation in architecture and urban design.

[...]

18. Environmental Systems

Understanding of the basic principles that inform the design of environmental systems, including acoustics, lighting and climate modification systems, and energy use.

[…]

20. Building Envelope Systems

Understanding of the basic principles that inform the design of building envelope systems.

21. Building Service Systems

Understanding of the basic principles that inform the design of building service systems, including plumbing, electrical, vertical transportation, communication, security, and fire protection systems.

22. Building Systems Integration

Ability to assess, select, and integrate structural systems, environmental systems, life-safety systems, building envelope systems, and building service systems into building design.

[…]

29. Comprehensive Design

Ability to produce an architecture project informed by a comprehensive programme, from schematic design through the detailed development of programmatic spaces, structural and environmental systems, life-safety provisions, wall sections, and building assemblies, as may be appropriate; and to assess the completed project with respect to the programme's design criteria."

SOURCES AND REFERENCES

RIAC website: www.riac.org
CACB website: www.cacb-ccca.ca

Mexico

UNIVERSIDAD DE COLIMA
FACULTAD DE ARQUITECTURA Y DISEÑO

Diploma in Architecture (5 years)

Level: Graduate (DipArch, 5 year) - Architecture Assistant Professional Training (2 semesters); Architecture Assistant Technical Training (7 semesters); Architect (10 semesters)

Accrediting Body: Ministry of Public Education (Secretaría de Educación Pública)

Educational Aims: The main target of the architectural programme at the Universidad de Colima consists of training architects with skills for designing, adapting, constructing and evaluating buildings and all kinds of architectural and urban environments. These buildings and spaces should offer ideal conditions of habitability to their residents by means of the use and implementation of sustainable energies, materials, systems, methods, strategies and policies according to the natural, cultural and social context that surrounds them. Another important aim is to contribute to the process of social transformation through the training of highly qualified individuals in the fields of architecture and urban design, with a deep humanistic, ethical, creative and innovative sense and also committed to a constant professional training. The training of architects is approached through three different levels: acquiring knowledge and developing skills; strengthening values and maturing competences; and, solving problems and developing projects. The student must be capable of specifying, describing and communicating the different architectural features and their interfaces. The objective is to develop students' attitudes and make them capable of carrying out different types of professional practice as well as to strengthen their ethics and convictions.

Outline Description of Course: The academic year is structured in 20 modules, which foster the development of several projects on the part of the students in order to create specific products. Modules are not organized taking into account thematic contents but those attributes of the objects of study whose image should be created by the student with the help of the teacher. Every year is structured in two parts: the cognitive construction process of the object of study and the development of the project. In each didactic unit, an independent project is developed and it can be horizontally linked to other projects in order to reach an interdisciplinary education. Teaching in the whole of the programme is articulated taking into account two cross topics (habitability and sustainability), three central themes related to learning direction and some units linked to compensatory training. The programme targets different learning direction themes. 1. *Builder*: the course covers teaching of building technology, including materials, building systems, structures, installations and methods, systems and devices for sustainable building (22% of total credits); and administrative management, including administration and coordination of works and projects, business, working and community management (11% of total credits). 2. *Designer*: covering representation and design communication techniques, which include geometry, architectural technical drawing, graphic, physical and virtual representation of objects and communication of ideas by visual and oral means; and planning synthesis, featuring design project development, architectural and urban design and space composition in general (23% of total credits). 3. *Academic*: covering theory, science and humanities subjects, such as analysis of the architectural phenomenon, history of architecture and urban planning, theory and criticism of architecture and urban planning and development of scientific research projects (15% of total credits). Finally, 8% of total credits is devoted to communication of ideas in a foreign language. The compensatory learning units are studied by those students who have obtained an average grade below *Satisfactory* (its equivalent in scale terms from 0 to 10 is 8.5) or by those who resign in writing to the result obtained in the preliminary evaluation of the substantive module in order to improve their grade and the module accreditation. The result obtained in the evaluation of the compensatory learning unit will replace the lowest evaluation mark obtained in the substantive learning units studied during the semester.

Course Structure: The total length of the course is 10 semesters, with a total of 438 credits. It consists of three cycles that qualify the student for different professional levels.

Diploma in Architecture (5 years)

Year 1 *(First Cycle: Initiation)*

Module	*Credits*	*Taught*
Basic Elements for the Definition of the Architectural Object	49	Semester 1
Architectural Analysis I		
Basic Training in Humanities I		
Geometry I		
Architectural Drawing I		
Architectural Representation I		
Architectural Composition I		

Basic Training in Architectural Design I		
Building I		
Structures I		
Basic Training in Construction Technologies I		
Study Tour I		
Complementary Training I	2	Semester 1
Architecture Masterworks Seminar I		
Social University Service		
Cultural and Sports Activities		
Requirements for the Determination of the Architectural Object	49	Semester 2
Architectural Analysis II		
Basic Training in Humanities II		
Geometry II		
Architectural Drawing II		
Architectural Representation II		
Architectural Composition II		
Basic Training in Architectural Design II		
Building II		
Structures II		
Basic Training in Construction Technologies II		
Study Tour II		
Complementary Training II	2	Semester 2
Architecture Masterworks Seminar II		
Social University Service		
Cultural and Sports Activities		

Credit Total 102 (Architectural Assistant)

Year 2

Module	*Credits*	*Taught*
Contextual Factors for the Determination of the Architectural Object	52	Semester 3
Architectural Analysis III		
History of Architecture I		
Intermediate training in History of Architecture I		
Architectural Drawing III		
Architectural Representation III		
Architectural Design I		
Project Development I		
Intermediate Training in Architectural Design I		
Building III		
Structures III		
Intermediate Training in Sustainable Technologies I		
Study Tour III		
Complementary Training III	2	Semester 3
Architecture and Environment Seminar		
Social University Service		
Cultural and Sports Activities		
Components and Interfaces in the Performance of the Architectural Object	52	Semester 4
Architectural Analysis IV		
History of Architecture II		
Intermediate training in History of the Architecture II		
Architectural Representation IV		
Architectural Design II		
Project Development II		
Intermediate Training in Architectural Design II		
Building IV		
Installations I		
Structures IV		
Intermediate Training in Sustainable Technologies II		
Study Tour IV		
Complementary Training IV	2	Semester 4
Architecture and Society Seminar		
Social University Service		
Cultural and Sports Activities		

Year 3

Module	*Credits*	*Taught*
Quantitative and Qualitative Performance of the Architectural Object	52	Semester 5

History of Architecture III		
Intermediate training in History of the Architecture III		
Architectural Representation V		
Architectural Design III		
Project Development III		
Intermediate Training in Architectural Design III		
Installations II		
Sustainable Architecture I		
Structures V		
Professional Sphere Laboratory I		
Intermediate Training in Sustainable Technologies III		
Study Tour V		
Complementary Training V	2	Semester 5
Architecture and Heritage Seminar		
Physical and Conceptual Integration of the Architectural Phenomenon	52	Semester 6
Theory of Architecture I		
Verbal Communication of Architectural Design Projects I		
Intermediate Training in Theory of Architecture I		
Architectural Design IV		
Project Development IV		
Intermediate Training in Urban Planning I		
Installations III		
Sustainable Architecture II		
Structures VI		
Professional Sphere Laboratory II		
Intermediate Training in Special Installations I		
Study Tour VI		
Complementary Training VI	2	Semester 6
Sustainable Architecture Seminar I		
Social University Service		
Cultural and Sports Activities		

Year 4

Module	*Credits*	*Taught*
Critical Appraisal of the Architectural Phenomenon	46	Semester 7
Theory of Architecture II		
Verbal Communication of Architectural Design Projects II		
Intermediate Training in Theory of Architecture II		
Architectural Design V		
Project Development V		
Intermediate Training in Urban Planning II		
Sustainable Architecture III		
Projects and Works Supervision I		
Professional Sphere Laboratory III		
Intermediate Training in Special Installations II		
Study Tour VII		
Complementary Training VII	2	Semester 7
Sustainable Architecture Seminar II		
University Social Service		
Cultural and Sports Activities		

Credit Total 366 (Technical Architectural Assistant)

Introduction to the Job Markets for Architects	34	Semester 8
Research Seminar I		
Advanced Training in Architectural Science I		
Integrated Development of Final Project I		
Advanced Training in Design Projects Communication I		
Projects and Works Supervision II		
Professional Sphere Laboratory IV		
Advanced Training in Works Supervision I		
Study Tour VIII		
Complementary Training VII	2	Semester 8
Architecture and Business Seminar I		
University Social Service		
Cultural and Sports Activities		

Year 5

Module	*Credits*	*Taught*
Professional Skills Required in Architects' Work Placements	34	Semester 9
Research Seminar II		
Advanced Training in Architectural Science II		
Integrated Development of Final Project II		
Advanced Training in Design Projects Communication II		
Projects and Works Supervision III		
Professional Sphere Laboratory V		
Advanced Training in Works Supervision II		
Study Tour IX		
Complementary Training IX	2	Semester 9
Architecture and Business Seminar II		
University Social Service		
Cultural and Sports Activities		
Internship	0	Semester 10

Credit Total 438 (Architect)

Learning Outcomes: The graduated students have the scientific and technical knowledge that will allow them to evaluate, plan, design, adapt and construct buildings and all types of architectural and urban environments. They gain abilities and general skills for architectural design, for building and for the creation and dissemination of architectural knowledge. At the same time, they are capable of finding out new and creative solutions to habitat problems, with a humanistic attitude and values which allow them to face these problems in a holistic, sustainable and professionally ethical way.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Teaching throughout the curriculum is articulated by means of cross topics of knowledge and longitudinal topics of learning direction leading to future job opportunities.

Amongst cross topics, **Habitability** is a topic that analyses the interface between residents and architectural objects (buildings, spaces and spatial environments), determined by a set of elements and conditions that allow the former to inhabit (to occupy, to use, to cover, to adapt, to interpret) the latest, in a way that their activities, habits and preferences can be carried out ideally, for their own benefit and quality of life.

Sustainability focuses on the interface between the architectural objects and the contexts in which they are located (natural, cultural, physical, intangible), determined by elements and conditions that make possible the presence of the former without threatening the qualities of the latest and vice versa, in a way that both can always be enjoyed by present-day and future generations.

Apart from the cross topics mentioned above, as far as the presence of environmental contents and experiences in the programme is concerned, the subjects of each semester are framed within a thematic module - which changes each semester - and a comprehensive training module with workshop and social, cultural and sporting activities. Among the different seminars, there are some which are remarkable for the purpose of this study: **Architecture and Environment**, **Sustainable Architecture I** and **Sustainable Architecture II** during the third, sixth and seventh semester respectively.

After the first year, when subjects such as technology, architectural drawing, humanities and other topics are introduced, other environmental contents and practical issues are presented to the students via the subjects **Intermediate Training in Sustainable Technologies I** and **II**, during the third and fourth semester, and in the seminar **Architecture and Environment**.

In the third year, technical knowledge related to sustainability is studied in depth. At the same time, this issue is treated specifically from an architectural point of view in the subjects **Sustainable Architecture I** and **II** and the seminar about **Sustainable Architecture** during the sixth semester.

In the fourth year, this line is continued thanks to the subject **Sustainable Architecture III**, as well as via the **Sustainable Architecture Seminar II** during the eighth semester.

During the fifth year, environmental contents are left aside to focus on the professional direction of the architect.

Structure of the Curriculum – Diploma in Architecture

CYCLE	SEMESTER	MODULES	CREDITS	CAREER
Initiation	1	Basic Elements for the Definition of the Architectural Object	49	Architectural Assistant (102 cr.)
		Complementary Training I	2	
	2	Requirements of the Architects in the Determination of the Architectural Object	49	
		Complementary Training II	2	
Development	3	Contextual Factors for the Determination of the Architectural Object	52	Technical Architectural Assistant (366 cr.)
		Complementary Training III	2	
	4	Components and Interfaces in the Performance of the Architectural Object	52	
		Complementary Training IV	2	
	5	Quantitative and Qualitative Performance of the Architectural Object	52	
		Complementary Training V	2	
	6	Physical and Conceptual Integration of the Architectural Phenomenon	52	
		Complementary Training VI	2	
	7	Critical Appraisal of the Architectural Phenomenon	46	
		Complementary Training VII	2	
Ending	8	Introduction to the Job Market for the Architects	34	
		Complementary Training VIII	2	
	9	Professional Skills Required in Architect`s Work Placements	34	
		Complementary Training IX	2	
	10	Internship	-	Architect (438 cr.)
		Total	**438**	

STRENGTHS AND OPPORTUNITIES

Strengths:

- Sustainability is clearly present in the central aims of the programme, where the training is based upon environmental topics such as the induction of an ecological sensibility;
- The environmental aspect, together with that of habitability, appears transversely throughout the degree in the different fields where it is to be applied (e.g., technology, construction, design), thus obtaining a better apprehension and capacity of application in the future professional practice;
- There are various integral workshops with sustainable architectural design in the intermediate years, which provide important guidelines;
- The University offers a Master in Sustainable Design for those who decide to extend their studies in these topics, for both professional architects and those who want to follow the teaching path;
- Due to the abundant presence of environmental contents, especially those taught in Architectural Design modules and workshops, the students will assume that these issues are an important part of the architectural practice, and not just a mere optional complement.

Opportunities:

- Due to the division created by the orientation of each module, along with the absence of environmental contents in the last two semesters, it would be interesting to include a final degree project to comprehensively verify the capacity of the student to apply, in a single project, all the different skills and criteria acquired during the course.
- The existence of internship in professional offices is an opportunity for the student to exchange architectural knowledge and interests. This not only provides certain experience to the student for their future work environment, but it also opens the minds of professional architects to new perspectives and ideas that are being debated in the schools of architecture, including the field of sustainability, which is in constant development.

SOURCES AND REFERENCES

University of Colima website: www.ucol.mx/docencia/facultades/arquitectura/

UNIVERSIDAD AUTÓNOMA DE YUCATÁN
FACULTAD DE ARQUITECTURA

Diploma in Architecture (5 years)

Level: Graduate (DipArch, 5 years)

Accrediting Body: Ministry of Public Education (Secretaría de Educación Pública)

Educational Aims: As a public institution, the Universidad Autonoma de Yucatan aims at training fully qualified new generations of graduates in contemporary architecture with an academic, historical and critical vision of the discipline as a social practice that enables them to design, build and disseminate knowledge about the habitat of men. The programme provides a humanistic approach, taking responsibility for the stability and social welfare, supporting the cultural tradition and regional identity, and working with a historical and critical approach. Instead of favouring a generalist pedagogy, it is necessary to achieve an integral training, both with regards to the specific knowledge concerning the degree and to the interaction with other professionals. Within a regionalist approach, a balanced curriculum should be aware of multiculturalism but also recognize and work for the local; in university terms, it should foster a social conscience that goes beyond the traditional; a co-responsible work that has equity as its purpose; it should commit to team work and pay attention to the problems within its competence as an ethical duty; it should search for depth of knowledge to extend the humanist vision and see the man as integrated into its environment to preserve and improve it. Architects should contribute to the improvement of the living conditions by means of a responsible and committed participation in the sphere of architecture and urban planning (of the different sectors of the society), answering to the environment, looking for a technological coherent adequacy with a current interpretation of the regional culture, and also taking into account the economic conditions.

Outline Description of Course: The modules are structured into two groups, General and Specific Profile. The objective of modules in the General Profile is to provide some basic knowledge and skills for the training of an architect. They are equivalent to 70% of the credits of the whole of the degree. Amongst the Specific Profile are subjects aimed at the study of concepts in depth and specialization, allowing students to choose within a range of courses with different academic contents corresponding to the areas of current professional performance. Students can select those modules that provide the training experiences necessary for them to develop the lines corresponding to their professional interest. The development lines are organised as follows: Habitat Design and City; Architectural Heritage; Architecture and Technological Development; Architecture and Environment; Architecture and Arts Architecture; Social Relevance and Opportunity. The General Profile is structured in three academic levels. The corresponding modules will have to be taken and passed as established by the curriculum, and the student will not be able to get to the next level until all the corresponding credits are covered. The modules corresponding to the Specific Profile are not associated to the levels and the students are able to take them when they wish, attending only to the recommendations of the Academic Secretary.

Course Structure: The First Level of the programme has a general focus and it provides students with the appropriate basic tools for learning the fundamentals of the Architecture degree by introducing the areas of knowledge traditionally included in the training of the architect, so that they acquire a wide and general panorama of the discipline. The Second Level aims to provide the students with the opportunity to be selective depending on their interests, to investigate and to know the problematic areas, to develop architectural and urban design proposals, to approach conceptualization and construction across diverse workshops and subjects designed according to the fields of the professional practice needed socially. The Third Level provides the student with the freedom to specialize in a particular area of knowledge by means of the development of a final work in which they can choose from urban topics, design, technology, heritage, environment, social issues or art.

<u>Diploma in Architecture (5 years)</u>

First Level Modules
Construction I
Architectural Drawing
Architectural Design A and B
Statics
Geometry I
Strength of Materials
Theory and History of Architecture
Theory and Criticism of Architecture

Second Level Modules
Management I and II
Architecture and Arts
Architecture and the City
Architecture and Regional City
Architecture and Environment
Architecture and Heritage (Maya Arch.)
Architecture and Heritage (Regional)
Construction II and III
Structures I and II
Installations I and II
Architectural Design and Art A and B
Architectural Design and the City A and B
Architectural Design and Environment A and B
Architectural Design and Heritage A and B
Architectural Design and Social Relevance A and B
Architectural Design and Technology A and B

Third Level Modules
Architectural Design and Art. Final Workshop I and II
Architectural Design and the City. Final Workshop I and II
Architectural Design and Environment. Final Workshop I and II
Architectural Design and Heritage. Final Workshop I and II
Architectural Design and Social Relevance. Final Workshop I and II
Architectural Design and Technology. Final Workshop I and II

Elective Modules *(any level)*
Composition
Computer Drawing
Graphic Design
Ecology
Geometry II
Methodology and Research Techniques
Art Movements of the 20th Century
Prospects and Digital Animations
Digital Design Presentations and Virtual Models
Natural Drawing Workshop
Art Drawing Workshop
Plastic Experimentation Workshop
Basic Photography Workshop
Materials Workshop
Intermediate Photography Workshop
Design presentation techniques and modelling
Theory of Design
Surveying and Measurement

Elective Modules (*once level 1 is passed*)
Project Management
Architectural Analysis and Criticism
Landscape Architecture
Maya Architecture
Construction A and B
Business Development
Interior Design
Urban Design
Urban Furniture
Structures A and B
Ethics
Installations A and B
Urban Infrastructures
Structural Models Workshop
Theory and Criticism of Regional Architecture
Real State Valuation
Housing

Free Choice Modules
3D Studio Workshop

Yucatan Architecture Analysis
Gardening Design
Structures and Spatial Rhythms
Entrepreneur Training
Introduction to Professional Practice
Home Automation
Revit y Sketch Up Workshop
SINCO Workshop
Digital Imaging Workshop
Watercolour Techniques

Free Choice Modules (*from Habitat Design*)
Learning to Undertake
Community Development and Management
Bioclimatic Design
Urban Design
Regional Urban Design
Ecosystems and Regional Development
Social and Environmental Assessment of Projects
Gender and Culture
Introduction to Demography
Methodology and Technical Research II
Environmental Psychology
Urban Sociology
Techniques of Representation III
Selected Development Issues
Theory of Regional Economic Development
Theory and History of the Habitat II
Roads and Transport
Housing II

Learning Outcomes: The programme has, as its final outcomes, the objective of training professionals who - by means of design – are able to contribute ethically to solve environmental and territorial problems of the habitat, have the capacity to work in multidisciplinary teams and can adapt to diverse cultural scenarios to propose initiatives linked with the community.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

The integration of environmental contents in the design practice occurs primarily in the theoretical course **Architectural Design A**, with a practical application in **Architectural Design and Environment**, and from a global perspective as the main theme within the **Architectural Design and Environment Final Workshop**.

Amongst the modules that introduce environmental themes in the curriculum, **Architecture and Environment** (7 credits, Level 2) has, as its general objective, the aims to: undertake a scientific and logical analysis between the interdependence of life systems and the physical and life processes of the earth with living organisms, to become aware of man's existence as a biological creature immersed in ecological relationships with other forms of human and non-human life; identify the elements, processes and problems of the relationship of man with his works and actions on the environment and their impact on rural and urban areas through the various stages of development of society; expose the attitudes, values and decisions learned as a person and professional to foster and promote them in the future work practice.

Architectural Design A (15 credits, Level 2) is structured as a studio-workshop where students discuss the conceptual and cultural meaning of architectural objects, acquiring greater skill in the architectural design process. They will also complement their training knowledge with the following: design projects focused on the reflection on the conceptual characteristics of architectural objects, so they can combine design and living spaces that are in demand; observation of the cultural conditions that give rise to architectural objects and living spaces; reflection on building regulations and urban planning; approach, sketching and development of an architectural design project; location, identification and characterization of the architectural problem; understanding the process of architectural design; identification and approach to the analysis of design assumptions; analysis of living conditions.

Architectural Design and Environment (15 credits, Level 2) specifically focuses on the development of design projects of buildings and public spaces - not necessarily of common typologies - of medium to high complexity in terms of special technological requirements and number of spaces. Students use and enrich the knowledge, skills, attitudes and values acquired within the programme, especially those aimed at minimizing the effects of human actions on the environment, both at the individual (separate buildings) and urban scale (large equipment projects, housing complexes, etc.). The module provides analytical, scientific and ethic reflection on the interdependence of students' design proposals and the environment with systems that support life. Students will prove progress of their technical and formal knowledge through their design project and will present their position as persons and future professionals of architecture in relation to the preservation of nature.

Within the **Architectural Design and Environment Final Workshop** (20 credits, Level 2) students develop a practical exercise in which they rationally integrate the knowledge and skills acquired during the programme, specifically in the areas of architectural design and sustainable development. The final work may be presented to an expert board for professional assessment.

Amongst elective modules, **Ecology** (7 credits, elective) has, as its main objectives, the following: identify the main elements of the environment and the species that form the local and regional ecosystems (urban, rural and coastal) and the relationships between them, including the human species; analyze the relationships between ecosystems and human activity from a scientific and ethical point of view; make proposals for promoting and encouraging respect for life and ecological balance as practitioners of architecture and as individuals. Within the elective **Installations B** (6 credits), students acquire the theoretical basis for the development of environmental design work.

STRENGTHS AND OPPORTUNITIES

Strengths:

- As environmental issues are approached in workshops and other modules from the first level, sustainability becomes a regular factor when it comes to designing, and the student assumes it as one of the key points to take into account from the very beginning of any design or urban-planning project;
- The workshop as the work space for several modules is the perfect environment for students to become aware of the intimate relationships between the factors that affect sustainability in a design project: design, urban planning, materials, constructive typologies, installations, etc.;
- There is a specific curricular line with environmental content within the programme in Architecture, and there is also a specific BA of Habitat Design. The free choice modules of that degree can be chosen among those of the generic architectural degree;
- Although the student may not select the environmental curricular line, the fact that the current curriculum includes several elective and free choice modules with environmental contents allows enough flexibility for a student interested in such issues to develop their own environmental curriculum through the choice of a specific selection of modules.

Opportunities:

- The proposed structure allows students to see from the first year how architectural design consists of multiple factors, sustainability being present in almost all of them;
- The Faculty is currently immersed in the process of creating a new curriculum, therefore creating a great opportunity to verify environmental contents in the structure of the curriculum and to correct and introduce new features. This includes review and evaluation of the curriculum, staff upgrading and qualification, human resources training through Master and Doctorate degrees, etc.;
- There is a need to further strengthen and consolidate the undergraduate program in Habitat Design;
- The University will expand its facilities and infrastructure. The Faculty of Architecture intends to participate in the design and construction of the new faculties, looking for technological innovation in energy saving, climate comfort and passive technologies that will match the current teaching of the University in these areas.

SOURCES AND REFERENCES

Facultad de Arquitectura website: www.uady.mx/~arquitec

Singapore

NATIONAL UNIVERSITY OF SINGAPORE

SCHOOL OF DESIGN AND ENVIRONMNENT - DEPARTMENT OF ARCHITECTURE

Bachelor of Arts in Architecture with Honours + Master of Architecture (5 years)

Level: Undergraduate (BA Arch. Hons, 4 years) + Graduate (MArch, 1 year)

Accrediting Body: RIBA (United Kingdom), Singapore Institute of Architects, Singapore Board of Architects

Educational Aims: The mission of the Department of Architecture is to foster a creative and intellectually vibrant environment with a global outlook that aims to establish design and professional excellence. The BA (Arch.) degree does not in itself qualify graduates for registration with the Singapore Board of Architects. Graduates of this degree are however considered for admission to the Master of Architecture programme or other academic graduate studies to qualify for professional registration. The MArch programme is the final year of the architecture course following a four-year undergraduate honours programme in architecture. Graduates of this course receive also Part 2 accreditation by the Royal Institute of British Architects. The strategic objective of the 5-year BA (Arch.) + MArch programme is to prepare students for a professional career in architecture in the rapidly changing contexts of Singapore, Southeast Asia and Asia in general. The programme prepares students to embark on professional practice and its aims consist in developing: intellectual and critical thinking skills in and around the field of architecture; rigour in the discipline of architectural design and the ability to integrate these many aspects in the design process; ability in scholarly research; and finally, to further the concept of tropical environment architecture.

Outline Description of Course: The undergraduate degree course in Architecture is offered as a four-year honours programme. A graduate who wishes to pursue a career as an architect is required to complete a one-year Master of Architecture programme after the four years. The BA (Arch.) course operates under a modular system which offers: Essential Modules, General Education Modules (GEM), Singapore Study Modules (SS), Breadth (Elective outside the student's Faculty) and Unrestricted Elective Modules (UE). The core subject consists of integrative studio-based design modules supported by a range of essential subjects (e.g., technology, history and the theory of design and management) to form the basic framework for a strong foundation program in architectural studies. GEM, SS, Breadth and UE modules serve to widen the scope of intellectual interest and pursuit. The curriculum is structured for students to complete modules under the University, School and Department requirements. Students proceeding with the MArch require an additional year (Honours Year) having possessed an RIBA Part 1 Degree in Architecture. The honours year is offered under different tracks that include: Architectural Design, Design Technology and Management, Landscape Architecture, and Academic Track. Design constitutes approximately two thirds of the MArch course content. The design programmes offered in the MArch programme are more complex in nature. The one year course includes three core modules; Architectural Practice, Dissertation and the Design Thesis.

Course Structure: Students are required to fulfil 164 module credits during the four-year programme in order to qualify for the BA (Arch.) degree. Under the Architecture Concurrent Degree Programme, students will indicate their choice of (Honours) study towards the end of the 3rd year in one of four offered tracks. For the successful completion of the MArch course, a candidate has to complete 40 credits dissertation and 3 essential modules. The course is conducted on a full-time basis lasting 1 year consisting of 2 semesters.

<u>Bachelor of Arts in Architecture (4 years with one Honours Year)</u>

1. UNIVERSITY REQUIREMENTS	
A. General Education Modules (GEM) comprising:	
- 1 module from Group A: Science & Technology	4 credits
- 1 module from Group B: Humanities & Social Sciences	
- Which includes GEK1016 History and Theory of Modern Architecture	4 credits
B. Singapore Studies (SS)	4 credits
C. Breadth (Elective modules outside SDE)	
- Which includes HR3003 (Management & Human Relations)	8 credits
2. PROGRAMME REQUIREMENTS	
A. Essential modules taken within the Department	120 credits
B. Essential modules taken outside the Department	4 credits
3. UNRESTRICTED ELECTIVES (UE) (within/outside SDE)	
- Which includes AR1221 (Ideas and Approaches in Design)	20 credits
Total	**164 credits**

Level 1

Code	*Title*	*Credits*	*Taught*
AR1101	Design 1	8	Semester 1
AR1121	Spatial - Visual Communication	4	Semester 1
PF2102	Structural Systems	4	Semester 1
AR1102	Design 2	8	Semester 2
AR1326	Architectural Construction 1	4	Semester 2
AR1721	Climatic Responsive Architecture	4	Semester 2
Credit Total	**32 Programme Credits**		

Level 2

Code	*Title*	*Credits*	*Taught*
AR2101	Design 3	8	Semester 1
AR2221	History and Theory of SEA Architecture	4	Semester 1
AR2723	Strategies for Sustainable Architecture	4	Semester 1
AR2102	Design 4	12	Semester 2
AR2223	Theory of Urban Development and Planning	4	Semester 2
AR2326	Architectural Construction 2	4	Semester 2
AR2724	Designing with Environmental Systems	4	Semester 2
Credit Total	**40 Programme Credits**		

Level 3

Code	*Title*	*Credits*	*Taught*
AR3101	Design 5	8	Semester 1
AR3222	History and Theory of Western Architecture	4	Semester 1
AR3102	Design 6	12	Semester 2
AR3323	Architectural Construction 3	4	Semester 2
AR3324	Architectural Structures	4	Semester 2

Under the Architecture Concurrent Degree Programme, students will indicate their choice of study at the end of 3rd year.

Credit Total **32 Programme Credits**

Level 4 (*Architectural Design Track*)

Code	*Title*	*Credits*	*Taught*
AR4101	Design 7	8	Semester 1
AR5011	Research Methodology	4	Semester 1
AR4102	Design 8	8	Semester 2
Credit Total	**20 Programme Credits**		

In addition to programme requirements, students have to take, throughout the duration of the course, the following:

General Education Modules (GEM)	8
Singapore Study Module (SS)	4
Breadth (Electives outside SDE)	8
Unrestricted Electives (within/ outside SDE) (UE)	20

GEK1016 History and Theory of Modern Architecture is a compulsory GEM to be read in Semester 1 of Year 1
HR3003 Management & HR is a compulsory Breadth to be read in Semester 1 of Year 3
AR1221 Ideas and Approaches in Design is a compulsory UE to be read in Semester 1 of Year 1
AR2511 Digital Design Media is a compulsory UE to be read in Semester 1 of Year 2

Credit Total **40 Programme Credits**

Master of Architecture (1 year)

Code	Title	Credits	Taught
AR5421	Architectural Practice 1	4	Semester 1
AR5422	Architectural Practice 2	4	Semester 1
AR5103	Architectural Design Thesis	24	Semester 2
AR5141	Dissertation	8	Semester 2
Credit Total	**40 Programme Credits**		

Learning Outcomes: The programme is set to educate environmentally and socially responsible professionals, who are committed to the provision of good buildings in architecture, have developed analytical and methodological skills that are critical foundations to design processes in technology, and provide expertise, at an advanced level, to the full range of issues that bear upon the design and realization of buildings using contemporary construction and engineering systems. Students with the MArch degree are awarded RIBA Part 2 accreditation and hold a prerequisite degree for professional registration in Singapore.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Within the Bachelor of Arts in Architecture (Hons) at semester 2 of Level 1, **Climatic Responsive Architecture** covers the principles of environmental responsive architecture, focusing on passive mode and other low energy design strategies for architecture in various climates and contexts. The topics presented address the impact of sun, daylight, wind and rain on architectural design. The module enables students to formulate holistic approaches in generating appropriate solutions in their design projects.

In the first semester of level 2, **Design 3** is a studio-based module that emphasizes design in response to environment and site. The course enables students to learn to design small-scale buildings within the context of hot humid tropical environments, using environment and sustainability as generators of design. Specifically, the module focuses on the characteristic design features that are typical of the tropical regions of South East Asia and also provides a discourse to study and understand the way of life of people living in the tropics, their habitat and environment and the development of design in response to climate. Concurrently, **Strategies for Sustainable Architecture** deals with topics in ecological and sustainable architecture, focusing on environmental issues as they apply to design. Basic technical knowledge on energy, water, materials, etc. is covered in the context of how buildings operate. The module enables students to acquire understanding on how to apply the principles when generating design solutions.

In the second semester of Level 2, **Design 4** emphasizes the integrative nature of architectural design. Students focus on the integration of architectural design with materials, structure and construction through the design of a small-scale building. Responses to program, climate and site context of urban fringe sites are also to be considered in the design. Simultaneously, **Designing with Environmental Systems** covers the principles and knowledge of building services systems and energy efficiency, focusing on the active and composite mode of environmentally responsive design. The topics presented and analysed include building services systems, total building performance, fire management, architectural lighting, architectural acoustics etc. and the integration of these principles in the design strategies. The module aims to inculcate deeper understanding of how architectural and engineering elements operate in synergy within building design.

At Level 3, the studio-based modules on offer, **Design 5** and **Design 6**, emphasize the integrative nature of architectural design, enabling students to understand how technology should be applied and integrated to building design and construction. The modules focus on projects that require consideration of functional, technical and statutory constraints. Buildings are generally of medium complexity with emphasis in urban, environment, and/or technological issues so as to demonstrate the acquisition of competence in research, design thinking, operational skills and communication. Design projects will demand a holistic awareness of the issues related to the environment, climate, context, technology and building regulations.

Similarly, at Level 4, the modules **Design 7** and **Design 8** provide the opportunity for students to demonstrate their understanding and ability in integrating technology with architecture. The studio-based courses demand more comprehensive response in developing an appropriate technological response to the particular demands of architecture, climate and context and enable students to explore the forms and typologies of housing in high-dense cities and the methods that may be pursued in the design of these building types. Students demonstrate ability in the design development process and a degree of innovation in integrating technological ideas and components into an architectural project.

Amongst the GEM, SS, Breadth and UE modules on offer at both BSc (Arch.) and Master level, **Environmental Science** introduces the scientific basis for environmental management. It discusses the earth's environmental dimensions of air, water and land, and the interaction between living and non-living components. The module covers the properties of air, water and land, ecosystems, biogeochemical cycles, ecosystem integrity and environmental capacity, pollution pathways and impacts, conservation science, integrated management approaches. The emphasis is to provide a sound understanding of the scientific basis for better environmental decision-making. **Environmental Science for Building** covers the basic science relating to projects in the context of sustainable development, with a focus on the elements of the scientific principles relevant to buildings. The major topics include external and climatic effects such as various forms of pollution, humidity and condensation, heat transfer, comfort conditions, comfort zones and indices, air movement, Sick Building Syndrome and solar radiation, daylighting and artificial lighting, and building acoustics. **Total Building Performance and Integration 1** and **2** aim to provide the principles and concept of total building performance and diagnosis, and introduce the interdisciplinary methodology for building performance evaluation. The courses expose the participants to a hands-on evaluation of a building system in the form of a major integrated project. **Environmental Management and Assessment** introduces the systems and approaches used to meet the challenges of natural resource protection and conservation and the contributions that can be made to the sustainability agenda. It provides an insight into the prediction of development impacts using assessment procedures designed to meet mandatory legal requirements.

Integration of Environmental Design Modules with Studio – Bachelor of Arts in Architecture

Level 1 - Semester 1

- **Spatial - Visual Communication** 4 Credits
- **Structural Systems** 4 Credits
- **Elective** 4 Credits
- **Elective** 4 Credits
- **Design 1** 8 Credits

Level 1 - Semester 2

- **Architectural Construction** 4 Credits
- **Climatic Responsive Architecture** 4 Credits
- **Elective** 4 Credits
- **Design 2** 8 Credits

Level 2 - Semester 1

- **History and Theory of SEA Architecture** 4 Credits
- **Strategies for Sustainable Architecture** 4 Credits
- **Elective** 4 Credits
- **Design 3** 8 Credits

Level 2 - Semester 2

- **Designing with Environmental Systems** 4 Credits
- **Theory of Urban Development and Planning** 4 Credits
- **Architectural Construction 2** 4 Credits
- **Elective** **4** Credits
- **Design 4** 12 Credits

Level 3 - Semester 1

- **History and Theory of Western Architecture** 4 Credits
- **Elective** 4 Credits
- **Design 5** 8 Credits

Level 3 - Semester 2

- **Architectural Construction 3** 4 Credits
- **Architectural Structures** 4 Credits
- **Elective** 4 Credits
- **Design** 6 12 Credits

Level 4 - Semester 1

- **Research Methodology** 4 Credits
- **Elective** 4 Credits
- **Design 7** 8 Credits

Level 4 - Semester 2

- **Elective** 4 Credits
- **Elective** 4 Credits
- **Design** 8 8 Credits

STRENGTHS AND OPPORTUNITIES

The Department of Architecture at the National University of Singapore offers further programmes to the BSc Architecture (Honours) and the Master of Architecture, which include a Bachelor of Arts in Industrial Design (Honours), a Master of Arts and Master of Architecture in Urban Design and a MArch option with specialisation in Design Technology and Sustainability. This latter programme offers a broad-based education in construction and management to enhance the knowledge and abilities of the professional architects involved in the design development and management of architectural technology. Amongst the strengths and opportunities of the programs on offer:

Strengths:

- The Department of Architecture fosters the implementation of sustainable environmental design as one of the core areas of its curriculum;
- A significant amount of resources are invested in the integration of sustainability in education, throughout the undergraduate, graduate and postgraduate programmes on offer;
- The implementation of sustainable principles and strategies is specifically evident (particularly in the final year of the BSc degree) where the curriculum presents a good spread of studio programmes addressing carbon neutrality, cradle to cradle approach, simulation tools in design and performance-based design.

Opportunities:

- Within the Master of Architecture degree, students have the option to choose a specialisation that focuses primarily on issues related to sustainable environmental design. The Faculty is going to devote more resources in this specialisation in the near future.

SOURCES AND REFERENCES

NUS Department of Architecture website: http://www.sde.nus.edu.sg/
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

Singapore Institute of Architects (SIA)

The Singapore Institute of Architects (SIA) is a professional organisation established in 1961 with the objective to promote the architectural profession and the built environment in Singapore. The Institute is the sole representative for the architectural profession in Singapore. Its mission is to champion excellence in architecture and the built environment. Membership of SIA is voluntary. The Institute's objectives are:

- To generate in the community a greater awareness and appreciation of the value of good design in their built environment and daily lives.
- To advance the theory and practice of architecture through the support and reward for quality research and innovation in architectural design, practice and education.
- To continually upgrade the level of professionalism among architects in order to better serve the community.
- To promote solidarity among architects through a collective vision of working towards a dignified and caring profession that upholds a high standard of professional conduct and ethics.

Board of Architects of Singapore (BOA)

The Board of Architects of Singapore (BOA) is the statutory authority established to administer the Architects Act 1991. The Architects Act 1991 sets out the general qualifications and requirements for registration and the BOA is responsible for evaluation of applications for admission to the Register of Architects. The main functions provided by the Board, under the Architects Act 1991, are:

- to keep and maintain a register of architects, a register of practitioners and a register of licensees;
- to hold or arrange for the holding of such examinations as the Board considers necessary for the purpose of enabling persons to qualify for registration under the Act;
- to establish, maintain and develop standards of professional conduct and ethics of the architectural profession;
- to promote learning and education in connection with architecture, either alone or in conjunction with any other professional body;
- to hear and determine disputes relating to professional conduct or ethics of registered architects or to appoint a committee or arbitrator to hear and determine those disputes;
- to appoint arbitrators for the purpose of hearing and determining disputes between registered architects or licensed corporations or partnerships and other persons;
- to license corporations or multi-discipline partnerships which intend to supply architectural services in Singapore; and
- generally to do all such acts, matters and things as are necessary to be carried out under the provisions of the Act.

Conditions for Professional Qualification

Singaporean law governs the use of the term "Architect" and prescribes the requirements to be listed in the Register of Architects. The Architects Act 1976 (no. 14 of 1976) was originally set to control the architectural profession in Singapore. The aim of the act was to maintain professional standards of architects in order to protect the public. This protection was afforded through a Register of Architects, which lists all persons and corporations who satisfy the requirements. The Architects Ordinance or the Architects Act - as it is known today - evolved over the years in light of transitions within Singapore.

The Architects Act 1991 (no. 22 of 1991) lists the ethics, codes and regulations which provide the framework to maintain professionalism in an increasingly competitive business climate. The Board requires registered architects to adhere to a high code of ethics and that they must fulfil with complete integrity their obligations to clients, the profession, and the public.

The requirements for registration as an Architect in Singapore consist of:

- an approved academic qualification in architecture;
- an appropriate practical experience in architectural work.

To meet the academic requirement for registration, applicants must possess qualification required under *Part IV – Registration of Architects*, *Section 15 – Qualification for Registration* of the Architects Act.

Subject to the subsection 15 (1), the following persons shall, on payment of the prescribed fee, be entitled to registration under the Architects Act:

(a) any person holding the degree of Bachelor of Architecture from the National University of Singapore;

(b) any person holding any other degree, diploma or qualification which the Minister may, after consultation with the Board, approve for the purpose of entitling the holder thereof to be registered under the Act;

(c) any person who satisfies the Board that he is otherwise qualified by having proper and recognised training in architecture and who passes such examinations as may be required by the Board.

Architectural qualifications accredited by the Board are generally full-time courses and examinations comprising of five academic years in residence, with one year practical training in between the pre-professional and professional programme. The Board adopts a list of accredited programmes in architecture which are contained under Section 15 (1) (b) of the Architects Act. A copy of this list is available in the *Board of Architects (Approved Qualifications) Notification 1999* Booklet.

Upon completion of a university degree, additional training by working for a minimum of two years under a registered architect is required. Under Section 15 (2) of the Architects Act, no person shall be entitled to registration under subsection (1) (a), (b) or (c) unless he/she satisfies the Board as to any of the following:

(a) that he has, after obtaining his qualifications:

> (i) acquired not less than 2 years of such practical experience in architectural work as may be prescribed or approved by the Board (including practical experience in architectural work in Singapore for a continuous period of at least 12 months); and
> (ii) passed such professional practice examination as may be prescribed or approved by the Board;

(b) that he has, after obtaining his qualifications:

> (i) acquired not less than 5 years of such practical experience in architectural work as may be recognised by the Board (including not less than 2 years of the prescribed practical experience in architectural work in Singapore with a continuous period of at least 12 months of such prescribed practical experience being acquired within the 5 years immediately preceding the date of his application for registration under the Act); and
> (ii) passed such oral or written examination as may be prescribed by the Board;

(c) that he has, after obtaining his qualifications -

> (i) acquired not less than 10 years of such practical experience in architectural work as may be recognised by the Board; and
> (ii) passed such oral or written examination as may be prescribed by the Board.

The following three categories of applicants can apply to the Board for registration under Section 15 (2) (c) mentioned above:

- Applicants who have won commendations / awards / honours from recognised professional bodies in their own countries, whose architectural degrees qualifications are recognised by the Board;
- Applicants who have won commendations / awards / honours at international level;
- Applicants who have personally executed architectural work of high design merit.

Applicants applying for registration under category (a) or (b) above are required to submit a log book which shall include details of the duration and a description of the practical experience. In addition, applicants are also required to submit a Professional Case Study. Specifically, in terms of examination requirements:

- Category (a) - Graduates with two years of practical experience may sit for the professional practice examination under Section 15(2) (a) of the Act. This consists of two written papers and one oral examination. Candidates are required to submit log book and case study.
- Category (b) - Graduates with five years of practical experience may sit for the professional interview under Section 15(2) (b) of the Act. This consists of an oral examination. Candidates are required to submit a log book and case study.
- Category (c) - Interview. Applicants applying for registration under this category are required to submit a portfolio including details of the list of completed buildings designed by him or under his direction.

Under the Architects Rule 1991 (Chapter 12, Section 36), Rule 3A (1) establishes the prescribed examinations for purposes of Section 15 (2) - Registration of the Architects Act. Under this Rule, the following examinations are the prescribed examinations for the purposes of section 15 (2) (a) (ii) of the Act:

(a) the Law and the Architect Examination, which tests the applicant's technical knowledge on the various Acts, by-laws, rules and regulations, limitations, codes of practice, submission and application procedures relating to the practice of architecture in Singapore;

(b) the Professional Practice Examination, which tests the applicant's understanding of and his abilities in Contract Administration and Project Management; and

(c) the Oral Interview Examination (to be conducted only after the applicants has sat for and passed the examinations referred to in sub-paragraphs (a) and (b)), which covers the following areas:

i) the topics set out in sub-paragraphs (a) and (b);
ii) the data recorded in the applicant's Professional Case Study, Practical Experience Record Book and Log Book; and
iii) the mentoring process of the applicant.

Under Rule 3A (2), the prescribed oral examination for the purposes of section 15(2) (b) (ii) of the Act shall be the Professional Practice Interview Examination, which covers the following areas:

(a) the topics set out in paragraph (1) (a) and (b); and

(b) the data recorded in the applicant's Professional Case Study, Practical Experience Record Book and Log Book.

According to Rule 3A (3) the prescribed oral examination for the purposes of section 15(2) (c) (ii) of the Act shall be the Professional Interview, in which the applicant will be asked to elaborate on his aspirations in relation to his practice of architecture in Singapore, his professional opinion on improving the architectural practice and standards in Singapore and his achievements in the architectural profession. It is the responsibility of the Board (Rule 3A (4)) to:

(a) appoint a Committee of Examiners to conduct the examinations referred to in paragraphs (1) , (2) and (3);

(b) determine the date, time and place for the examinations to be held;

(c) determine the number of such examinations to be conducted in a year (not being less than one examination per year);

(d) determine the scope and duration of such examinations;

(e) determine the procedure for the conduct of such examinations; and

(f) notify each applicant of the result of his examination as soon as practicable.

Under Rule 4A (2), no person is eligible to sit for the examination referred to in section 15 (2) (a) of the Act unless he has the necessary practical experience prescribed. Every person applying for registration under the Act shall submit with his application proof in writing of his practical experience, which shall include details of the duration and a description of the practical experience in such form as the Board may require.

Professional Practice Examination

The objective of the Professional Practice Examination (for registration under section 15(2) (a)) and the Professional Practice Interview Examination for registration under section 15(2) (b)) is to ensure that a PPE Candidate has undergone a comprehensive professional practice programme to acquire core competencies in the various areas of architectural training and practice and reinforce his or her discipline, integrity, judgement, skills, knowledge and quest for learning so that after having passed the examination he or she is able to become a registered architect in Singapore and able to exercise his or her professional skills, in addition to carrying his or her duty and responsibilities professionally.

Selected Excerpts (full document available on http://www.boa.gov.sg/examination.html):

"In the training of a PPE Candidate, he or she must undergo a PPE Candidate's Development Programme in two distinct kinds of activities:

(a) Awareness, Understanding and Learning Activities.

(b) Skills and Application Activities.

5.2.1 AWARENESS, UNDERSTANDING AND LEARNING ACTIVITIES

A PPE Candidate needs to acquire basic knowledge/information and would firstly be involved in the awareness, understanding and learning activities which encompass technical information, concepts and principles. These practical experience activities include the following:

(a) Design and Technical Knowledge which cover the production of the project programme, making feasibility studies with considerations to planning requirements, site and environmental analysis, economics and market situation, production of schematic designs, design development, production of building drawings, details and measured drawings, understanding of various building and engineering systems to enable the selection and integration into the design including taking into consideration of the mechanical and electrical services, understanding of building cost analysis, knowledge of building codes, codes of practice, Standards' codes and various performance-based regulations and their compliance, and finally, various submission procedures.

(b) Contract Administration and Project Management which cover the understanding of the purpose of the Conditions of Building Contract and Sub-Contract, and understanding each and every clause, the understanding and usage of the National Productivity and Quality Specification to establish quality assurance, contract documentation, tendering procedure, evaluation of tenders and award of tender, conducting consultants' meetings and site meetings, administration of the building contract and involving in the creation and maintenance of a systematic and comprehensive record of the project.

(c) Office Administration and Management which involves learning about the various administrative duties and systems of an architect's office, and the administration of the office's resources to support the goals or objectives of the firm.

5.2.2 SKILLS AND APPLICATION ACTIVITIES: CORE COMPETENCIES

A PPE Candidate needs to acquire practical experience whilst learning to apply his or her formal education to the daily realities of architectural practice involving awareness, understanding and learning activities which when successfully accomplished, will result in core competencies in the following areas:

(a) acquire abilities to make independent site inspection/ investigation, gather information through visual inspection and to gather information through personal interviews to assist in the formulation of the project requirements;

[...]

(d) able to advise his or her Client on the possibility of a project development and providing him with a coherent, logical and well-designed sketch design taking into consideration all planning constraints, economics, site and environmental considerations and market situation;

(e) acquire the necessary knowledge and understanding of various building and engineering systems to enable the selection and integration into the design including taking into consideration of the mechanical and electrical services and with subsequent ability to implement and coordinate engineering systems in buildings and to resolve areas of disagreement or difference of opinion with the engineering consultants;

[...]

(j) acquire practical experience in Contract Administration and able to carry out his/her duties in the following areas:

> *(ii) would have acquired skill in research and selection of appropriate building materials based on performance criteria and programme requirements whilst preparing the NPQS documents and also acquire communication skill to deal with the consultants and the Client, in the relationship between the drawings and specifications with specific considerations being taken on issues of safety, precautionary measures, house-keeping and environmental matters."*

Continued Professional Development Programme (CPD)

Over the last few years, the CPD programme has been implemented and introduced to SIA members on a voluntary basis. However, to respond to one of the Construction 21 recommendations - and with the directive from the Singaporean Ministry of National Development to make CPD compulsory as a pre-requisite for renewing the practicing certificate in the year 2003 - BOA has assigned to SIA the role of the Managing Agent to implement the CPD activities. All licensed architects have to successfully obtain an annual requirement of 20 credits points in CPD activities except for age sixty and above.

SOURCES AND REFERENCES

SIA website: www.riac.org
BOA website: www.cacb-ccca.ca

Switzerland

EPFL ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE

FACULTE' DE L'ENVIRONNEMENT NATUREL, ARCHITECTURAL ET CONSTRUIT

Bachelor of Science in Architecture + Master of Science in Architecture

Level: Undergraduate (BSc, 3 years) + Graduate (MSc, 2 years)

Accrediting Body: REG (Fondation des Registres Suisses des Ingénieurs, Architectes et Techniciens)

Educational Aims: Architecture as a field has broadened in the past several years and this is why the study of architecture at EPFL is structured differently from classes in other sections: teaching is based on a continuous interplay between theory and application. Modelling volumes, studying building physics, and testing new materials are all part of the curriculum, as well as the new challenges of sustainable development. Architectural thinking must be broad and give meaning to the whole. This is why urbanism, humanities and the history of architecture occupy an important place in the study program, to prepare students for their professional life. Classes concentrate on four fundamental areas, which are explored throughout the Bachelor program and investigated more deeply in the Master's program: Design and Representation; History and Theory; Science and Techniques; City and Surroundings. Basic sciences, such as geometry and physics, are also part of the study program, but still in a much applied manner.

Outline Description of Course: The first year of the Bachelor's program, called the Preparatory Cycle (or *Propédeutique* in French, 60 credits), is dedicated to acquiring basic scientific foundations (e.g. maths, physics, chemistry, etc.) and to join introductory courses related to the field of studies chosen (section). Students are registered in one of the 15 sections, but at this stage, there is still the possibility for them to join another closely related section, once they have passed their preparatory exam. The Bachelor's cycle (120 credits) introduces specific courses that are necessary for each section. Students will progressively master the basic indispensable knowledge, tools and methods required for their chosen degree. The study program is still very structured. In the final year of the Bachelor degree, students have the opportunity to choose elective courses with a view to a future Master's specialization. After completion of the BSc, students must undertake a period of compulsory validated practice (*stage*, 12 months) at an architectural firm in Switzerland or abroad. Following the stage, the Master's program is based upon, and a continuation of, knowledge acquired at the Bachelor's level, offering flexibility and making it possible for each student to construct a personalized program of study. The work load in the Master's cycle can vary between 90 and 120 credits, depending on the section and specialization chosen (although 120-credit programs are becoming the norm). Students can also opt for a Minor (30 credits) which gives a transdisciplinary dimension to their studies. The last semester is dedicated to the Master's project -- a personal research project that culminates the studies of the program. The project takes between 4 and 6 months and is done as part of a research project in an EPFL laboratory, in another university or in a company. As the holder of an EPFL MSc degree in Architecture, graduates are authorized to hold the title of EPF Architect.

Course Structure: Since the preparatory cycle, the course focuses on 4 core areas, which are taught throughout the three years of Bachelor and the two years of Master at depth. These areas are: Design and Representation; History and Theory; Science and Building Techniques; City and Surroundings. The interdisciplinary lecture series involve students from three different sections of the ENAC, whilst the teaching of Humanities and Social Sciences brings together all EPFL students completing their studies in Architecture. The BSc ensures a solid balance of generalist architectural knowledge and skill, and allows students to enrol in the Master cycle after having completed a 12 months full-time validated period in professional practice (of which at least 6 months have to be of consecutive employment). The Master cycle is designed to be taken, in principle, over a period of two years for a total of 120 credits. Within the Master, 60 credits are awarded for compulsory courses, design projects and electives; 30 credits are awarded for specialization or an ENAC/EPFL Minor; and 30 credits are awarded for the final Master's thesis.

Bachelor of Science in Architecture (1 Year Preparatory Cycle + 2 years Bachelor)

Year 1 - Preparatory Cycle (*Cycle Propédeutique; Bachelor 1 and Bachelor 2*)
Branche d'Examen (Theoretical courses)

Code	*Title*	*Coefficient*	*Taught*
AR-131	Eléments constructifs et matériaux I (Materials and construction I)	0.5	BA1
AR-132	Eléments constructifs et matériaux II (Materials and construction II)	0.5	BA2
AR-123	Histoire de l'Architecture I (History of Architecture I)	0.5	BA1
AR-124	Histoire de l'Architecture II (History of Architecture II)	0.5	BA2
AR-133	Physique du bâtiment I (Building Physics I)	0.5	BA1
AR-134	Physique du bâtiment II (Building Physics II)	0.5	BA2
AR-121	Théorie de l'architecture I (Theory of Architecture)	0.5	BA1

AR-122	Théorie de l'architecture II (Theory of Architecture II)	0.5	BA2
	Géométrie I (Geometry I)	0.5	BA1
	Géométrie II (Geometry II)	0.5	BA2
	Mathématiques I (Mathematics I)	0.5	BA1
	Mathématiques II (Mathematics II)	0.5	BA2

Coefficient Total 6 (Branche d'examen)

Branche Semestrielles (Design-based)

Code	*Title*	*Coefficient*	*Taught*
AR-111	Dessin I (Drawing I)	0.5	BA1
AR-112	Dessin II (Drawing II)	0.5	BA2
CIVIL-122	Strucures I (Structures I)	0.5	BA1
CIVIL-123	Strucures I (Structures I)	0.5	BA2
AR-101	Théorie et critique du projet BA1 (Studio BA1)	1.5	BA1
AR-102	Théorie et critique du projet BA2 (Studio BA2)	1.5	BA2
SHS Modules		1 (2x0.5)	BA1/BA2

SHS Modules, Sciences Humaines et Sociales
Optional modules are conceived to propose to students an organised overview of social sciences, in order to complement the technical knowledge given by the curriculum. Modules are organised in 2 blocks of 5 modules per each semester and students have to freely choose one module (0.5 coefficient each) per semester (SHS: BA1 and SHS: BA2). Students can choose amongst an offer of 11 modules.
Coefficient Total 6 (Branche Semestrielle)

Year 2 and Year 3 - Bachelor (*Bachelor 3, 4, 5 and 6*)
SHS – Cycle Bachelor
Starting from the Year 2 of the Bachelor, the organisation of modules in Social and Human Sciences is arranged in semesters and each student freely chooses a total of 4 SHS modules during Year 2 and Year 3 (one per each semester, worth 2 credits per semester). SHS modules are organised in domains: Culture and Civilisation; Production Systems; Arts and Aesthetics; Reflexivity and Knowledge; Individuals and Society. Currently 89 SHS modules are on offer.
Credit Total 8 Credits (SHS Cycle Bachelor)

Bloc "Projeter Ensemble" (Design and Build Together)

Code	*Title*	*Credits*	*Taught*
	Semaine ENAC (ENAC Week)	4	BA4
	Unite' d'enseignement ENAC (Learning Units)	4	BA6

Credit Total 8 Credits (Projeter Ensemble)

Bloc 1 (Bachelor 3 and 4)

Code	*Title*	*Credits*	*Taught*
AR-213	Bases d'informatique graphique I (Graphic Informatics I)	2	BA3
AR-214	Bases d'informatique graphique II (Graphic Informatics II)	2	BA4
AR-231	Eléments constructifs et matériaux III (Materials and construction III)	2	BA3
AR-232	Eléments constructifs et matériaux IV (Materials and construction IV)	2	BA4
AR-251	Eléments d'analyse urbaine I (Elements of urban analysis I)	2	BA3
AR-252	Eléments d'analyse urbaine II (Elements of urban analysis II)	2	BA4
AR-223	Histoire de l'architecture III (History of Architecture III)	2	BA3
AR-224	Histoire de l'architecture IV (History of Architecture IV)	2	BA4
AR-233	Physique du bâtiment III (Building Physics III)	2	BA3
AR-234	Physique du bâtiment IV (Building Physics IV)	2	BA4
AR-235	Structures III (Structures III)	2	BA3
AR-236	Structures IV (Structures IV)	2	BA4
AR-221	Théorie de l'architecture III (Theory of Architecture III)	2	BA3
AR-222	Théorie de l'architecture IV (Theory of Architecture IV)	2	BA4

Credit Total 28 Credits (Bloc 1)

Bloc 2 (Bachelor 3 and 4)

Code	*Title*	*Credits*	*Taught*
AR-211	Dessin III (Drawing III)	2	BA3
AR-212	Dessin IV (Drawing IV)	2	BA4
AR-201	Théorie et critique du projet BA3 (Studio BA3)	10	BA3
AR-202	Théorie et critique du projet BA4 (Studio BA4)	10	BA4

Credit Total 24 Credits (Bloc 2)

Bloc 3 (Bachelor 5 and 6)

Code	*Title*	*Credits*	*Taught*
AR-331	Eléments constructifs et matériaux V (Materials and construction V)	3	BA5
AR-332	Eléments constructifs et matériaux VI (Materials and construction VI)	3	BA6

AR-323	Histoire de l'architecture V (History of Architecture V)	2	BA5
AR-324	Histoire de l'architecture VI (History of Architecture VI)	2	BA6
AR-333	Physique du bâtiment V (Building Physics V)	2	BA5
AR-334	Physique du bâtiment VI (Building Physics VI)	2	BA6
AR-381	Sociologie et économie du logement I (Sociology and economics I)	2	BA5
AR-382	Sociologie et économie du logement II (Sociology and economics II)	2	BA6
AR-335	Structures V (Structures V)	2	BA5
AR-336	Structures VI (Structures VI)	2	BA6
AR-321	Théorie de l'architecture V (Theory of Architecture V)	2	BA5
AR-322	Théorie de l'architecture VI (Theory of Architecture VI)	2	BA6
Credit Total	**26 Credits (Bloc 3)**		

Bloc 4 (Bachelor 5 and 6)

Code	*Title*	*Credits*	*Taught*
AR-301	Théorie et critique du projet BA5 (Studio BA5)	13	BA5
AR-302	Théorie et critique du projet BA6 (Studio BA5)	13	BA6
Credit Total	**26 Credits (Bloc 3)**		

BA1 = Autumn Year 1; **BA2** = Spring Year 2; **BA3** = Autumn Year 2; **BA4** = Spring Year 2; **BA5** = Autumn Year 3; **BA6** = Spring Year 3

Master of Science in Architecture (2 years)

Bloc 1- Branches Obligatoires (Compulsory Courses)

Code	*Title*	*Credits*	*Taught*
ENG-483	Droit de l'architecte I, introduction (Law and Management I)	3	MA1-MA3
AR-598	Enoncé théorique de master (Briefing Document)	8	M1A-MA3
AR-481	Gestion du projet d'architecture I (Design Management I)	3	MA1-MA3
Optional SHS	*Modules thématique I, II*	6	MA1/MA3
Credit Total	**20 Credits (Bloc 1)**		

Optional Modules, SHS Sciences Humaines et Sociales
At Master level, the objective is to enable the students to work in groups. The programme is subdivided into Thematical Master Modules (TMM), whose organisation may vary depending on the chosen topics. The Master programme offers both interdisciplinary approach to specific topics and more specialized TMM. The courses are subdivided into the following Major Areas: Cultures and Civilizations; Production Systems; Arts and Aesthetics; Reflexivity and Knowledge; Individuals and Societies. Students take two modules over two semesters for a total credit value of 6 credits. 46 different modules for the SHS are currently on offer.

Bloc 2- Projets (students choose two designs modules)

Code	*Title*	*Credits*	*Taught*
AR-401	Théorie et critique du projet MA1 (Studio MA1)	13	MA1
AR-402	Théorie et critique du projet MA2 (Studio MA2)	13	MA2
AR-501	Théorie et critique du projet MA3 (Studio MA3)	13	MA3
Credit Total	**26 Credits (Bloc 2)**		

Groupe Options (Specialisation Modules)
Students can choose amongst 51 different modules currently on offer in order to obtain the 44 remaining credits, with the only obligation of taking at least one *Unite' d'enseignement* (theoretic course, seminar; 6 credits). Within the specialisation, students can choose a Minor amongst the following: Territorial Development; Management of Technology and Entrepreneurship. Within the Minor, students can choose between 29 different modules to achieve 30 credits.
Credit Total 44 Credits (Specialisation Modules and/or Minor)

Projet de Master (Master Thesis)

AR-599	Projet de master en architecture (Master thesis)	30	MA4
Credit Total	**30 Credits (Master Thesis)**		

Learning Outcomes: The Bachelor program is centred on three main axes: advanced scientific and theoretical knowledge, guaranteeing a broad-based education that is necessary for an innovative and interdisciplinary approach; practical content, whereas EPFL's many laboratories, projects and internships let students apply theoretical knowledge and gain practical experience; direct and permanent contact with the research world, ensuring an optimal transfer of the latest skills and technical knowledge. In addition, courses in humanities and social sciences (SHS) allow students to step back and develop critical thinking skills with regard to social, ethical and environmental implications. The MSc focuses on education of practitioners with a solid theoretical background. The multidisciplinary nature of the training includes humanistic, constructive and technical aspects, delivered through close collaboration with different sections within the ENAC.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

Throughout the BSc, the programme is structured in parallel satellite modules that include a teaching of Building Physics (*Physique du bâtiment*) per semester. **Building Physics I** focuses on the interactions between buildings and the environment in terms of solar geometry, wind, heat transfer and hygrothermal comfort. Students learn how to: determine the sun path for any given latitude; draw building shadows; determine the size of sun shades; use a psychrometric diagram; calculate wind pressure on building envelopes; calculate thermal resistance of a multi layers wall; identify weaknesses in the thermal insulation of buildings. **Building Physics II** introduces building acoustics, analysing origin and measurement of acoustic quantities, sound propagation and acoustic constrains, and also investigating luminous and chromatic properties of building materials. Students are taught how to: quantify and use sound levels; evaluate the sound level dampening; assess the acoustic quality of a building space; differentiate photometric quantities; appreciate the luminous properties of glazing and building materials. In year 2, **Building Physics III** focuses on non-transparent construction materials, analysing hygrothermal balance, thermal insulation and acoustic protection and the impact of thermal inertia. Students learn how to: determine the temperature and vapour pressure distributions in a multi-layer wall; assess and improve the acoustic properties of a space; select building construction materials according to outdoor/indoor acoustic and thermal constrains. **Building Physics IV** highlights the properties of transparent construction materials and openings, looking into windows physical features, solar gains and thermal losses and introducing advanced daylighting systems. Specific objectives are to: compare windows performance; determine solar gains and thermal losses; assess the impact of different sunshades; determine the day lighting contribution for different room positions and assess complementary electric lighting needs; assess the impact of daylighting systems. In the 3rd year, **Building Physics V** introduces the energy consumption of buildings, optimization methods applicable to the building energy consumption and building energy design and analysis tools. Students learn to: determine the detailed energy balance of buildings; optimise the building energy balance and thermal comfort by way of design tools; determine and apply the appropriate measures to reduce building cooling loads. **Building Physics VI** analyses energy management, heat recovery, solar energy collectors, heat storage technology, and building energy analysis and management methods. Students learn how to: perform energy performance diagnostics; determine the energy savings contribution of different heat recovery devices; identify and design different passive and active solar energy systems and heat storage processes and technologies. For all courses, assessment is via a final written examination.

A number of optional units within the **SHS - Social and Human Science** modules analyse themes related to sustainable development and environmental design. Amongst them, in the preparatory cycle, **Climate Challenges** focuses on climate change and the impact of human activities, promoting a multidisciplinary approach that embraces natural and human sciences and includes ethics, economics and politics. In 2nd year, **Sustainable Development and Globalisation** analyses the economic, social and environmental aspects of development of urban conglomerations, and the territorial effects of the process of globalisation. In 3rd year, **Economics of the environment and sustainable development** investigates the theme of sustainable development in terms of its economic dimension, specific reference to developing countries. **Ethics and Environment** presents the theme of environmental protection starting from an “anthropocentric” and “non-anthropocentric” perspective and focuses on an ethical approach when addressing the environmental debate. **Sustainable Development – Workshop** favours a critical analysis of the various themes surrounding sustainability and introduces the methodological tools necessary to develop a research proposal. At Master level, **Energy and Society I** and **II** analyse some of the key issues related to human sciences in the energy and climate change debate, starting from scientific controversies on fossil fuels reserves and the role of CO2 and discussing action plans. **Sustainable Development – Enquiries and Controversies I** and **II** propose an analysis of the concept of sustainable development, exploring the characteristics of this incompletely identified theme, its worldwide scale, its presence and the time issue.

Amongst the optional and specialisation modules, **Indoor environmental quality** looks at the comfort and health conditions of inhabited environments, analysing the methods to achieve thermal comfort, indoor air quality, good lighting, an appropriate acoustical environment, etc. and presenting some building diagnosis methods. One teaching unit (*Unite’ d’enseignement*) is focused on **Environmental Concepts and Criteria**, and another on **Space and Light**, focusing on how to see, to plan and to design light in architecture.

The *Projeter Ensemble* (**Design Together**) strategy responds to the need for increased cooperation on projects between engineers and architects in the various programmes. **ENAC Weeks** are one-week courses where 2nd year BSc students work together on a selected joint theme. **ENAC Learning Units** enable 6th semester students from Architecture, Civil and Environmental Engineering to review a specific theme in depth with 4 hours of courses and exercises per week during the summer term. Several other interactions are gradually being introduced, i.e. joint projects and joint Master's thesis.

Integration of Environmental Design with Studio (Bachelor of Science only)

Preparatory Cycle – BA1

- **Physique du Bâtiment I** – Coefficient 0.5
- **Mathématique I** – Coefficient 0.5
- **Eléments Constructifs et Matériaux I** – Coefficient 0.5
- **Géométrie I** – Coefficient 0.5
- **Histoire de l'Architecture I** – Coefficient 0.5
- **Studio Module BA1** – Coefficient 1.5
- **Dessin I** – Coefficient 0.5
- **Structure I** – Coefficient 0.5
- **Théorie de l'Architecture I** – Coefficient 0.5
- **SHS Cours Thématique I** – Coefficient 0.5

Preparatory Cycle – BA2

- **Physique du Bâtiment II** – Coefficient 0.5
- **Mathématique II** – Coefficient 0.5
- **Eléments Constructifs et Matériaux II** – Coefficient 0.5
- **Géométrie II** – Coefficient 0.5
- **Histoire de l'Architecture II** – Coefficient 0.5
- **Studio Module BA2** – Coefficient 1.5
- **Dessin II** – Coefficient 0.5
- **Structure II** – Coefficient 0.5
- **Théorie de l'Architecture II** – Coefficient 0.5
- **SHS Cours Thématique II** – Coefficient 0.5

Bachelor Year 3 – BA4

- **Physique du Bâtiment V** – 2 Credits
- **Sociologie et économie du logement I** – 2 Credits
- **Eléments Constructifs et Matériaux V** – 3 Credits
- **Théorie de l'Architecture V** – 2 Credits
- **Histoire de l'Architecture V** – 2 Credits
- **Studio Module BA5** – 13 Credits
- **Structure V** – 2 Credits
- **SHS Cours a Choix III** – 2 Credits

Bachelor Year 3 – BA6

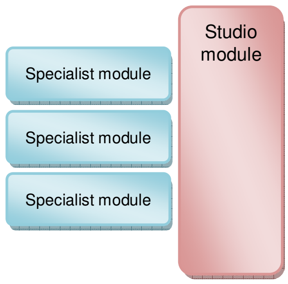
- **Physique du Bâtiment VI** – 2 Credits
- **Sociologie et économie du logement II** – 2 Credits
- **Eléments Constructifs et Matériaux VI** – 3 Credits
- **Théorie de l'Architecture VI** – 2 Credits
- **Histoire de l'Architecture VI** – 2 Credits
- **Studio Module BA6** – 13 Credits
- **Structure VI** – 2 Credits
- **SHS Cours a Choix IV** – 2 Credits
- **Learning Unit** – 4 Credits

Bachelor Year 2 – BA3

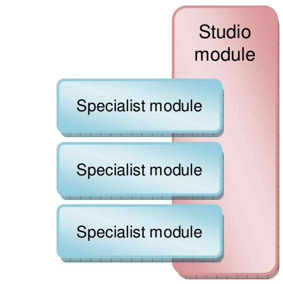
- **Physique du Bâtiment III** – 2 Credits
- **Eléments d'analyse urbaine I** – 2 Credits
- **Eléments Constructifs et Matériaux III** – 2 Credits
- **Bases d'informatique graphique I** – 2 Credits
- **Histoire de l'Architecture III** – 2 Credits
- **Studio Module BA3** – 10 Credits
- **Dessin III** – 2 Credits
- **Structure III** – 2 Credits
- **Théorie de l'Architecture III** – 2 Credits
- **SHS Cours a Choix I** – 2 Credits

Bachelor Year 2 – BA4

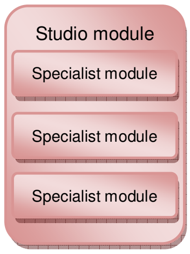
- **Physique du Bâtiment IV** – 2 Credits
- **Eléments d'analyse urbaine II** – 2 Credits
- **Eléments Constructifs et Matériaux IV** – 2 Credits
- **Bases d'informatique graphique II** – 2 Credits
- **Histoire de l'Architecture IV** – 2 Credits
- **Studio Module BA4** – 10 Credits
- **Dessin IV** – 2 Credits
- **Structure IV** – 2 Credits
- **Théorie de l'Architecture IV** – 2 Credits
- **SHS Cours a Choix II** – 2 Credits
- **ENAC Week** – 4 Credits



Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

Amongst the major strengths and opportunities of the Bachelor of Science + Master of Science in Architecture at the ENAC/EPFL are the following:

Strengths:

- Sustainable environmental design represents a significant part of the curriculum at ENAC/EPFL, particularly in terms of passive design and occupant comfort and well-being;
- A great deal of technical knowledge is imparted to students in terms of themes of sustainable design;
- Students are encouraged to explore themes of sustainable design throughout the curriculum, starting from the undergraduate level, up to (with stronger emphasis) their following stages of education;
- Architecture is one out of three sections within the ENAC Faculty (Natural, Architectural and Built Environment), so there is a strong interdisciplinarity within the curriculum which is encouraged by a number of contributions from external experts and specialists in scientific as well as social and humanistic domains;
- Participatory teaching is highly encouraged specifically in studio and in multidisciplinary design courses (e.g. learning units).

Opportunities:

- Sustainable environmental design should be considered as a compulsory requirement for the curriculum as well as a requirement for accreditation of the course due to the creative inputs that it can offer to architectural design;
- A higher level of implementation is given in postgraduate teaching, specifically in terms of professional specialisation courses (Master) which focus on sustainable environmental design;
- A new Chair in Sustainable Architecture and Building Technology is being appointed to encourage integration between scientific and applied domains.

SOURCES AND REFERENCES

ENAC - EPFL website: enac.epfl.ch
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR PROFESSIONAL QUALIFICATION

REG – Fondation des Registres Suisses des Ingénieurs, des Architectes et des Techniciens

Aware of the necessity of minimum quality requirements for carrying out technical professions, the SIA (Swiss Society of Engineers and Architects) originally created in 1917 a commission for the protection of the titles, in order to achieve a legal ruling on the matter. Such endeavour led in 1939 to a parliamentary act, which however did not reach any effect due to the lack of a legal base. In 1952, the first Swiss Register of Engineers, Architects and Technicians, named RIAT, was set up. Established on a simple agreement, relaying on unambiguous principles, the most important Swiss professional associations SIA, FAS, ATS and ASIC were able to implement and manage this first Register.

In 1966, the RIAT was transformed into the present Register of Engineers, Architects and Technicians REG, a foundation in the board of which delegates of the Federal Government, of the Cantons and of the Schools are represented, as an implicit recognition of the public interest to the REG activities. The CSA – Conférence Suisse des Architectes, on the other hand, is an organisation which is part of the European Council of Architects and is responsible for the international relationship on behalf of the organisations of Swiss architects which are part of REG, i.e. the FAS (Fédération des Architectes Suisses), the SIA (Société Suisse des Ingénieurs et des Architectes) et FSAI (Fédération Suisse des Architectes Indépendants).

In Switzerland, a number of schools are accredited to graduate architects: two polytechnic schools, the EPFL in Lausanne and the ETHZ in Zurich; the University of Geneva, Institute of Architecture (IAUG), and the Universita' della Svizzera Italiana (USI); and, a series of Universities of Applied Sciences (UAS).
The titles awarded by some of these institutions differ, and are respectively Arckitekt Dipl. ETHZ, Architect Dipl. EPFL, Architecte IAUG, etc. The study period in architecture takes at least 6 years, including 9 semesters of teaching, 2 semesters of professional experience and one semester of final thesis.

Conditions for Professional Qualification

The REG (Foundation of the Swiss Registers of Engineers, Architects and Technicians) is the only private institution in Switzerland accredited to officially recognize the degrees of professionals in Engineering, Architecture, Industry and Environment, obtained in foreign schools as equivalent to Swiss degrees.

For this purpose, the REG manages a list of all people carrying out a registered profession under fulfilment of the due requirements. The Register, including the professional qualifications, is accessible to the public and is structured on three levels:

- REG A: for academy education at the Swiss Federal Institutes of Technology ETHZ and EPFL, as well as IAUG and USI;
- REG B: for education at the Universities of Applied Sciences UAS and HTS;
- REG C: for education at Higher Engineering and Technical Schools HETS.

The requirements for professional registration usually include the study title and a minimum period of professional practice. The professions recognised by REG embrace: Architects; Planners; Landscape Architects; Civil Engineers; Surveying Engineers; Mechanical Engineers; Electrotechnical Engineers; IT Engineers; Professionals of the Environment

For all the above branches, test procedures are established equivalent to those of the related schools, specified in the REG Regulations and certified by the Federal Government. Professionals belonging to other branches can be registered in REG, based on recognized degrees, after exhibiting the required professional practice. These professionals are listed separately in the register "Other Professions".

Professionals presenting a degree of an Academy School (EPFL, ETZH, IAUG, USI), a University of Applied Sciences (UAS), a Higher Technical School (HST), a Higher Engineering and Technical School (HETS) or of a foreign educational institution recognized as equivalent, are registered based on their degree, after exhibiting sufficient professional practice, generally of at least 3 years (2 years for a HEST degree).

Professionals without degrees can also be registered, however only based on a test procedure and after a suitable practice period. Tests allowing the registration in REG A, B and C are carried out by Exam Commissions, consisting of delegates of the recognized schools, according to the Test Regulations approved by the Department of Economic Affairs.

The Foundation of the Registers certifies that at the time of registration, the person has given proof of his qualifications corresponding to his degree.

Prescription of Qualifications

The register is divided into:

- **Register A**: Professionals with recognized Master's degree or equivalent qualification and with at least 3 years of practical experience. The degrees recognized are those awarded by the Swiss Federal Technical Universities, Swiss Universities, Specialised Schools and those accepted by the REG.
- **Register B**: Professionals with a Bachelor degree or equivalent qualification and 3 years of proven practical experience. The degrees recognized are those awarded by Specialised Schools and those accepted by the REG.
- **Register C**: Professionals with a recognized diploma from a high school (HF) or equivalent qualification and 3 years of proven practical experience. The degrees recognized are those awarded by Higher Engineering and Technical Schools and those accepted by the REG.

The individual registers are grouped by subject areas.

The entry in the Register A is open to professionals without a recognized Master's degree, if the following cumulative conditions are met:

- Professionals with recognized FH (Fachhochschulen, Technical School) diploma under the old law, as well as holders of a recognized vocational Bachelor's degree:
    - Proof of sufficient practice (or specialist training) of 3 years;
    - Proof of qualification necessary to pursue the profession, assessed on an examination based on the submission of a dossier.
- Holders of a recognized Bachelor's degree:
    - Proof of sufficient practice (or specialist training) of 3 years;
    - Demonstrate the necessary qualifications to pursue the profession by successfully passing the examination.
- Professionals who have enrolled in a Master's degree, but without completing it:
    - Proof of sufficient practice (or specialist training) of 5 years;
    - Demonstrate the necessary qualifications to pursue the profession by successfully passing the examination.
- For REG B registered professionals:
    - Proof of sufficient practice of 1 year after entry into the REG B:
    - Demonstrate the necessary qualifications to pursue the profession by successfully passing the examination.
- For REG C registered professionals:
    - Proof of sufficient practice of 8 years after entry in the REG C;
    - Demonstrate the necessary qualifications to pursue the profession by successfully passing the examination.
- Professionals with a secondary apprenticeship 2:
    - Proof of sufficient practice of 10 years after completion of an apprenticeship with federal certificate of competence;
    - Demonstrate the necessary qualifications to pursue the profession by successfully passing the examination.

The Comité de Direction (Board of Trustees) has a maximum of 48 members and a minimum of 24. It is composed by half by representatives of public agencies, of the Confederation, of Cantons, and of Polytechnic Schools, Universities, Specialised Schools and Technical Schools; and by half by representatives of professional associations and members of the Registers A, B or C.
The Board of Trustees elects, according to needs, the examination panels for the different professional domains. Examination panels, which include at least 6 members, are in charge of judging the suitability of a candidate to one specific section of the Register.
Upon presentation of request of inscription to the Register, the candidate has to show proof of his practical work experience (in self-employment or dependent position), which has lasted more than the total of the prescribed time. Proof of sufficient practice is provided by way of corresponding documents (certificates,

employment letters, order confirmations, etc....) and any recruitment or activity period should at least indicate: time, duration, location and type of business, duties fulfilled, etc.
In the context of the examination, the assessment of professional experience is carried out, in accordance with the provisions of the examination regulations and the related subject-specific instructions. An examination is requested if the professionals do not hold a degree or certificate of study suitable to grant access to one section of the Register. The examination is finalised to verify that professionals hold the necessary capacities and skills for the practice of the profession.
The Boards of Trustees decides, in collaboration with the examination panel, the specific prescriptions for qualification relative to the different professional domains. These prescriptions describe specific dispositions relative to the exigencies in terms of knowledge and professional competence and in terms of the documents that compose the specific dossier of the candidates.

Professional Networks

Amongst other associations (FAS, FSAI), the SIA (Société des Ingénieurs et Architectes), the Swiss Society of Engineers and Architects, brings together recognized practitioners in the fields of environment, architecture, engineering and industry. The SIA mission is to provide their customers with complete solutions and responsible approach. The SIA sets the groundwork for demanding professional practice. It urges its members to take full measure of their responsibilities and adopt - among the different actors involved in planning, studies and construction - a behaviour consistent with professional ethics and respect for rules of fair competition. Amongst the Priority Themes adopted by the Directorate of SIA in 2009/2010 is the:

"Promote actions in the field of energy and climate.
The SIA will promote the search for informed and effective solution so the issues affecting climate change, the emissions of CO2 and energy efficiency. [Main measures: Promote the Energy Model SIA 2009; Encourage a census of the Swiss building stock to appraise existing energy balance and taking this as a starting point for the energetic analysis (including the value of conservation) and the planning of future actions; synchronization between the "Purpose of energy performance" and "Energy Efficiency Initiative IEE"

SOURCES AND REFERENCES

REG website: www.schweiz-reg.ch
SIA website: www.sia.ch

United States of America

ILLINOIS INSTITUTE OF TECHNOLOGY

COLLEGE OF ARCHITECTURE

Bachelor of Architecture (5 years)

Level: Undergraduate (BArch, 5 years)

Accrediting Body: NAAB (National Architectural Accreditation Board)

Educational Aims: The IIT College of Architecture's 5-year degree program emphasizes investigations in architectural design and technology, while expanding the significance of such investigations through rigorous and critical thought. Its mission relies on certain guiding values: design excellence, technical expertise, advanced professional practice, and respect for the architect in today's society as an ethical, thoughtful and informed producer not only of buildings, but also of all visual and physical environments. The College allows its students to extend their credentials through professional specialization, as they can choose to complete Minors in related fields or pursue a specialization within architecture. The Bachelor of Architecture program allows students to complete the degree in less time than the usual 4+2 structure.

Outline Description of Course: During the first three years, a highly structured curriculum provides solid foundations for architectural practice which include: studio work; requirements in math, physics, structural and mechanical engineering; art and architectural history; housing and ecological planning; and electives from the humanities and social sciences. Within the required curriculum, students may select from studios and architecture electives to satisfy an area of specialization. Working with their academic advisors, students are encouraged to identify a specialization in their second or third year of study in order to plan the appropriate sequence of courses. Credit requirements (15 credits) for each specialization are met by a combination of required core courses, advanced studios, and architecture electives. Each of the three years is team-taught to horizontally integrate all courses within each year and vertically structure the learning experiences. This professional background prepares students for the last two years of advanced design studios which are focused on spatial awareness, comprehensive building design, and the design of large building complexes. During the last two years, students learn the way to work in an environment that parallels professional practice by choosing the architectural studio of their choice to pursue independent, comprehensive, applied-design projects in collaboration with senior faculty members and practicing architects. In addition to exploring a wide range of architectural electives, students can pursue a Minor or a professional specialization of each individual's interest. The specializations on offer are: Architectural History and Theory, City and Regional Planning, Design Build, Digital Design and Landscape Architecture.

Course Structure: Each year of study requires 33-36 credits (generally referred to as credit-hours), normally 15-18 credit/semester. The degree requires a minimum of 169 credits.

<u>Bachelor of Architecture (5 years)</u>

Semester 1

Code	*Title*	*Credits*	*Taught*
ARCH 113	Architecture Studio I	6	Fall
ARCH 100	Introduction to Architecture	3	Fall
ARCH 109	Freehand Drawing I	2	Fall
MATH 119	Geometry for Architects	3	Fall
	Humanities Elective	3	Fall
Credit total	**17 Credits**		

Semester 2

Code	*Title*	*Credits*	*Taught*
ARCH 114	Architecture Studio II	6	Spring
ARCH 110	Freehand Drawing II	2	Spring
MATH 122	Introduction to Mathematics II	3	Spring
ARCH 125	Introduction to Architectural Computing	3	Spring
	Humanities or Social Science Elective	3	Spring
Credit total	**17 Credits**		

Semester 3

Code	*Title*	*Credits*	*Taught*
ARCH 201	Architecture Studio III	5	Fall
PHYS 200	Basic Physics for Architects	4	Fall
AAH 119	History of World Architecture I	3	Fall
ARCH 226	CAD in Practice	3	Fall
Credit total	**15 Credits**		

Semester 4

Code	*Title*	*Credits*	*Taught*
ARCH 202	Architecture Studio IV	6	Spring
AAH 120	History of World Architecture II	3	Spring
ARCH 230	Architecture and Structure	3	Spring
CRP 201	The Dwelling	3	Spring
	Social Sciences Elective	3	Spring
Credit total	**18 Credits**		

Semester 5

Code	*Title*	*Credits*	*Taught*
ARCH 305	Architecture Studio V	6	Fall
ARCH 403	Building Systems for Architects I	3	Fall
ARCH 334	Frame Structural System and Steel	3	Fall
ARCH 423	Architectural Programming	3	Fall
ARCH 321	History of Modern Thought	3	Fall
Credit total	**18 Credits**		

Semester 6

Code	*Title*	*Credits*	*Taught*
ARCH 306	Architecture Studio VI	6	Spring
ARCH 335	Reinforced Concrete /Continuous Structure	3	Spring
CRP 465	The Ecological Basis of Planning	3	Spring
ARCH 404	Building Systems for Architects II	3	Spring
	Architecture Elective	3	Spring
Credit total	**18 Credits**		

Semester 7

Code	*Title*	*Credits*	*Taught*
ARCH 417	Architecture Studio VII	6	Fall
	History of Architecture Elective	3	Fall
	Architecture Elective	3	Fall
	Architecture Elective	3	Fall
	Social Sciences Elective	3	Fall
Credit total	**18 Credits**		

Semester 8

Code	*Title*	*Credits*	*Taught*
ARCH 418	Architecture Studio VIII	6	Spring
IPRO 497	Interprofessional Project I	3	Spring
	Architecture Elective	3	Spring
	Humanities Elective	3	Spring
Credit total	**15 Credits**		

Semester 9

ARCH 419	Architecture Studio IX	6	Fall
IPRO 497	Interprofessional Project II	3	Fall
	Architecture Elective	3	Fall
	Architecture Elective	3	Fall
	Social Sciences Elective	3	Fall
Credit total	**18 Credits**		

Semester 10

Code	*Title*	*Credits*	*Taught*
ARCH 420	Architecture Studio X	6	Spring
ARCH 413	Architecture Practice	3	Spring
	Architecture Elective	3	Spring
	Humanities Elective	3	Spring
Credit total	**15 Credits**		

Learning Outcomes: The BArch course provides a curriculum that meets the requirements of the National Architectural Accreditation Board (NAAB). In the United States, most State Registration Boards require a degree from an accredited professional degree program as a prerequisite for qualification. The NAAB recognizes three types of degrees: the Bachelor of Architecture, the Master of Architecture, and the Doctor of Architecture. A program may be granted a 6-year, 3-year, or 2-year term of accreditation, depending on the extent of its conformance with established educational standards. Professionals degree programs may consist of a pre-professional undergraduate degree (4 years) and a Master graduate degree (2 years) that, when earned sequentially, constitute an accredited professional education. However, the 4-year pre-professional degree (not on offer at IIT Chicago) is not, by itself, recognized as an accrediting degree.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

During the third semester of the Bachelor of Architecture, **Basic Physics for Architects** addresses the basic physical principles and concepts associated with structures and buildings. Although quantitative at times, the course stresses conceptual understanding and practical applications. Hands-on exercises are conducted both in class and out of class in addition to extensive web-based materials available in lieu of textbooks.

In the fourth semester of the course, **The Dwelling** introduces programming and planning for human habitation in dwellings and neighbourhoods. It also discusses a number of topics such as housing as a response to human needs, environmental impacts and their amelioration, and building types and their impacts on programmatic needs. It studies examples of various housing schemes in and around Chicago.

In semester five and six, **Mechanical and Electrical Building Systems for Architects I** and **II** introduce a selection of building support systems, such as: heating, ventilating, air conditioning, water supply, sanitary and storm drainage, power distribution, lighting, communications and vertical transportation. Systems are analyzed for their effect on building form, construction cost and operating efficiency. Simultaneously, **Architecture Studios V** and **VI** are based on the development of architectural principles introduced in previous design studio modules through the correlation of design process and building systems. These studios consider the interrelation of building, programming, site planning, structure, enclosure, energy consumption, and environmental control systems, and the cultural concepts supporting their organization.

In semester six of the course, **Ecological Basis of Planning** discusses the role of natural systems in meeting human needs. It also considers natural systems, climate, geology, land forms, soils, vegetation, and animal populations as the bases of agricultural and industrial technologies. In addition, the module focuses on the analysis of the competing demands on air, water, and land-limiting factors.

In the final year of the course, **Architecture Studios IX** and **X** represent the most extended and developed exercises in macro planning issues. Major priority is given to the urgent needs of the environment such as housing, schools or community buildings for urban centres. Projects reinforce the entire curriculum, emphasizing complex relationships of buildings in an urban landscape taking all factors into consideration. Students increase their ability to make value judgments, and learn to critically review, test and improve conventional concepts of architecture relative to current demands placed upon the profession. These studios also offer students a variety of possible specialization topics providing expertise in specific building types, advanced building technologies, sustainability, digital applications in design, and contemporary materials.

Throughout the curriculum, students may pursue a **Minor** in another Department. Minors consist of at least five courses (minimum 15 credits) and are optional and frequently cross-disciplinary. Architecture students are also encouraged to select electives that provide a sequence of 15 credits of learning experiences related to a specific interest that will reinforce their curriculum. Requirements for architecture electives are most often met by courses offered in the College of Architecture. When deemed appropriate, a selected number of courses from other Departments may serve as architecture electives.

Amongst the electives (and/or graduate courses) on offer at IIT, **Ecology, Sustainability, Site** analyses the role of natural systems in meeting human needs; climate, geology, landforms, soils, vegetation, and animal populations as the bases of agricultural and industrial technologies compose the topics discussed. Competing demands on natural systems and the necessity for integration and coherence, as well as ecological sustainability as a basis of architectural works, are presented. Site forming and reforming, soils and drainage, grading, orientation, microclimate development and plant materials will also be emphasized.

Energy Conscious Design I and **II** focus on the application of energy conservation methods and renewable energy sources, such as wind power and passive solar systems. These are examined in the development of building energy budgets for a variety of building types.

Building Systems Technology reviews the construction industry's entire production and building delivery system. Case study examples of selected current Chicago buildings quickly establish state-of-the-art concerns for energy management, environmental systems and construction methods, including sub-systems, costs parameters, and construction management. Evolving trends are related to the interdependent nature of the decision-making process in the design studio. Information is developed from professionals, manufacturers, representatives and construction management firms. Field visits to shop fabricators and construction sites are also organized.

Design of Energy-Efficient Buildings I and **II** focus on design criteria for achieving human performance goals in energy-efficient buildings, criteria for the exterior/interior environment, and criteria for architectural, mechanical, electrical and building system components. Various energy-conserving strategies are evaluated for achieving cost effective, energy-efficient design of a specific building type.

Integration of Environmental Design in the Curriculum – Bachelor of Architecture

Semester 1 – BArch

- **Introduction to Architecture** 3 Credits
- **Freehand Drawing I** 2 Credits
- **Geometry for Architects** 3 Credits
- **Elective** 3 Credits
- **Studio Module** Architecture Studio I 6 Credits

Semester 2 – BArch

- **Freehand Drawing II** 2 Credits
- **Introduction to Mathematics** 3 Credits
- **Introduction to Architectural Computing** 3 Credits
- **Social Science Elective** 3 Credits
- **Studio Module** Architecture Studio II 6 Credits

Semester 3 – BArch

- **Basic Physics for Architects** 4 Credits
- **History of World Architecture I** 3 Credits
- **CAD in Practice** 3 Credits
- **Studio Module** Architecture Studio III 5 Credits

Semester 4 – BArch

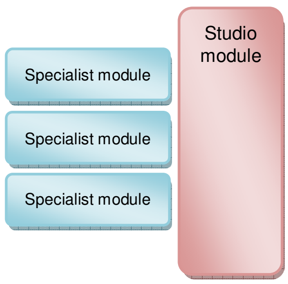
- **History of World Architecture II** 3 Credits
- **Architecture and Structure** 3 Credits
- **The Dwelling** 3 Credits
- **Social Science Elective** 3 Credits
- **Studio Module** Architecture Studio IV 6 Credits

Semester 5 – BArch

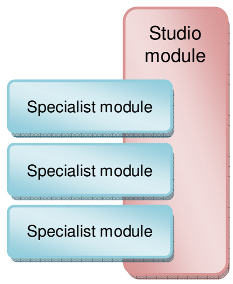
- **Mechanical and Electrical Building Systems I** 3 Credits
- **Frame Structural System and Steel** 3 Credits
- **Architectural Programming** 3 Credits
- **History of Modern Thought** 3 Credits
- **Studio Module** Architecture Studio V 6 Credits

Semester 6 – BArch

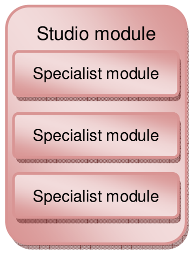
- **Reinforced Concrete and Continuous Structure** 3 Credits
- **Ecological Basis of Planning** 3 Credits
- **Building Systems II** 3 Credits
- **Social Science Elective** 3 Credits
- **Studio Module** Architecture Studio VI 6 Credits



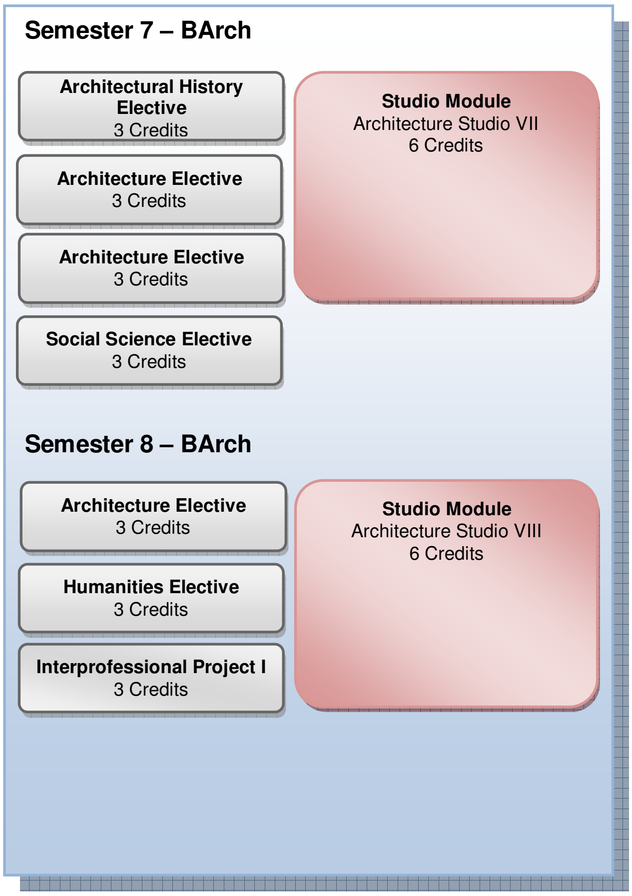
Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).

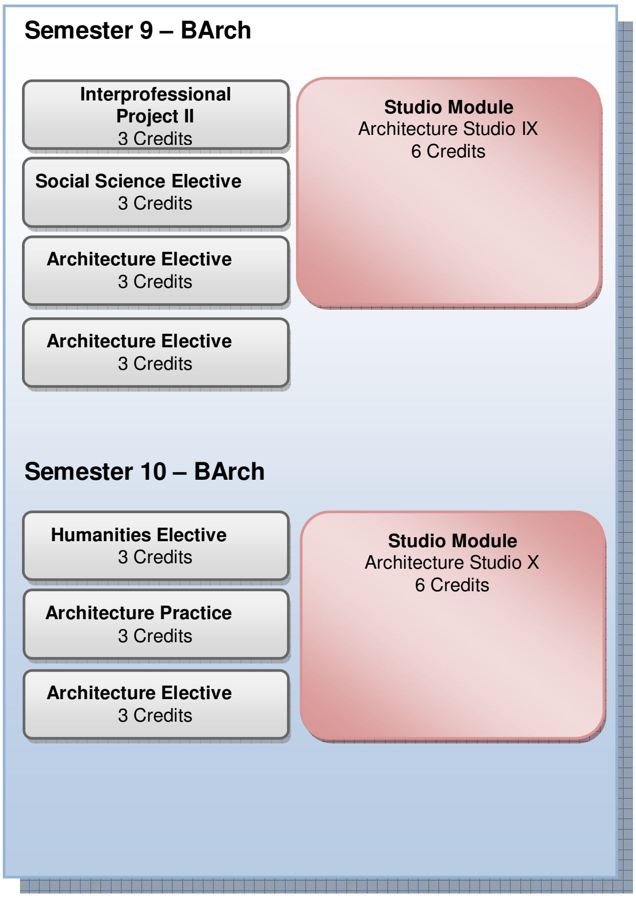


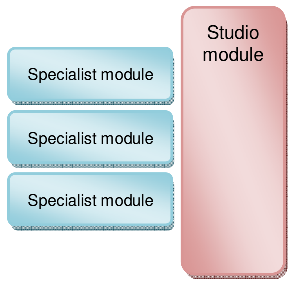
Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



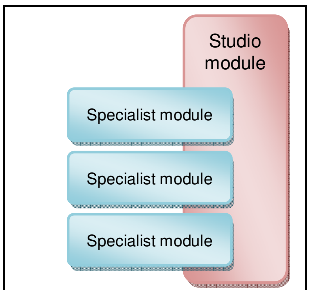
Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.



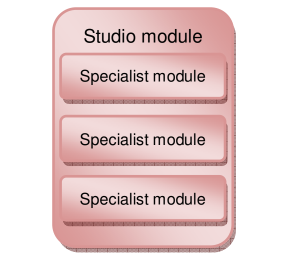




Satellite structure
Material is delivered via a lecture series and typically assessed independently of studio (e.g. by examination).



Partially integrated structure
Material is delivered via a lecture series and is partially or fully assessed within studio through project work.



Fully integrated structure
Material is delivered to meet the demands of studio in terms of both content and timing. Assessment is integral with studio project.

STRENGTHS AND OPPORTUNITIES

The IIT's architecture program is specifically structured to develop professional architects who are well prepared in the speciality of their choice. The BArch degree maximizes the benefits of an architecture education with a concentrated, yet flexible, curriculum. In addition to the BArch (5 years) degree, the IIT also offers a Master of Architecture programme (3 years professional degree programme), which serves those students seeking an advanced professional education. The degree is accredited by the National Architectural Accreditation Board (NAAB) and is a necessary component for qualification in the field. Candidates who hold a BA or BSc in Architecture (a pre-professional degree from an NAAB-recognized school) in a 4+2 program, and who have completed the equivalent of the first year's technology, history and studio courses, may qualify for up to one year of advanced standing in the professional degree program. Admission to Program 2 may allow the candidate to complete the Master of Architecture degree in as few as two years (four semesters), depending on prior preparation.

Strengths:

- The BArch degree encourages students to seek specialisation in areas that relate to sustainable environmental design, particularly at graduate and professional level;
- Sustainable design is seen as a positive and creative input in design and is integrated in a number of advanced design studios, particularly during the last two years of the curriculum.

Opportunities:

- A number of different options are offered at postgraduate level (e.g., MSc programmes) in the field of sustainable environmental design;
- To provide skilled professional practitioners, the IIT also offers double degree programmes such as the B.Arch. / M.B.A. (Master of Business Administration) and the B.Arch. / M.C.E. (Master of Civil Engineering).

SOURCES AND REFERENCES

Illinois Institute of Technology College of Architecture web site: http://www.iit.edu/arch
Academic Surveys and Feedback

UNIVERSITY OF MINNESOTA

SCHOOL OF ARCHITECTURE- COLLEGE OF DESIGN

Bachelor of Design in Architecture (4 years) + Master of Architecture (3 years)

Level: Undergraduate (BDA, 4 years) + Graduate (MArch, 3 years)

Accrediting Body: NAAB (National Architectural Accrediting Board)

Educational Aims: The College of Design offers three pre-professional 4-years undergraduate programs: Bachelor of Design in Architecture (BDA, flexible degree focused on design thinking), Bachelor of Science in Architecture (B.S. Arch., traditional approach with integration of technology) and Bachelor of Arts in Architecture (BA, liberal arts with emphasis in architecture). Each degree begins with one year in the pre-architecture program. The BDA includes many architectural electives and access to design workshops and grants access to a Master of Architecture program. Following the 4-year Bachelor, the Master of Architecture Program is both a professional and a graduate program, taught in the College of Design but awarded by the Graduate School. It prepares students for the practice and discipline of architecture as a speculative, analytic and investigative endeavour. Architectural practice, critical thinking and the design process are valued as the principal goals of the Master degree as preparation for qualification as architects. Through rigorous methods of inquiry developed in the design studio, lectures and seminars, students acquire the breadth of knowledge required of the professional architect: the techniques and processes of representation, communication and analysis; the history and theory of making architecture and urban form for human use; and the technology, systems, processes and economics of construction and practice. This degree is fully accredited by NAAB.

Outline Description of Course: The BDA requires an understanding of social, cultural and physical contexts as a foundation for the examination of the methods, values, precedents and material reality characteristic of the process of shaping natural and built environments. Each fall semester is taught in term-long coordinated courses and each spring semester contains combinations of 7-week modules. The curriculum consists of core instruction courses and electives that are tackled alternatively throughout the semesters (e.g., sustainability, urban/suburban/rural, history/theory/culture emerging practice). Half of this curriculum is devoted to create three coordinated design studios, one in each fall semester of the three-year curriculum. Each coordinated semester has a different set of sub-goals and combination of non-studio classes, but all share critical thinking as the most important learning objective. The MArch professional curriculum is structured to provide a strong foundation that encourages students to develop a vision as designers. Students are encouraged to understand the theoretical roots of their ideas in order to support design propositions from knowledge-based arguments. The integration of construction and environmental technologies is an important goal of the curriculum, as well as understanding the role of computer technology in design. The University of Minnesota only offers a 3-year MArch degree.

Course Structure: To graduate with a BDA Bachelor from the College, a minimum of 120 credits needs to be completed. The program consists mainly of courses in the selected Major and in liberal education (or upper division courses). The standard MArch programme is 90 credits (also a 3+option degree is on offer).

<u>Bachelor of Design in Architecture (4 years)</u>

Year 1 - Pre-Architecture (Common to the BDA, BS Arch. and BA)

Code	*Title*	*Credits*	*Taught*
Arch 1701	The Designed Environment	3	Fall
Math 1031	College Algebra (or Short Calculus/Calculus I)	3-4	Fall
Writ 1201	First Year Writing	4	Fall
	Liberal Education Requirement	3-4	Fall
Arch 1281	Design Fundamentals I	4	Spring
	Liberal Education Requirement (or Short Calculus/Calculus I)	3-4	Spring
Phys 1101W	Introductory College Physics	4-5	Spring
	Liberal Education Requirement	3-4	Spring
Credit Total	**27-32 Credits**		

Year 2 - Bachelor of Design in Architecture

Code	*Title*	*Credits*	*Taught*
Arch 2301	Introduction to Drawing in Architecture	4	Fall
Arch 3411	Architectural History to 1750	3	Fall
Arch 3711W	Environmental Design and the Socio-cultural Context	3	Fall
	Liberal Education Requirement	6-8	Fall
Arch 2281	Design Fundamentals II	4	Spring
Arch 3412	Architectural History since 1750	3	Spring

Arch 3611	Design in the Digital Age	3	Spring
LA 3501	Environmental Design and Biological and Physical Context	3	Spring
	Liberal Education Requirement	3-4	Spring
Credit Total	**32-35 Credits**		

Year 3 - Bachelor of Design in Architecture

Code	*Title*	*Credits*	*Taught*
Arch 32xx	Design Workshops	4	Fall
Arch 4701	Introduction to Urban Form and Issues	3	Fall
Arch 3/4xxx	*Architecture Elective*	3	Fall
Arch 44xx	*Architecture History Elective*	3	Fall
	Upper-division course outside the Major	3-4	Fall
Arch 32xx	Design Workshops	4	Spring
Arch 4561	Architecture and Ecology	3	Spring
Arch 3/4xxx	*Architecture Elective*	3	Spring
	Upper-division course outside the Major	3-4	Spring
Credit Total	**29-31 Credits**		

Year 4 - Bachelor of Design in Architecture

Code	*Title*	*Credits*	*Taught*
Arch 32xx	Design Workshops	4	Fall
Arch 3/4xxx	*Architecture Elective*	3	Fall
	Upper-division course outside the Major	6-10	Fall
Arch 3/4xxx	*Architecture Electives*	6	Spring
	Upper-division course outside the Major	7-10	Spring
Credit Total	**29-31 Credits**		

<u>Master of Architecture (3 years)</u>

Year 1 - Master of Architecture

Code	*Title*	*Credits*	*Taught*
Arch 5411	Principles of Design Theory	3	Fall
Arch 5515	Technology I: Building Materials & Construction Systems	3	Fall
Arch 8251	Graduate Architectural Design	9	Fall
Arch 5516	Technology II: Luminous & Thermal Design	6	Spring
	Project module A/B/C	4	Spring
	Electives A/B/C	6	Spring
Arch 5110	Catalyst	1	Spring
Credit Total	**32 Credits**		

Year 2 - Master of Architecture

Code	*Title*	*Credits*	*Taught*
Arch 5517	Technology III: Structural Systems	3	Fall
Arch 5621	Professional Practice in Architecture	3	Fall
Arch 8253	Graduate Architectural Design	9	Fall
Arch 8254	Technical Applications in Design	4	Spring
	Project module A/B/C	4	Spring
	Electives A/B/C	6	Spring
Arch 5110	Catalyst Spring	1	Spring
Credit Total	**30 Credits**		

Year 3 - Master of Architecture

Code	*Title*	*Credits*	*Taught*
Arch 8255	Graduate Architectural Design V	6	Fall
	Electives A/B/C	9	Fall
In the spring semester, students select Plan A or Plan C			
Arch 8299	Plan C - Master's Design Studio	10	Spring
	Elective A/B/C	3	Spring
Arch 8777	Plan A - Thesis Studio	12	Spring
Arch 5110	Catalyst	1	Spring
Credit Total	**28 Credits**		

Learning Outcomes: The BDA-MArch programme encourages interdisciplinary innovation and exploration of socially responsible and sustainable design throughout the full life cycle of products and environments. The pre-architecture track is designed to transfer students who need to complete the course prerequisites required to apply to an architecture degree. Completion of the Bachelor of Design in Architecture degree allows students to apply for a 3-year or 3+ MArch (the only professional degree offered in Minnesota).

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

In year one, **The Designed Environment** examines issues in the building design environment, including relationships between place and space, and realms of the ideal and the real, public and private. Surveys of how architecture, landscape architecture and urban design have explored these issues are also introduced.

In year two (first year of the BDA degree), **Environmental Design and the Socio-cultural Context** considers the designed environment as a cultural medium and as the product of a socio-cultural process and expression of values, ideas, and behavioural patterns. It also views design/construction as complex political process. **Environmental Design and its Biological and Physical Context** investigates the dynamic relationships between environmentally designed places and their biological and physical contexts. Case studies of successfully created integrated places and biological and physical contexts are examined.

In year three, **Architecture and Ecology** introduces theories and practices of ecological approaches to design. It includes examining the ecological context, implications and opportunities of architecture, and historical/theoretical framework for ecological design thinking. Issues are studied at various scales.

Throughout the duration of the degree, students are encouraged to take a number of electives from architecture, from other majors or from the liberal education courses, which include modules in Physical and Biological Sciences, Social Sciences and Humanities and Mathematical Thinking. Amongst them, **Environmental Technology I** which investigates issues related to environmental quality and design, exploring the basics of climate responsiveness, heating, cooling, lighting design and indoor air quality. Alternatively, students can take a Minor, such as **Environmental Design** and **Sustainability Studies**.

During the three fall semesters of the Master of Architecture, **Graduate Architectural Design** projects focus on fundamental issues of space/form/light/materiality in relation to human habitation. Design as a process of exploration and inquiry, in addition to modes and media of representation and their critical impact, are encouraged. Concurrently, at first year, **Technology I: Building Materials and Construction Systems** examines building materials (e.g., concrete, masonry, steel, timber, glass), building systems and their integration (e.g., structure, envelope, circulation, HVAC, plumbing) and construction processes.

In the second year of the MArch, **Technology II: Luminous and Thermal Design** introduces concepts and principles of daylighting, thermal, energy systems integration, and ecological thinking in support of sustainable design decision making. Objectives of the course include: ecological and holistic systems thinking; zero energy carbon neutral design; formal, aesthetic and experiential design opportunities; ecological and technological design opportunities; appropriate technology and multi-functionality; performance assessment methods and testing. The course includes three design projects, which enable students to assess and apply concepts, strategies and assessment methods through direct application to design. Students also work on a collaborative project which includes individual and group graded exercises.

The Architecture as a **Catalyst** course creates an experience where students deal with topics and/or methodologies not typically explored in the curriculum. Topical workshops analyse design methods, theories or emerging practices, etc. to raise the level of discourse about design and to provoke leaps in perception.

Throughout the MArch, the Project Modules and Electives (A/B/C) are divided into three groups: A - Building Technology & Sustainable Practices; B - History/Theory/Culture; C - Urban/Suburban/Rural. Group A includes a variety of modules that tackle sustainability issues. Amongst others, **Sustainable Design Theory & Practice** investigates history, theory and ethics of sustainable design processes and practices. The course emphasizes approaches to sustainable architecture, regional/global ecological issues, design strategies, and methods of assessment. Primary architectural and technological implications of sustainable design theory and practice that inform design thinking are analysed via research projects, case studies and fieldwork. **Daylighting and Architecture Design** analyses design approaches that combine ecological, physiological, and experiential aspects to enhance relationship to place. How formal, aesthetic, and experiential aspects of daylighting support and foster sustainable architectural design are specifically explored. **Energy and Indoor Environmental Quality Issues in Sustainable Design** introduces energy and IEQ aspects of sustainable design related to global environmental issues, and, via research projects and presentation of case studies, presents energy/IEQ strategies, methods and tools as applied to sustainable building design. **Materials Performance in Sustainable Building** explores building material properties, resource conservation, fabrication/construction processes in production of high performance sustainable building designs and the application of assessment/evaluation tools (LCA, BEES, Athena or LEED) for IEQ, waste reduction and management with an emphasis on experimental/analytic methods. **Site and Water Issues in Sustainable Design** analyses ecological principles, site analysis, integration strategies between water, site and buildings, methods and tools integrated with sustainable design issues such as energy, indoor environmental quality, and materials. The module is structured in research projects, case studies, measurement methods.

Integration of Environmental Design in the curriculum - Bachelor of Design in Architecture

Year 1 - Fall Semester

- **The Designed Environment** 3 Credits
- **College Algebra** 3-4 Credits
- **First Year Writing** 4 Credits
- **Liberal Education Requirement** 3-4 Credits

Year 1 - Spring Semester

- **Liberal Education Requirement (Maths)** 3-4 Credits
- **Liberal Education Requirement** 3-4 Credits
- **Introductory College Physics** 4-5 Credits
- **Design Fundamentals I** 4 Credits

Year 2 - Fall Semester

- **Architectural History to 1750** 3 Credits
- **Environmental Design and Socio-cultural Context** 4 Credits
- **Liberal Education Requirement** 3-4 Credits
- **Liberal Education Requirement** 3-4 Credits
- **Introduction to Drawing in Architecture** 4 Credits

Year 2 - Spring Semester

- **Architectural History to 1750** 3 Credits
- **Design in the Digital Age** 3-4 Credits
- **Environmental Design and Bio-Physical Context** 3 Credits
- **Liberal Education Requirement** 3-4 Credits
- **Design Fundamentals II** 4 Credits

Year 3 - Fall Semester

- **Introduction to Urban Form and Issues** 3 Credits
- **Architecture History Elective** 3 Credits
- **Upper-division Course outside the Major** 3-4 Credits
- **Architecture Elective** 3 Credits
- **Design Workshops** 4 Credits

Year 3 - Spring Semester

- **Architecture Elective** 3 Credits
- **Architecture and Ecology** 3 Credits
- **Upper-division Course outside the Major** 3-4 Credits
- **Design Workshops** 4 Credits

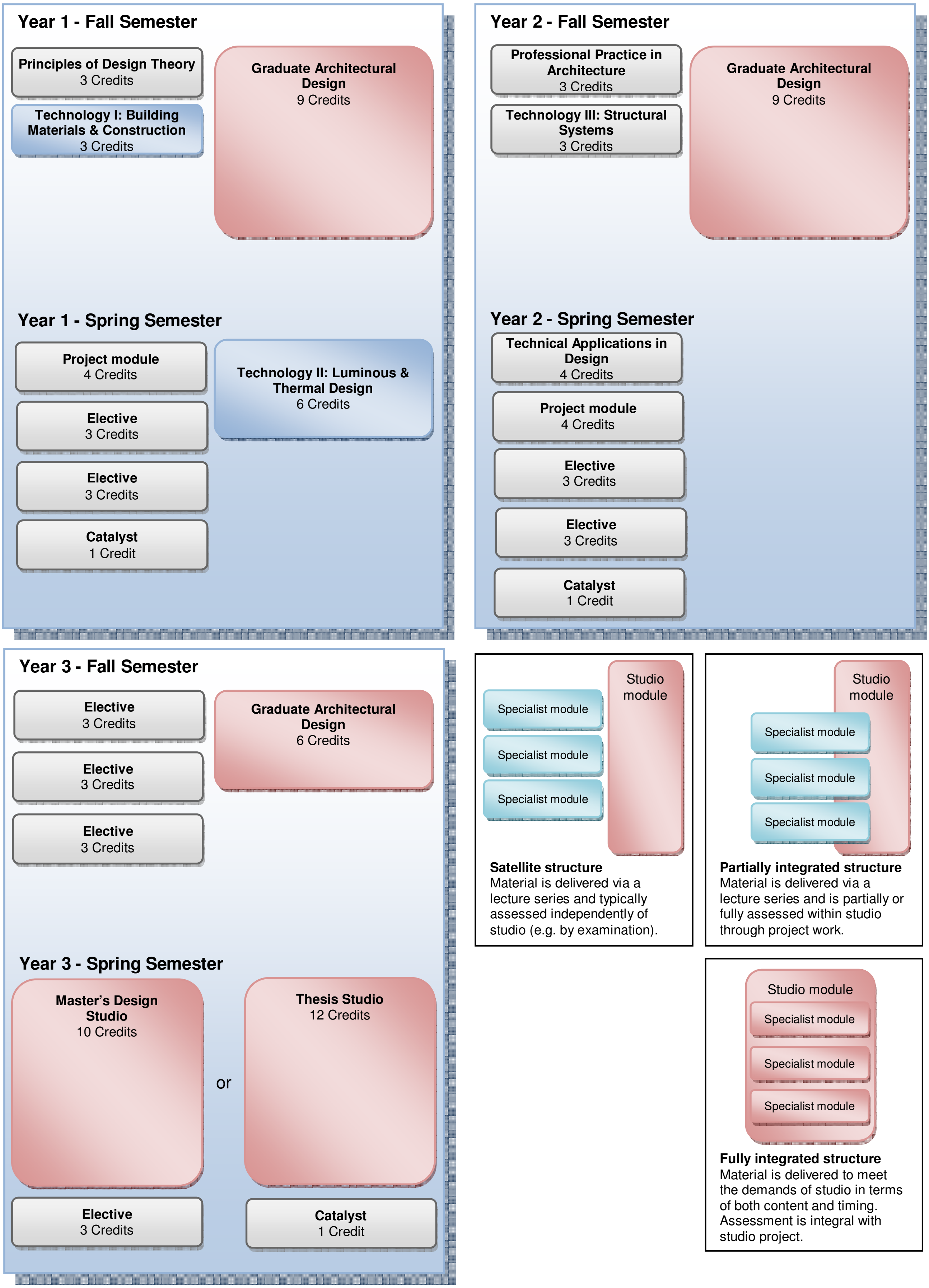
Year 4 - Fall Semester

- **Architecture Elective** 3 Credits
- **Upper-division Course outside the Major** 7-10 Credits
- **Design Workshops** 4 Credits

Year 4 - Spring Semester

- **Architecture Elective** 6 Credits
- **Upper-division Course outside the Major** 7-10 Credits

Integration of Environmental Design in the curriculum - Master of Architecture



STRENGTHS AND OPPORTUNITIES

In addition to the traditional BDA-MArch route for professional qualification, the School of Architecture at the University of Minnesota's College of Design has developed the MSc in Architecture-Sustainable Design Track. Bringing together a rich group of multidisciplinary courses, projects, and research opportunities, students can customize the program to meet their individual needs. Options for an MSc-SD + MArch professional degree are also available. The school's unique dual degree program allows students to combine professional architecture studies with a focus on sustainable design theory and practice. This dual-degree curriculum provides designers and researchers with the knowledge and expertise to address issues including energy and resource efficiency, water, waste reduction, materials, and technological innovations in sustainable design. The dual degree prepares students to integrate sustainable design practice and research in the design professions, government agencies, research institutes, and business. The MSc-SD can be completed in three semesters (34 credits). The dual degree, which combines the MSc-SD and the Master of Architecture degree (MSc-SD + MArch), can be completed concurrently as a full-time student in three-and-a-half years (100 credits). Amongst the strengths and opportunities of the curricular options on offer:

Strengths:

- Sustainable environmental design represents a significant part of the curriculum at the University of Minnesota, at undergraduate level, as in graduate and postgraduate teaching;
- Adequate resources are invested in terms of implementation of the curriculum within teaching practices;
- Significant efforts are devoted to the teaching of passive environmental strategies and energy efficiency and carbon neutrality;
- Students are strongly encouraged to explore environmental strategies in taught modules as in the practice of design studio-based courses;
- The professional programme (Master of Architecture) is founded on an integrated approach to design and technology, with sustainability representing the issue at the core of the agenda.

Opportunities:

- The development of easy computer programs and visual learning tools could facilitated the communication of technical knowledge and illustrate the results of design alternatives throughout the development of the design process.

SOURCES AND REFERENCES

University of Minnesota College of Design web site: http://www.design.umn.edu
Academic Surveys and Feedback

UNIVERSITY OF CALIFORNIA - BERKELEY

COLLEGE OF ENVIRONMENTAL DESIGN - DEPARTMENT OF ARCHITECTURE

Bachelor of Arts in Architecture (4 years) + Master of Architecture (2 years)

Level: Undergraduate (BA Arch, 4 years) + Graduate (MArch, 2 years)

Accrediting Body: NAAB (National Architectural Accrediting Board)

Educational Aims: The Department of Architecture at Berkeley has a strong tradition of fostering independent design thinking and research. Students take courses in environmental history, behavioural sciences, resource management and design theory, as well as in the technical, aesthetic and cultural components of design. The 4-year undergraduate Bachelor of Arts in Architecture combines required courses in environmental design and architecture with opportunities for highly varied individual programs. The BA Arch. degree is not accredited by NAAB, but accreditation is achieved with the professional Master of Architecture. This graduate professional program is intended to develop the students' abilities to conceive and accurately describe appropriate built spaces at several scales, to help them to learn the processes that can be used to bring buildings into place, and to provide a basis for understanding the consequences that buildings and open spaces have for their inhabitants, for society, and for the environment.

Outline Description of Course: At the lower-division level, students take an introductory course in environmental design, a two-course studio sequence in drawing and design, prerequisite courses in calculus and physics, and breadth area courses in natural sciences, social and behavioural sciences, historical studies, international studies, philosophy and values, and arts and literature. At the upper-division level, students take a two-course architecture studio sequence, a two-course architecture history sequence, three architecture "area studies" courses, and three electives within the College. Additional design and technology courses are recommended for students preparing for Master of Architecture programs. Most students are able to take one-quarter of their program as electives. The MArch program is a relatively flexible degree and is awarded to students who successfully complete a one to three years program of studies. The length of the required residence period, the number of required semester units, and the specific list of required courses varies depending upon the undergraduate major and previous studies. The Master of Architecture is the only accredited professional degree offered by UC Berkeley's Department of Architecture.

Course Structure: A total of 120 units (credits) is required for the BA degree in Architecture. The Master of Architecture is offered under 3 different structures. The 1-year Master of Architecture program (Option 1) is designed for students who have earned a five-year Bachelor of Architecture (BArch) or equivalent degree. The degree may be earned in one year (2 semesters) with the completion of 24 units of course work. The 2-year Master of Architecture program (Option 2) is intended for students who have earned architecturally focused pre-professional degrees such as the BA or BS with a major in architecture, the BS in architectural studies, or the Bachelor of Environmental Design. The degree may be earned in two years (four semesters) with the completion of at least 48 units of course work. The 3-year Master of Architecture program (Option 3), is designed for those who have earned a bachelor's degree in a field other than architecture. The program, focused around design, requires completion of 72 units of coursework in 6 semesters of enrolment.

<u>Bachelor of Arts in Architecture (4 years)</u>

Students in the architecture undergraduate program are expected to meet four sets of course requirements:

1. **University and Campus Requirements:**
   - Entry-Level Writing
   - American History
   - American Institutions
   - American Cultures
2. **College of Environmental Design (CED) Requirements:**

   Outside CED; 11 courses (36-38 units)

   1. Essential Skills Requirements
   - Two courses in reading and composition (8 units)
   - Two courses in calculus, either:
     MATH 16A (3 units) and MATH 16B (3 units), or
     MATH 1A (4 units) and MATH 1B (4 units)

   2. Seven-Course Breadth Requirements
   - One of the following two courses in Physical Science:
     PHYSICS 8A (4 units) Introductory Physics, or
     PHYSICS 7A (4 units) Physics for Scientists and Engineers

- One course in Biological Science (2-4 Units)
- One course in Social and Behavioural Sciences (2–4 Units)
- One course in International Studies (2-4 Units)
- One course in Arts and Literature (2-4 Units)
- One course in Historical Studies (2-4 Units)
- One course in Philosophy and Values (2-4 Units)

Inside CED; 6 courses, 20 units:

A. Environmental Design Lower-Division Requirements

- ENV DES 1 (3 Units) People and Environmental Design
- ENV DES 11A (4 Units) Introduction to Visual Representation and Drawing
- ENV DES 11B (5 Units) Introduction to Design (with 1-unit graphics module)

B. Electives

- Three upper-division elective courses (9 units) in CED but outside the Department of Architecture

3. Architecture Major Requirements, 7 courses, 32 units:

A. Architectural Design and Representation; Professional Practice. Two required courses (12 units):

- ARCH 100A (6 units) Fundamentals of Architectural Design (with 1-unit graphics module)
- ARCH 100B (6 units) Fundamentals of Architectural Design (with 1-unit graphics module)

B. Architectural History, Culture, and Society. Three required core courses (11-12 units):

- ARCH 170A (4 units) An Historical Survey of Architecture and Urbanism (Part 1)
- ARCH 170B (4 units) An Historical Survey of Architecture and Urbanism (Part 2)
- ARCH 110AC (4 units) The Social and Cultural Basis of Design or ARCH 130 (3 units) Introduction to Design Theories and Methods

C. Architectural Technologies and Building Performance. Two required core courses (8 units) from the following:

- ARCH 140 (4) Energy and Environment
- ARCH 150 (4) Introduction to Structures
- ARCH 160 (4) Introduction to Construction

4. General Electives, 29-31 units:

These may be taken inside or outside of CED. The University requires 120 units minimum for graduation. No more than 48 units total in the student's major department will be credited toward the 120 minimum for graduation, so only 16 units beyond the required courses may be courses in architecture. 13-15 units must be taken in other Departments. The minor program allows students to take a minor in a subject outside architecture by taking five upper-division courses (18 units) of their electives in an approved subject area. The Department of Architecture offers the following minor programs: Architecture; Environmental Design and Urbanism in Developing Countries; History of the Built Environment; Social and Cultural Factors in Environmental Design; Sustainable Design.

Master of Architecture (2 years, Option 2)

1. Architectural Design (5 courses, 23-24 units)
   - Three semesters of ARCH 201 (5) Case Studies in Architectural Design
   - Final Project (final semester): Thesis (2 courses, 8-9 units)
     - ARCH 209D Thesis Prep Seminar (3) or ARCH 281 Methods of Inquiry in Architectural Research (4)
     - ARCH 202A Thesis Studio (5) or ARCH 202B Independent Thesis (5)
2. Architectural Method and Practices (2 courses, 6-7 units)
   - Professional Practices (ARCH 120-229 series) (3)
   - Theories and Methods (ARCH 130-239 series) (3-4)
3. Architectural Sciences (3 courses, 11-12 units)
   - Building Sciences (ARCH 140 or other course from 140-249 series) (4)
   - Building Structures (ARCH 150 or other course from 150-259 series) (4)
   - Construction and Materials (ARCH 160-269 series) (3-4)
4. Architectural Humanities (2 courses, 7-8 units, unless equivalent courses were taken in undergraduate curriculum)
   - Social and Cultural Processes in Architecture and Urbanism (ARCH 110-219 series) (3-4)
   - History of Architecture and Urbanism (ARCH 170-279 series) (4)
5. Elective Units

   Depending on the required courses a student has taken, he/she may have as many as 25 electives units.

Learning Outcomes: The aim of the course is to provide strong principles of multidisciplinary collaboration and respect for experimentation rooted in social, cultural, and environmental values. Undergraduate studies provide pre-professional competency for entry-level employment in architecture, the option for graduate work in architecture, or further studies in a related environmental design field. The graduate professional program in architecture develops students' abilities to visualize and accurately describe proper built spaces at several scales and helps them to learn the processes incorporated for the purpose of bringing buildings into place.

EXECUTIVE SUMMARY - Environmental Design in the Academic Curriculum

The BA in Architecture (4 years) combines required courses in environmental design and architecture with opportunities for individual programs. Amongst the courses taken inside CED, **People and Environmental Design** studies environmental awareness and environmental design, introducing surveys on the relationships between people and environments, designed and non-designed, with an emphasis on activism and sustainability, interpretations of architecture, landscapes and urban planning. The goal is to promote an understanding of the forces that shape the human-made environment and the role-played by design professionals. A mid-term examination and a final project are required for assessment.

Within the Architecture Major requirements, **Fundamentals of Architectural Design** offers introductory courses in the design of buildings. The problems analysed emphasize the major social, technological, and environmental determinants. ARCH 100A focuses on the design process, social factors, and site planning, whilst ARCH 100B analyses structures, materials, and energy considerations. **Energy and Environment** presents a study of the thermal and lighting environments in buildings, with emphasis on quantitative design techniques. This course - also available to Master's students - provides an introduction to physical building performance including building thermodynamics, daylighting, solar control, energy efficiency, ecology, and responsible design. The course also provides an analysis of broader building science topics including mechanical system design, microclimate, and current developments in energy-efficient design.

Amongst the electives on offer, **Sustainability Colloquium** features presentations on a variety of topics related to sustainability, offering perspectives from leading practitioners, architectural designers, city planners, consultants, engineers, and researchers. **Special Topics in Energy and Environment** includes analysis of climatic design, heating, ventilation, air-conditioning systems, lighting, and acoustics.

Within the MArch, a number of elective courses are related to sustainable environmental design. Amongst them, **Advanced Study of Energy and Environment** deals with minimizing energy use for designing and operating sustainable buildings that greatly improve indoor environmental quality. The course presents quantitative and qualitative methods for assessing energy performance during design of both residential and commercial buildings. Students get hands-on experience with state-of-the-art software - ranging from simple to complex - to assess the performance of building components and whole-building designs.

Natural Cooling: Sustainable Design for a Warming Planet focuses on a wide range of passive cooling strategies, including solar control, natural ventilation, radiation, evaporation and earth-contact cooling and their treatment in architectural design. Throughout the course, case studies and design exercises are used as tools for exploring these questions. Students also use the wind tunnel to explore design solutions.

Daylighting is an exercise-based seminar which explores qualities of daylight with attention to developing an understanding of the physical and perceptual mechanisms that shape our experience of daylight. Students use three-dimensional models as a tool for the investigation of daylight in buildings. In contrast to the complexity of a computer simulation, physical models offer a practical tool for understanding and quantifying natural light in architectural space and provide immediate visual information for assessment of qualitative issues. Student work includes the construction and analysis of lighting models as well as a series of exercises designed to foster students' capacities to observe and understand light.

The **Green Studio Companion: Generative Tools for Bioclimatic Design** seminar explores the potential of both analytical and phenomenological notions of building performance to shape architectural design. The class focuses on deriving sustainable strategies from an understanding of human perception and response in a quick and generative fashion. Quantitative analysis using calculations and simulations alternate with speculative explorations based on responses to theoretical texts, art films, and environmental artists' work. Both of these "right-brain" and "left-brain" modes of analysis inform short design interventions. The term project is completed in teams and involves analyzing and re-designing select components of a prominent case study building. The project is divided into four parts: climate, heat, air, and light. Each topic is analyzed using a quantitative method one week and then a qualitative method the next. Project teams incrementally re-design components of the case study in order to apply the principles and poetics that they've discovered.

The **Case of Sustainable Neighbourhoods** course takes the form of a seminar which examines and evaluates the "best practices" of sustainable neighbourhood design from around the globe. It explores the multiple strategies and processes for achieving sustainability, their assumptions, their whole-systems integration and their impact on landscape, architecture and urban design. Where available, the seminar evaluates performance data. The argument for sustainability at the neighbourhood scale, rather than at the building scale, is based on the larger system of flows - the climate, ecology, geomorphology, energy, water, waste, transportation and food available from which to design a self-sustaining integrated system. The purpose is to engage students in cutting-edge thinking on how to create sustainable neighbourhoods.

The **Secret Life of Buildings** is a three-hour seminar per week that addresses architectural, lighting, and mechanical systems in existing buildings with attention to energy use, occupant well-being, and architectural space making. Analysis of collected data and their comparison with simulation tools provides a foundation for understanding the more abstract tools and standards used by designers in practice. Several measurement projects are conducted by teams, addressing issues from lighting patterns to thermal comfort.

Integration of Environmental Design in the Curriculum - Bachelor of Arts in Architecture (4 years)

College of Environmental Design Requirements

Outside CED; 11 courses (36-38 units):

1. Essential Skills Requirements:
   - Two courses in reading and composition (8 units)
   - Two courses in calculus: Either
     Math 16A (3 units) and Math 16B (3 units) or
     Math 1A (4 units) and Math 1B (4 units)
2. Seven-Course Breadth Requirements:
   - One of the following two courses in Physical Science:
     PHYSICS 8A (4 units) Introductory Physics or
     PHYSICS 7A (4 units) Physics for Scientists and Engineers
   - One course in Biological Science (2-4 Units)
   - One course in Social and Behavioural Sciences (2-4 Units)
   - One course in International Studies (2-4 Units)

11 courses, 36-38 units

Inside CED, 6 courses- 20 units

People and Environmental Design ED1
3 units

Introduction to Visual Representation and Drawing ED11A
4 units

Introduction to Design ED11B
5 units

Upper-division elective course
3 units

Upper-division elective course
3 units

Upper-division elective course
3 units

Outside the Department of Architecture

6 courses, 20 units

Architecture Major Requirements

Fundamentals of Architectural Design ARCH100A
6 units
+
Fundamentals of Architectural Design ARCH100B
6 units

An Historical Survey of Architecture and Urbanism (Part 1) ARCH170A
4 units
+
An Historical Survey of Architecture and Urbanism (Part 2) ARCH170B
4 units

The Social and Cultural Basis of Design ARCH110AC
4 units
Or
Introduction to Design Theories and Methods ARCH 130
3 units

Energy and Environment ARCH140
4 units

Introduction to Structures ARCH150
4 units

Introduction to Construction ARCH160
4 units

(2 of 3)

7 courses, 32 units

GENERAL ELECTIVES 29-31 units

STRENGTHS AND OPPORTUNITIES

The College of Environmental Design offers an undergraduate and graduate program which is based on the multidisciplinary interests of the faculty and includes collaborations with a variety of other disciplines, such as anthropology, international studies, engineering, new media, and urban studies. Through its core courses, the BA Arch – MArch degree offers a broad introduction to the field of architecture and, encouraging studies in related areas, it provides opportunities to prepare for specialization in the field of architectural design and representation, architectural technologies, environmental design, building performance, history, and society and culture. Amongst the strengths and opportunities of the curriculum on offer:

Strengths:

- Sustainable environmental design represents a substantial part of the curriculum at the CED - Department of Architecture both at undergraduate level and, particularly, in graduate and postgraduate teaching;
- Significant resources are invested in terms of implementation of the curriculum within teaching practices;
- Students are strongly encouraged to explore environmental strategies in taught modules as in the practice of design studio-based courses.

Opportunities:

- There is a request to expand the teaching and understanding of basic ecology since this would benefit architectural education in most programs;
- Current areas of focus include an emerging position in the application of digital-design media, ongoing studios and seminars that embrace an international perspective, and a continued commitment to emphasis on design and ecology.

SOURCES AND REFERENCES

UC Berkeley CED Department of Architecture web site: http://arch.ced.berkeley.edu/
Academic Surveys and Feedback

APPENDIX

SUMMARY OF CRITERIA FOR ACCREDITATION AND QUALIFICATION

The National Architectural Accrediting Board (NAAB)

Accreditation of postsecondary institutions in the USA originated almost a century ago. In 1932, the *Association of Collegiate Schools of Architecture (*ACSA) abandoned the use of standard minima, causing an eight-year pause in the profession's national system of education until the ACSA, the American Institute of Architects (AIA), and the National Council of Architectural Registration Boards (NCARB) established the NAAB and gave it the authority to accredit schools of architecture nationally.

The NAAB's founding agreement of 1940 announced its intention to create an integrated system of architecture education that would allow schools with varying resources and circumstances to develop their programs according to their particular needs. As architecture education and practice became more complex, the NAAB continued to revise its accrediting process in response to the advice of its various constituencies. At first, ad hoc committees were formed to address specific concerns identified by one of the organizations within architecture, allied professional organizations, or regional and federal agencies. Today, the process of review and revision has become a formalized process of validation. The NAAB initially accredited Schools of Architecture, but at present it actually accredits the professional degree programs within schools, although other programs are reviewed on an advisory basis when they are identified by a school as being relevant to its professional program. In addition, accrediting standards have evolved to include general studies in combination with professional and elective studies, outcome-based performance criteria for evaluating student work, and procedures for guiding the accreditation process. The mission of the National Architectural Accrediting Board is leadership in, and the establishment of, educational quality assurance standards to enhance the value, relevance, and effectiveness of the architectural profession. The NAAB is the only agency in the United States that accredits professional degree programs in architecture.

The NAAB accredits the following professional degree programs: the Bachelor of Architecture (BArch), the Master of Architecture (MArch), and the Doctor of Architecture (DArch). The curricular requirements for awarding these degrees must include professional studies, general studies, and electives. Schools offering the degrees BArch, MArch, and/or DArch are strongly encouraged to use these degree titles exclusively with NAAB-accredited professional degree programs.

The U.S. model for accreditation is based on the values of independent decision-making by institutions, the ability of institutions to develop and deliver postsecondary education within the context of their mission and history, the core tenets of academic freedom, and the respect for diversity of thought, pedagogy, and methodology. These principles and practices have remained stable over the past 60 years. Voluntary accreditation is distinguished by five components, which also guide the NAAB’s policies and procedures:

1. It is provided through private agencies;
2. It requires a significant degree of self-evaluation by the institution or program, the results of which are summarized in a report to the Board;
3. A team conducts a visit;
4. Recommendations or judgments about accreditation are made by expert and trained peers;
5. Institutions have the opportunity to respond to most steps in the process.

NAAB 2009 Conditions for Accreditation

The *NAAB Conditions for Accreditation* apply to all programs seeking continued accreditation, candidacy, continuation of candidacy, or initial accreditation beginning April 1, 2010. They define the minimum standards that professional degree programs in architecture are expected to meet in order to ensure that students are prepared to move to the next steps in their careers including internship and professional qualification. Specific areas and levels of excellence will vary among accredited degree programs, as well as the approaches to meeting the conditions and reporting requirements. Nevertheless, schools must present complete and accurate information to demonstrate compliance with each of the elements required. The positive aspects of a degree program in one area cannot override deficiencies in another.

As part of the Conditions for Accreditation, the *Architecture Program Report* (*APR*) serves both as a self-study for the program and as the principal source document for conducting the visit. It is constituted by:

Part One (I): Institutional support and commitment to continuous improvement
Part Two (II): Educational outcomes and curriculum
Part Three (III): Progress since the last site visit
Part Four (IV): Supplemental information

Within *Part Two (II): Educational Outcomes and Curriculum*, the program must document its current performance relative to student learning and the curricular framework for learning and student achievement. Specifically:

- Programs must demonstrate that graduates are learning at the level of achievement defined for each of the Student Performance Criteria (SPC) that are listed in this Part. Compliance is evaluated through the review of student work.
- Programs must also demonstrate their compliance with requirements that address the curricular framework for NAAB accredited degrees.
- Programs must document their processes for evaluating students admitted to the professional degree.

This Part is composed by four sections that address the following aspects:

- *Student Performance*. This section includes the Student Performance Criteria (SPC).
- *Curricular Framework*. This section addresses the program and institution relative to regional accreditation, degree nomenclature, credit hour requirements, general education and access to elective study as well as accurate public information concerning the accredited and non-accredited architecture programs. In this section, programs are asked to describe the process by which curriculum is evaluated and how changes or modifications are proposed and implemented.
- *Evaluation of Preparatory/Pre-professional Education*. The NAAB recognizes that students entering an accredited program from a pre-professional program and those entering an accredited program from a non-pre-professional degree program have different needs, aptitudes and knowledge bases. In this section, programs are required to demonstrate the process by which incoming students are evaluated and to document that the SPC expected to have been met in educational experiences in non-accredited programs have indeed been met.
- *Public Information*. The NAAB expects accredited degree programs to provide information to the public regarding accreditation activities and the relationship between the program and the NAAB, as well as career information for students and parents.

Within *Part Two (II): Section 1 - Student Performance - Educational Realms & Student Performance Criteria*, the accredited degree program must demonstrate that each graduate possesses the knowledge and skills defined by the criteria defined. The knowledge and skills are the minimum for meeting the demands of an internship leading to registration for practice. The school must provide evidence that its graduates have satisfied each criterion through required coursework. If credits are granted for courses taken at other institutions or online, evidence must be provided that the courses are comparable to those offered in the accredited degree program. The criteria encompass two levels of accomplishment:

- *Understanding*: The capacity to classify, compare, summarize, explain and/or interpret information.
- *Ability*: Proficiency in using specific information to accomplish a task, correctly selecting the appropriate information, and accurately applying it to the solution of a specific problem, while also distinguishing the effects of its implementation.

Student Performance Criteria (SPC)

For the purpose of accreditation, graduating students must demonstrate understanding or ability as defined in the Student Performance Criteria (SPC). The SPCs are organized into realms to more easily understand the relationships between individual criteria:

Realm A: Critical Thinking and Representation:
Architects must have the ability to build abstract relationships and understand the impact of ideas based on research and analysis of multiple theoretical, social, political, economic, cultural and environmental contexts. This ability includes facility with the wider range of media used to think about architecture including writing, investigative skills, speaking, drawing and model making. Students' learning aspirations include:

- Being broadly educated.
- Valuing lifelong inquisitiveness.
- Communicating graphically in a range of media.
- Recognizing the assessment of evidence.
- Comprehending people, place, and context.
- Recognizing the disparate needs of client, community, and society.

Realm B: Integrated Building Practices, Technical Skills and Knowledge:
Architects are called upon to comprehend the technical aspects of design, systems and materials, and be able to apply that comprehension to their services. Additionally they must appreciate their role in the implementation of design decisions, and the impact of such decisions on the environment.

Students learning aspirations include:
- Creating building designs with well-integrated systems.
- Comprehending constructability.
- Incorporating life safety systems.
- Integrating accessibility.
- Applying principles of sustainable design.

Realm C: Leadership and Practice:
Architects need to manage, advocate, and act legally, ethically and critically for the good of the client, society and the public. This includes collaboration, business, and leadership skills. Student learning aspirations include:
- Knowing societal and professional responsibilities.
- Comprehending the business of building.
- Collaborating and negotiating with clients and consultants in the design process.
- Discerning the diverse roles of architects and those in related disciplines.
- Integrating community service into the practice of architecture.

Selected Excerpts (full document is available at http://www.naab.org/accreditation/2009_Conditions.aspx):

"*A.6. Fundamental Design Skills: Ability to effectively use basic architectural and environmental principles in design* […]

B.3. Sustainability: Ability to design projects that optimize, conserve, or reuse natural and built resources, provide healthful environments for occupants/users, and reduce the environmental impacts of building construction and operations on future generations through means such as carbon-neutral design, bioclimatic design, and energy efficiency.

B. 4. Site Design: Ability to respond to site characteristics such as soil, topography, vegetation, and watershed in the development of a project design.

B. 5. Life Safety: Ability to apply the basic principles of life-safety systems with an emphasis on egress.

B. 6. Comprehensive Design: Ability to produce a comprehensive architectural project that demonstrates each student's capacity to make design decisions across scales while integrating the following SPC:
A.2. Design Thinking Skills
A.4. Technical Documentation
A.5. Investigative Skills
A.8. Ordering Systems
A.9. Historical Traditions and Global Culture
B.2. Accessibility
B.3. Sustainability
B.4. Site Design
B.5. Life Safety
B.8. Environmental Systems
B.9. Structural Systems

[…]

B.8. Environmental Systems: Understanding the principles of environmental systems' design such as embodied energy, active and passive heating and cooling, indoor air quality, solar orientation, daylighting and artificial illumination, and acoustics; including the use of appropriate performance assessment tools.

[…]

B. 10. Building Envelope Systems: Understanding of the basic principles involved in the appropriate application of building envelope systems and associated assemblies relative to fundamental performance, aesthetics, moisture transfer, durability, and energy and material resources.

B. 11. Building Service Systems: Understanding of the basic principles and appropriate application and performance of building service systems such as plumbing, electrical, vertical transportation, security, and fire protection systems.

B. 12. Building Materials and Assemblies: Understanding of the basic principles utilized in the appropriate selection of construction materials, products, components, and assemblies, based on their inherent characteristics and performance, including their environmental impact and reuse."

National Council of Architectural Registration Boards (NCARB)

The National Council of Architectural Registration Boards (NCARB) represents the architectural licensing board across the 50 states, the District of Columbia, Guam, Puerto Rico, and the U.S. Virgin Islands. The Council governs the process that provides the standardised architectural registration examination recognised by the registration boards in the USA. This organisation has also a critical indirect role in architectural education as the Council develops and recommends standards for architectural qualification and practice. The services provided by NCARB include a process for certifying to the member boards that an individual has met uniform qualification for registration, thus implementing a method of reciprocity between jurisdictions for individual architects. This process refers to the NCARB Education Standard for clarification on architectural education requirements. The NCARB Education Standard and the NAAB Conditions for Accreditation are the two principal documents affecting architectural education and practice in the USA.

To practice architecture in the United States, persons must be registered in a jurisdiction (state, territory, or the District of Columbia) by demonstrating their qualifications through education, training, and examination. Each jurisdiction sets its own specific requirements for registration within its boundaries, but generally each requires an applicant to have eight years of a combination of education and training and to have passed an examination testing the applicant's knowledge, skills, and abilities. To help its Member Boards develop consistent registration standards that will facilitate the ability of architects to practice in other jurisdictions, NCARB establishes recommended standards for education and training and develops a uniform qualification examination. In addition, NCARB provides the following services for architects:

- compiles and evaluates a record of credentials, including good character, education, training, examination, and registration;
- maintains the architect's record in a condition suitable for transmittal to any governmental authority that registers architects;
- grants a Certificate to an architect who meets the requirements in the areas of good character, education, training, examination, and registration;
- transmits an architect's record to a jurisdiction in support of the architect's application for registration;
- creates and administers the Professional Development Program (PDP) that may be used by architects to meet Member Boards' and other continuing education requirements.

To qualify for registration, applicants must hold a professional degree in architecture from a program accredited by the National Architectural Accrediting Board (NAAB) or the Canadian Architectural Certification Board (CACB) not later than two years after the graduation, or hold a professional degree in architecture, certified by the CACB, from a Canadian university.

Applicants without a degree from a National Architectural Accrediting Board (NAAB)-accredited professional degree program or from a Canadian Architectural Certification Board (CACB)-accredited professional degree program, who are seeking registration, must meet the following conditions:

A. Satisfaction of *NCARB's Broadly Experienced Architect* program, which permits an applicant with the required years of comprehensive architectural experience gained while holding a registration issued by any U.S. jurisdiction to demonstrate that a combination of education and/or comprehensive architectural experience satisfies all of his/her education deficiencies with respect to the NCARB Education Standard set forth in the Education Guidelines. The required years are:

- Six years for architects who hold a pre-professional degree in architecture awarded by a U.S.-regionally accredited institution or the Canadian equivalent, or
- Eight years for architects who hold any other baccalaureate or higher degree, or
- Ten years for architects who do not hold a post-secondary baccalaureate or higher degree.

B. With respect to applicants with a degree in the field of architecture granted by an academic institution outside the U.S. and Canada, an evaluation report is needed stating that they have met the NCARB Education Standard.

Applicants who hold an accredited degree must have completed the *Intern Development Program* (IDP), which ensures exposure to the diverse areas of the practice of architecture. The IDP objectives are to:

- Facilitate the transition from education to professional practice;
- Provide a validated list of experience areas essential for the competent, comprehensive practice of architecture;
- Provide a uniform system for documentation and periodic assessment of progress;
- Identify alternative means of acquiring experience to supplement on-the-job opportunities.

The intern architects needs to earn 700 training units (TUs) diversified into 16 categories; each TU is equivalent to 8 hours of experience working under the direct supervision of a licensed architect. To begin participation in the IDP, an applicant shall have established an NCARB Record and met all requirements for eligibility listed in the IDP Guidelines, which may be revised from time to time by NCARB. The IDP Guidelines describe the specific training requirements including eligibility to begin participation in the IDP, work settings, training categories, training areas, training unit minimums and maximums, timely reporting and verification of training experiences. In lieu of completing the IDP, NCARB will accept any of the following:

1) Registration by an NCARB Member Board for five consecutive years and submission of satisfactory evidence showing that the practice gained included exposure to each of the IDP training areas.
2) Five years of foreign experience as a principal in an organization whose architectural practice encompasses the comprehensive practice of architecture including each training category found in the IDP Guidelines and submission of evidence satisfactory to NCARB showing that the experience gained included exposure to each of the IDP training areas.
3) Registration by an NCARB Member Board before July 1, 1996, and satisfaction before or after that date of the NCARB training requirements existing on June 30, 1996.
4) Satisfaction of the NCARB training requirements existing on June 30, 1996.
5) Satisfactory completion of the Canadian Intern Architect Program.

To gain registration, applicants must have passed the *NCARB Architect Registration Examination* (ARE) or the *NCARB Professional Examination*, including either the Qualifying Test or the Equivalency Examination, when required by NCARB standards; or the NCARB examination syllabus, provided such examinations and the pass/fail standards applied were in accordance with NCARB standards current at the time graduates took the examination. The ARE assesses candidates for their knowledge, skills, and ability to provide the various services required in the practice of architecture. The ARE has been adopted for use by all 54 U.S. Member Boards and the Canadian provincial and territorial architectural associations as a registration examination required for architectural registration. The ARE is structured in the following divisions:

- Programming, Planning & Practice
- Site Planning & Design
- Building Design & Construction Systems
- Schematic Design
- Structural Systems
- Building Systems
- Construction Documents & Services

NCARB Education Standard

The NCARB Education Standard has been adopted by many of the registration boards in the United States as a basic requirement for registration as an architect. A professional degree in architecture received from an academic institution in the United States or Canada will satisfy the NCARB Education Standard if the degree program was accredited by the National Architectural Accrediting Board (NAAB) or by the Canadian Architectural Certification Board (CACB) not later than two years after the degree was received. A professional degree in architecture from a Canadian university certified by the CACB will also satisfy the NCARB Education Standard. A professional degree may be a Bachelor of Architecture, a Master of Architecture, or a Doctorate of Architecture. Pre-professional degrees in architectural studies, post-professional Master of Architecture degrees, and post-professional degrees in related fields do not satisfy the NCARB Education Standard, but may satisfy requirements evaluated by EESA - Education Evaluation Services for Architects. Foreign-educated applicants to registration in the USA, other than those applying under the *Broadly Experienced Foreign Architect* (BEFA) Program, must have their educational credentials evaluated through the Education Evaluation Services for Architects (EESA). The EESA is administered by the National Architectural Accrediting Board (NAAB). A broadly experienced architect is one who can demonstrate that the NCARB Education Standard has been met through a combination of education and comprehensive architectural experience.

Selected excerpts: (full document is available at http://www.ncarb.org/Studying-Architecture):

"*The NCARB education requirements, as well as ways to satisfy any identified deficiencies, are described below and on the following pages. The following education requirements have been developed to approximate an NAAB-accredited degree program in architecture. A minimum of 160 semester hours (240*

quarter hours) of academic credit is required and is grouped into six subject areas: general education; history, human behaviour, and environment; technical systems; practice; design; and electives."
History, Human Behaviour, and Environment Requirement

At least 16 semester hours of credit in:
- *History*
- *Human Behaviour*
- *Environment*

The 16 semester hours of credit may be completed in one or more of the three areas.

[...]

Environment

Environment is defined as the constructed artefacts, service infrastructure, and climatic, geographic, and other natural characteristics of the site that influence the setting for architecture. Acceptable topics include landscape architecture, site analysis, site planning, and urban planning as they relate to physical form and structure of the environment.

[...]

Environmental Control Systems (at least 6 credits)

Environmental control systems are defined as building elements that pertain to the modification of the microclimate for purposes of human use and comfort. Acceptable topics include acoustics, air conditioning, building core systems, energy, energy efficiency, energy transmission, environmental systems, fire protection, heating, lighting (natural and artificial), plumbing, sanitary systems, solar energy utilization, and sound.

[...]

Design requirement

At least 50 semester hours of credit, including a Level V design studio sequence. Each level must have a minimum of eight semester hours and a maximum of 12 semester hours. Design is defined as analysis, synthesis, judgment, and communication that architects use to understand, bring together, assess, and express the ideas that lead to a built project.

Design is divided into five levels. These levels are:

Level I: Individual learning experiences within a non-building spatial context; beginning user consciousness with a familiarity of spatial analysis, design process methodology, and development of communication skills; design literacy.

Level II: The foundation sequence continues with greater emphasis on the environment, user space study, and further skill development; introduction of qualitative technical materials; a minimum proficiency in the design and communication of simple buildings with an introductory understanding of construction and structural systems; data analysis, programming, site analysis, and design.

Level III: Simple and complex building case studies with qualitative technical input; individual and group projects; total building synthesis developed; a general proficiency in the complete design of simple buildings with a minimum ability to deal with complex buildings and multibuilding complexes; site analysis and design.

Level IV: The synthesis of complex building and multi-building complexes within the urban context; integration of technical information; general proficiency in the total synthesis of complex buildings and related systems; transportation, communication, life-safety systems, and social ramifications of architecture.

Level V: Project emphasis on complex building design, planning, and urban design; Level V work must indicate a mastery of data collection, analysis, programming, planning, building design, structures, building systems, landscape design, and other related knowledge."

SOURCES AND REFERENCES

NAAB website: www.naab.org
NCARB website: www.ncarb.org