

Reformation of the Curricula on Built Environment in the Eastern
Neighbouring Area

Market Need Analysis for Built Environment Higher Education

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February 2013

DRAFT VERSION



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1 Introduction

In order to implement one of the central goals laid out in the CENEAST project's WP2, a Market Need Analysis for Higher Education in Built Environment has been performed. To identify the evolving needs in the market of built environment and the need for energetically and ecologically sustainable, affordable and healthy built environment, the Vision for Civil Engineering in 2025 published by the American Society of Civil Engineers has been considered; it has been used as a guide to determine the skills a civil engineer will have to possess in 2025. Our detailed analysis was carried out taking into account the following statements:

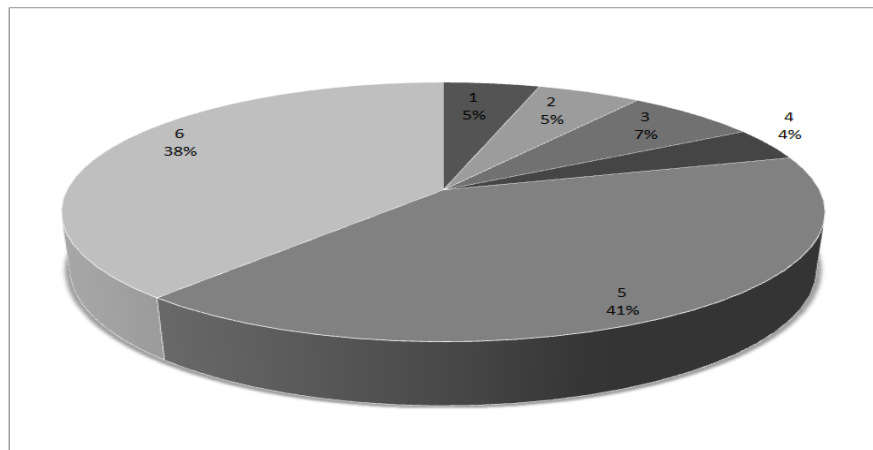
- 1) the graduates shall have sufficient knowledge and skills for the implementation of the following projects;
- 2) the graduates shall have to assess economic, social and environmental context;
- 3) the graduates shall have particular practical skills;
- 4) engineering programmes shall train students in the following subjects;
- 5) engineering programmes shall train students for competent execution of research tasks;
- 6) all students shall assimilate principles of research during studies;
- 7) students shall have the following general intellectual skills;
- 8) graduates shall have skills transferable to other areas.

Existing BSc, MSc and PhD study programmes promoting energetically and ecologically sustainable, affordable and healthy built environment were analysed as well. The analysis included an overview of corresponding study programmes available around the globe, including the lists of their modules. The modules were also analysed to determine which module topics were the most common in such programmes. The final step was an analysis of books dealing with the module topics and available worldwide. According to the findings the themes for BSc, MSc and PhD modules was recommended.

2 Evolving needs in the built environment market and need for energetically and ecologically sustainable, affordable and healthy built environment

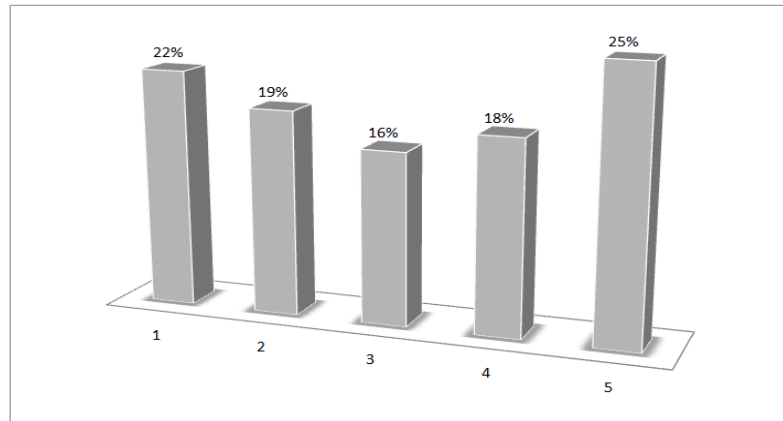
To identify the evolving needs in the market of built environment and the need for energetically and ecologically sustainable, affordable and healthy built environment, the Vision for Civil Engineering in 2025 published by the American Society of Civil Engineers has been considered; it has been used as a guide to determine the skills a civil engineer will have to possess in 2025. Our detailed analysis was carried out taking into account the following statements:

- 1) **The graduates shall have sufficient knowledge and skills for the implementation of the following projects** (ASCE Curriculum ..., 2007, ASCE Task ..., 2007, Jha and Lynch, 2007, Lynch, et al. 2007)



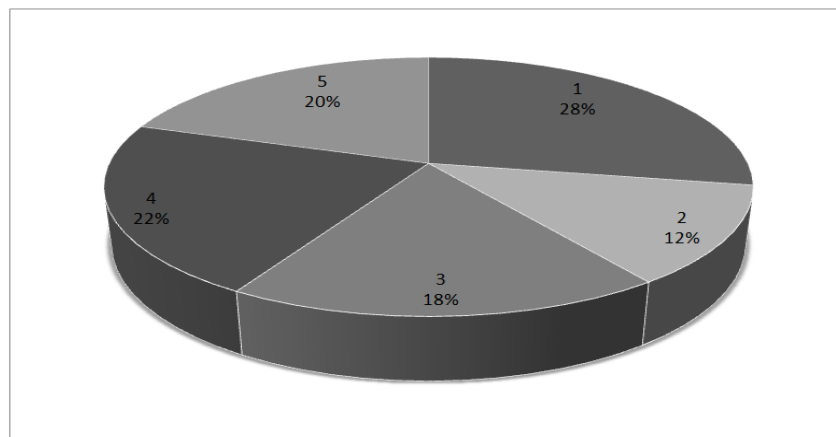
- 1 - Investigation and definition of the issue, determination of limits set for external environment, balance, health, safety, risk of the Project
- 2 - Understanding of costumers' needs, importance of esthetical and other qualitative parameters
- 3 - Determination and management of costs and expenditures
- 4 - Creative determination of modern decisions
- 5 - Ensuring effective implementation of team goals within the whole life cycle of the project (production, management, supervision, disposal, etc.)
- 6 - Management of Project development process and assessment of the results gained

2) The Graduates shall be able to assess economical, social and environmental context
(ASCE Curriculum ..., 2007, ASCE Task ..., 2007, Jha and Lynch, 2007, Lynch, et al. 2007)



- 1 - Understanding of commercial and economical context of engineering process
- 2 - Knowledge about management methods, in order to gain engineering goals within the particular context
- 3 - Understanding of the requirements set for engineering activity required in order to stimulate balanced development
- 4 - Understanding of legislative requirements, regulating engineering activity (regarding personnel, health and risks issues)
- 5 - Understanding of the importance of high level professional and ethical behaviour for civil engineering

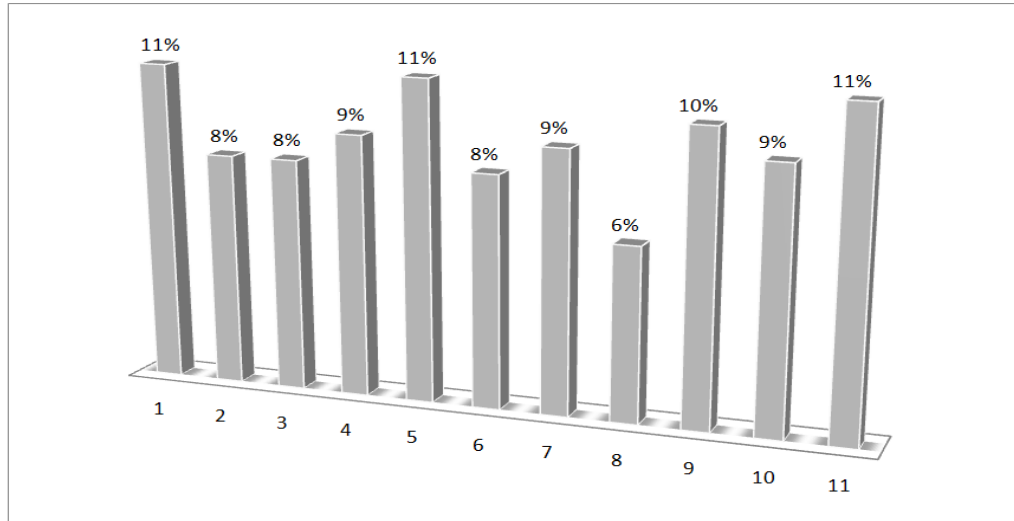
3) The graduates shall have particular practical skills (ASCE Curriculum ..., 2007, ASCE Task ..., 2007, Jha and Lynch, 2007, Lynch, et al. 2007)



- 1 - Knowledge about precise materials, products, tools, processes, and technologies
- 2 - Experience got from activities in laboratories or seminars
- 3 - Ability to apply knowledge about engineering (operations and management, development of technologies) for particular spheres

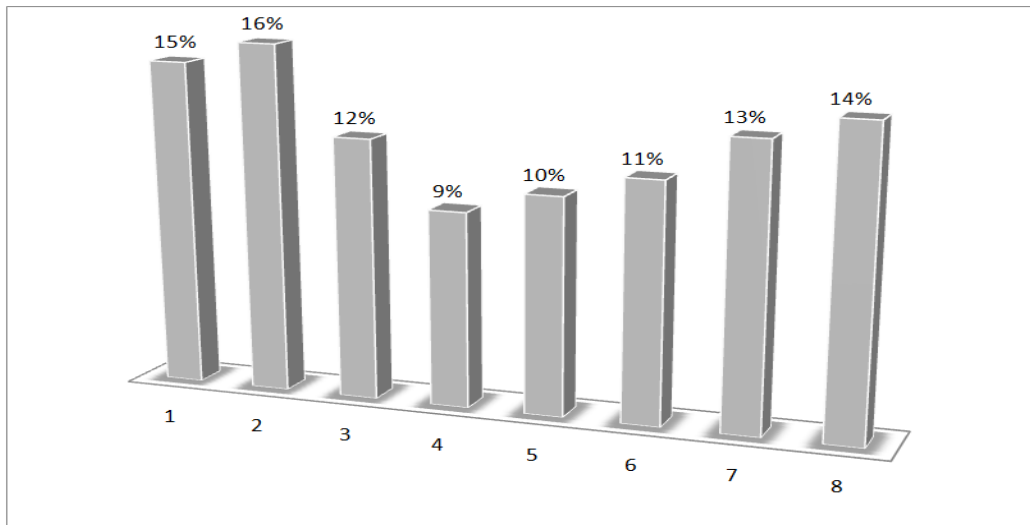
- 4 - Knowledge about effective application of technical literature or other information sources
- 5 - Understanding of legislative acts and industrial standards, regulating engineering activity

4) Engineering programmes shall train students in the following subjects (ASCE Curriculum ..., 2007, ASCE Task ..., 2007, Jha and Lynch, 2007, Lynch, et al. 2007)



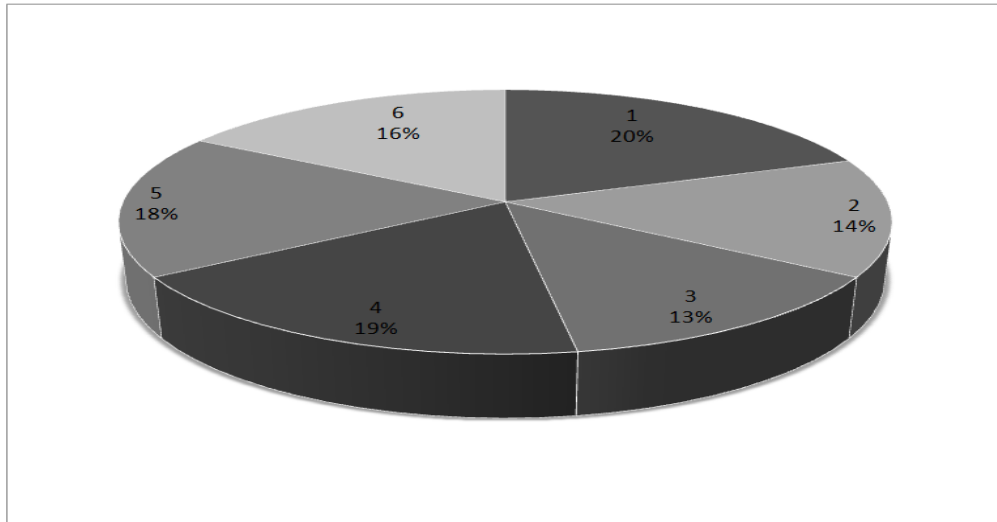
- 1 - Ability to apply knowledge of mathematics, natural science and engineering
- 2 - Ability to design and execute experiments, analyze and interpret/explain obtained results
- 3 - Ability to design systems, components or processes in accordance with the results to achieve, in order to meet real economical, environmental, social, political, ethical, health and safety, production and stability limitations
- 4 - Ability to carry out interdisciplinary team work
- 5 - Ability to recognize, formulate and solve engineering issues
- 6 - Understand professional and ethical liability
- 7 - Ability to communicate effectively
- 8 - Have wide education in order to understand the influence of engineering solutions within international, economical, natural and public context
- 9 - Wish and recognition of the importance of the education lasting the whole life
- 10 - Knowledge about modern problems
- 11 - Ability to apply modern engineering technique, technologies, skills for engineering practice

5) Engineering programmes shall train students for competent execution of research tasks
(ASCE Curriculum ..., 2007, ASCE Task ..., 2007, Jha and Lynch, 2007, Lynch, et al. 2007)



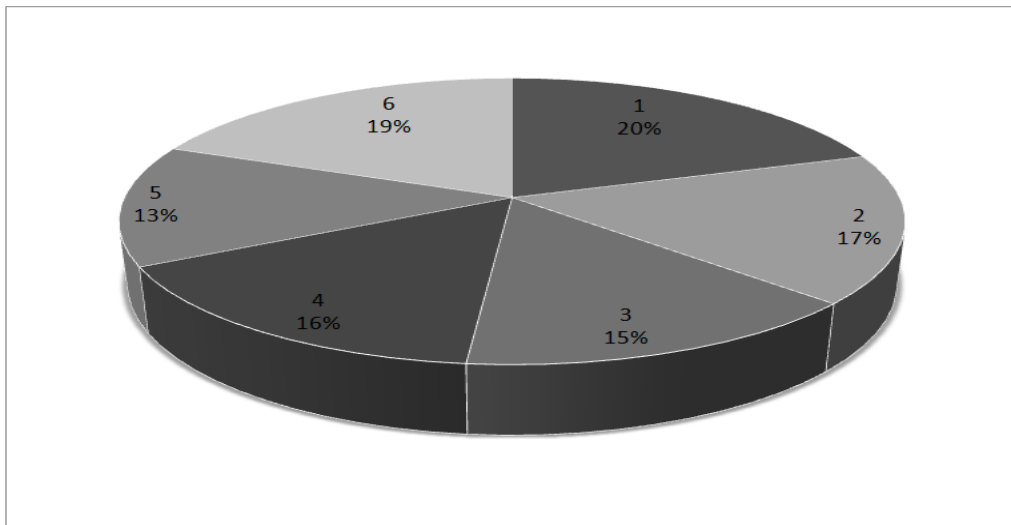
- 1 - Reformulation of poorly formulated research tasks. Pays attention to limits of the system. Justifies new interpretations and alternatives for concerned parties
- 2 - Students shall be attentive and observant, creative and able to solve every day engineering issues in accordance with the requirements of the concerned parties
- 3 - Students shall be able to execute research researches under supervision
- 4 - Students shall be able to work at various abstraction levels
- 5 - Students shall understand the importance of interdisciplinary knowledge and knows how to apply it
- 6 - Students shall understand varying direction of research researches induced by external factors or improved understanding
- 7 - Students shall be able to evaluate the availability of particular research researches
- 8 - Students shall be able to participate in the development of research knowledge of one or several related engineering spheres

6) All students shall assimilate principles of research during studies (ASCE Curriculum ..., 2007, ASCE Task ..., 2007, Jha and Lynch, 2007, Lynch, et al. 2007)



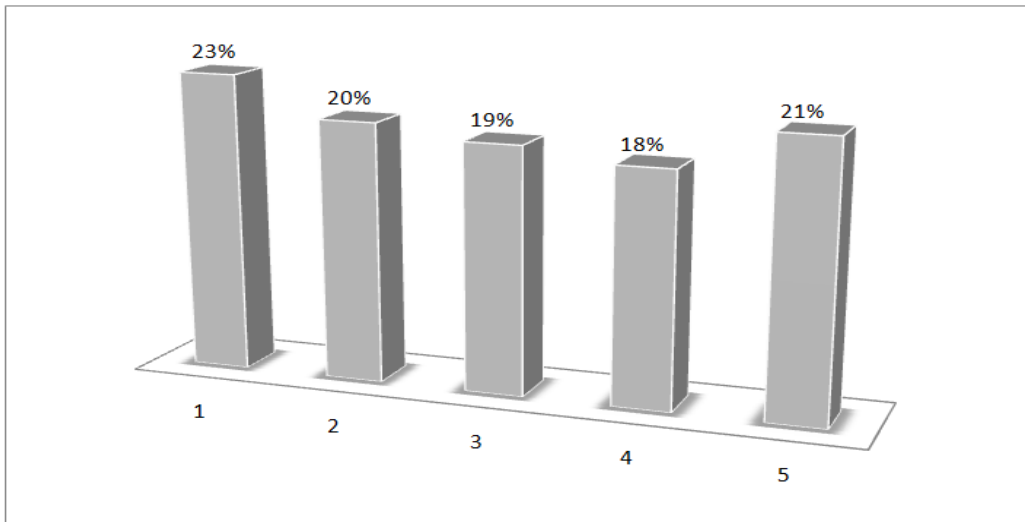
- 1 - Students shall be curious and biased towards continuous study
- 2 - Students shall solve tasks applying theories, models and interpretations of system approach
- 3 - Students shall be able to apply practically different models
- 4 - Students shall understand the basis of engineering science and technologies (essence, methods, differences and similarities of research spheres, nature of laws, theories, descriptions, objectivity, role of the experiment)
- 5 - Students shall understand research practice (research systems, relations with clients, information systems, integration importance)
- 6 - Students shall be able to document research and project results, take part in the development of engineering knowledge base

7) Students shall have the following general intellectual skills (ASCE Curriculum ..., 2007, ASCE Task ..., 2007, Jha and Lynch, 2007, Lynch, et al. 2007)



- 1 - Students shall be able to evaluate own thinking, decision making and activity critically under supervision and change the above attitudes in accordance with the internal and external deviations of the activity
- 2 - Students shall be able to think logically and answer questions „What if“ and „Why“ raised for own and related engineering spheres
- 3 - Students shall know how to apply inductive, deductive, analogy methods for their activity
- 4 - Students shall ask particular questions, shall have critical and constructive point of view for task analyzing and solving
- 5 - Students shall be able to form reasonable point of view in case of uncompleted or indirect information
- 6 - Students shall be able to take part in research discussions of related topic effectively

8) Graduates shall have skills to be applied for other spheres (ASCE Curriculum ..., 2007, ASCE Task ..., 2007, Jha and Lynch, 2007, Lynch, et al. 2007)



- 1 - Students shall be able efficiently to work on their own or in team
- 2 - Students shall be able to perform effective communication with engineering community and broad public with the help of different methods
- 3 - Students shall know about: legal issues concerning health and safety, engineering practice liability; influence of the engineering solutions on public and environment; professional ethics, obligations of the engineering activity and standards
- 4 - Students shall understand project management and business practice, including all limitations (for example, risk management and deviation management)
- 5 - Students shall understand the importance of continuous studying and shall have the intention to do it all the life

For all responses, experience (38%) and communication skills (30%) rated as the most important skills needed by project managers. Companies with over \$200M revenue placed a higher value on communication skills (46% vs. 26%) compared to smaller companies (<\$200M). Overall, respondents rated financial management as the skill that new candidates lack most when entering the workforce (34%), then communication skills (28%), and experience (23%) with technical skills ranked only 14%. Larger companies more often said that communication skills were most lacking in new candidates (42%) with financial management skills the next concern on the list (35%). Larger organizations place a greater emphasis on communication skills than on financial management skills, or experience. This reflects the need to communicate with more people and departments in a larger company internally. Other resources available in larger companies fill the gap for lack of financial management skills, technical competency, and experience. Generally, the weakness in skills of new project management candidates reflects disconnect between universities and contractors. If contractors make it known that they are mostly concerned with technical skills, universities are more likely to turn out graduates strong in technical skills. Universities may respond by adding financial management and communications course materials to the curriculum; however, additional coursework adds time and expense to the attainment of a qualified degree. The alternative for most is to get the training once they enter the workforce through mentoring, on-the-job training, or third-party training programs. The most expensive of these choices is most often the on-the-job method, especially if it means the student has to make several costly errors before he or she learns the right way to go about it (FMI 2006).

According to the FMI Project Management Survey the top five weakest skill sets noted by all respondents were (FMI 2006):

- Cost to complete and profit projections (21% of responses).
- Time management (12%).
- Closeout skills (11%).
- Communication (written) (10%).
- Change order management (10%).

The top five strongest skill sets noted by all respondents were (FMI 2006):

- Client/customer relations (35%).
- Understanding the building process (27%).
- Change order management (8%).
- Cost to complete and profit projections (6%).
- Communication (written) (5%).

The good news when it comes to skill sets is that project managers are best at client/customer relation skills, and they understand the building process. These skills are in line with the two traits that contractors place the most emphasis on when hiring project managers—experience and communication skills. At the same time, communication skills and experience are among the top causes for concern for construction executives with their project managers. There is no single area that all project managers are weak or strong in, but most have sufficient building experience to understand the process. If the goal is to create project leaders, then project managers will need a well-rounded set of skills. It is typical that, over the course of a career, the project managers that become true project leaders increasingly focus on improving their “soft skills,” which includes management and leadership skills (see Figure 2, FMI 2006).

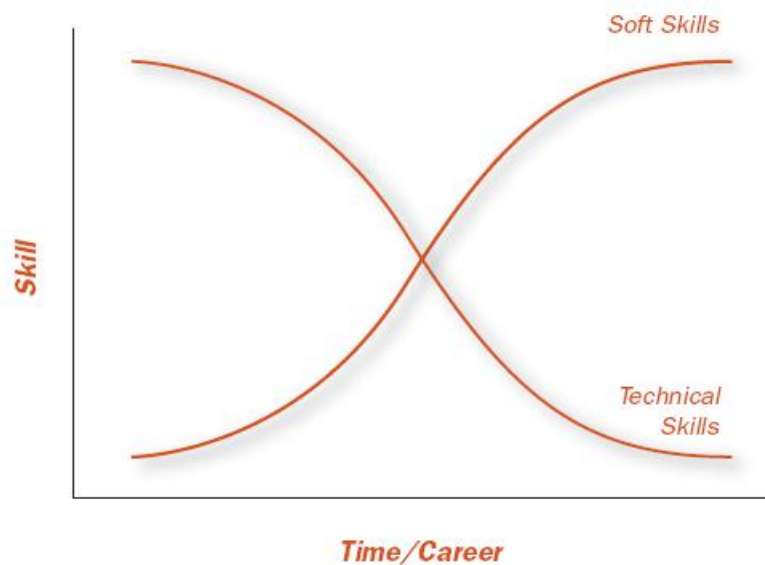


Figure 1. Project leader skills change over the course of a career (FMI 2006).

When we examine the ideal project leader model, it appears we are really thinking about three different people with three different skill sets. Companies look most often for project experience when evaluating new project managers, followed by communication skills. Technical skills are assumed for most project managers entering the job market, especially when the requirement is a four-year construction management degree. Little, if any, emphasis is placed on financial management skills, yet that is the area reported as lacking most often when new project managers enter the workforce. In the FMI Project Leader Model, possessing just one skill is not enough, nor is it enough to have skills in all three areas, if one is operating in a vacuum. To be most effective, the true project leader applies all of these skills collaboratively, and mission-critical processes are designed with this in mind (FMI 2006).

The companies reporting the highest rate of on time/on budget performance place the highest emphasis on communication skills, yet only about 16% of companies overall said that a four-year, non-technical degree was a minimum requirement. That degree likely would produce candidates stronger in the two areas that concern companies the most—communication skills and financial management. It is typical for a company in an industry as technical as the construction industry is to emphasize project experience for new candidates. Project mistakes can be dangerous and costly. It seems that, historically, the general belief has been that a construction firm needs to hire experience and technical skills, and the other, softer, skills will be learned on the job. Often this approach has produced unsatisfactory results, especially if a firm hasn't identified their project management best practices and haven't reinforced the project manager as planner, communicator, and businessperson (FMI 2006).

Project management qualifications, experience and skills required in Wired Consulting are presented in Table 1. Kaip matome, kylant karjeros laiptais projekto vadovams keliami vis didesni reikalavimai.

Table 1. Project management qualifications, experience and skills required in Wired Consulting (Wired Consulting 2010)

Role	Program Manager	Senior Project Manager	Project Manager	Junior Project Manager	Project Coordinator
Minimum Experience	10 years managing large complex projects	5 years experience as a Project Manager	3 years experience as a Project Manager	12+ months experience as a Project Manager	18 months experience working in a project team
Qualification	Practitioner level MSP/PMBOK / PRINCE2	PMBOK (PMP) / PRINCE2 Practitioner	In-depth knowledge of PMBOK / PRINCE2	Understanding of PMBOK / PRINCE2	Understanding of Project Management techniques
Responsibilities	Ability to manage a number of project plans and costs and their interdependencies on resources and schedules	Ability to create project plans and schedules, manage milestones, deadlines and budgets through to successful satisfaction of the customer	Ability to create project plans and schedules and then manage milestones, deadlines and budget through to successful satisfaction of the customer	Ability to create project plans, schedules manage milestones and deadlines. through to successful satisfaction of the customer	Provides administration and coordination to the project team
3rd Party Management	Strong Ability to manage 3 rd parties to ensure deliverables are timely and on budget	Ability to manage 3 rd parties to ensure deliverables are timely and on budget	Ability to manage 3 rd parties to ensure deliverables are timely and on budget	Ability to co-ordinate 3rd parties to ensure tasks are delivered on time.	Supports the project team by applying the Management System to project tasks
Client Relationship	Sole accountability for the Program to the client managing the implementation interface to the telecoms supplier	Strong relationship building skills to ensure that the requirements understood within the capabilities of the provider	Good relationship building skills to enable smooth communication between the client and the supplier	Good relationship building skills to enable smooth communication between the client and the supplier	Supports project team through ensuring smooth communications across project team members
Financial Management	Overall Management of time & costs to ensure that the Program is delivered to scope and budget	Overall Management of time & costs to ensure that the Project is delivered to scope and budget	Management of time & costs to ensure that the Project is delivered to scope and budget	Co-ordination of time & costs to ensure that the Project is delivered to scope and budget	Sources financial information on behalf of the Project Manager and collates as required
Reporting	Timely and regular progress and Risk Management reporting	Timely and regular progress and Risk Management reporting	Timely and regular progress and Risk Management reporting	Timely and regular progress and Risk Management reporting	Responsible for collating and dissemination of progress and reporting
Attitude	Pro-active, "can do" attitude	Pro-active, "can do" attitude	Pro-active, "can do" attitude	Pro-active, "can do" attitude	Pro-active, "can do" attitude

In the global market, modern organizations face high levels of competition. In the wake of increasingly competitive world market the future survival of most companies, depends mostly on the dedication of their personnel to companies. Employee or personnel performances such as capability, knowledge, skill, and other abilities play an important role in the success of an organization. Competencies in organizations can be broadly classified as employee-level and organizational-level.

A core competency can take various forms, including technical/subject matter know-how, a reliable process and/or close relationships with customers and suppliers. Core competencies are the source of competitive advantage and enable the firm to introduce an array of new products and services. Core competencies lead to the development of core products.

Competencies could be very diverse. For example, Goleman (2010) has developed the following model of competencies:

- Personal competence: these competencies determine how we manage ourselves:
 - Self-awareness: knowing one's internal states, preferences, resources and intuitions.
 - Emotional self-awareness: recognising one's emotions and their effects.
 - Accurate self-assessment: knowing one's strengths and limits.

- Self-confidence: a strong sense of one's self-worth and capabilities.
- Self-management: managing one's internal states, impulses and resources.
- Self-control: keeping disruptive emotions and impulses in check.
- Trustworthiness: maintaining standards of honesty and integrity.
- Conscientiousness: taking responsibility for personal performance.
- Adaptability: flexibility in handling change.
- Achievement-orientation: striving to improve or meeting a standard of excellence.
- Initiative: readiness to act on opportunities.
- Social competence: these competencies determine how we handle relationships:
 - Social awareness: awareness of others' feelings, needs and concerns.
 - Empathy: sensing others' feelings and perspectives, and taking an active interest in their concerns.
 - Organisational awareness: reading a group's emotional currents and power relationships.
 - Service orientation: anticipating, recognising and meeting customers' needs.
 - Social skills: adeptness at inducing desirable responses in others.
 - Developing others: sensing others' developmental needs and bolstering their abilities.
 - Leadership: inspiring and guiding individuals and groups
 - Influence: wielding effective tactics for persuasion.
 - Communication: listening openly and sending convincing messages.
 - Change catalyst: initiating or managing change.
 - Conflict management: negotiating and resolving disagreements.
 - Building bonds: nurturing instrumental relationships.
 - Teamwork and collaboration: working with others toward shared goals. Creating group synergy in pursuing collective goals.

Interpersonal skills may include leadership skills, verbal and non-verbal communication skills, decision making, dealing with emotions and stress, conflict management, trust building, negotiating, demonstrating sensitivity to diversity issues, and modeling desired behavior. The application of interpersonal skills may be influenced by the phase of the project life-cycle.

3 Analysis of existing BSc, MSc and PhD study programmes in promoting energetically and ecologically sustainable, affordable and healthy built environment

To identify what study programmes in energetically and ecologically sustainable, affordable and healthy built environment are available at universities around the globe, we turned to an online analysis of the existing BSc, MSc and PhD study programmes promoting this kind of built environment. The analysis involved looking around the globe for any universities that offered corresponding study programmes related to energetically and ecologically sustainable, affordable and healthy built environment. In the analysis, the programmes were grouped by the cycles of higher education, which were BSc, MSc and PhD. Study programmes that cover topics similar to those mentioned above have been found in a number of universities around the globe. The universities are listed in Table 2.

Table 2. The universities that offer study programmes promoting energetically and ecologically sustainable, affordable and healthy built environment

No.	University	Country	Programme title (Qualification)
1.	Birmingham City university	UK	Planning, Environment and Development (BSc) Environmental Sustainability (PgCert/PgDip /MSc) Environmental Sustainability (Design and Construction) (PgCert/PgDip /MSc)
2.	University of Central Lancashire	UK	Sustainable Energy Management (BSc) Building Services (MSc) Urban Environmental Management (MSc)
3.	Sheffield Hallam University	UK	Built Environment (BSc) Building surveying (MSc)
4.	The Hong Kong University of Science & Technology	PRC	Environmental Management and Technology (BSc)
5.	Plymouth University	UK	Environmental Construction Surveying (BSc) Building Surveying and the Environment (BSc) Environmental Consultancy (MSc) Learning for Sustainability (MSc)
6.	Stony Brook University	USA	Environmental Design, Policy and Planning (BSc)
7.	Kingston University London	UK	Sustainable Development (BSc (Hons)) Sustainability for Built Environment Practice (PgCert/PgDip/MSc/MA)
8.	Northumbria University	UK	Sustainable Development in the Built Environment (MSc)
9.	London's Global University	UK	Facility & Environment Management (Singapore) (MSc)
10.	Nelson Mandela Metropolitan University	ZA	Built Environment (MSc / PGD)
11.	The University of Nottingham	UK	Sustainable Energy and Entrepreneurship (MSc)
12.	University of Brighton	UK	Construction Management (MSc/PGCert/PGDip) Facilities Management (MSc/PGCert/PGDip) Project Management for Construction (MSc/PGCert/PGDip) Environmental Assessment and Management (MSc/PGCert/PGDip) Sustainability of the Built Environment (MSc/PGCert/PGDip) Town Planning MSc (PGCert/PGDip)
13.	University of Dundee	UK	Advanced Sustainability of the Built Environment (MSc/PGDip)

14.	University of Washington	US	The Built Environment (PhD)
15.	Clemson university	US	Planning, Design and the Built Environment (PhD)

Next, the study programmes promoting energetically and ecologically sustainable, affordable and healthy built environment (and their modules) available at the universities listed above are outlined, all grouped by the cycle of higher education (see chapters 2.1, 2.2, 2.3).

A statistical analysis was carried out to identify which modules were the most common in the existing BSc, MSc and PhD study programmes promoting energetically and ecologically sustainable, affordable and healthy built environment. The keywords related to energetically and ecologically sustainable, affordable and healthy built environment and most common in the modules were picked out and their frequency rate determined. Figure 2 shows the most common keywords found in the existing BSc study programmes offered by universities around the world.

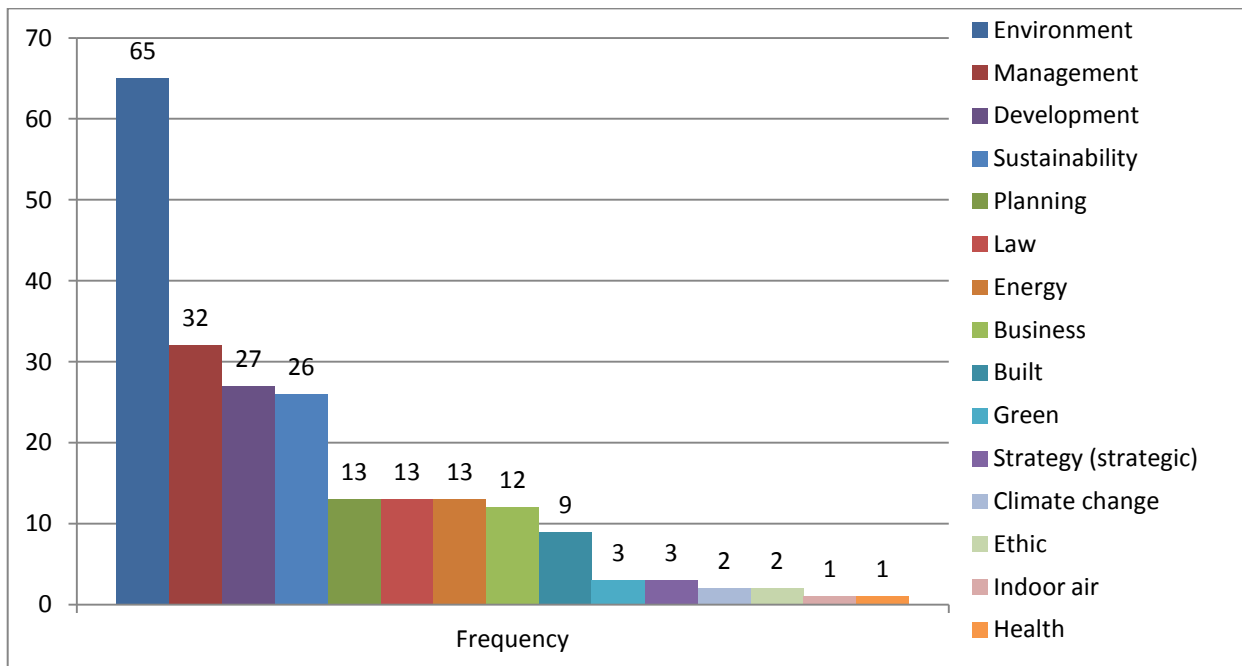


Figure 2. The most common keywords related to energetically and ecologically sustainable, affordable and healthy built environment in BSc study programmes offered by universities around the world

Figure 2 shows that the BSc study programmes in question offered by universities around the world most often comprised modules with such keywords as “environment”, “management”, “development”, “sustainability”, “planning” and “law”. Figure 1 also shows that “Environment” was the most common word in the said study programmes with 65 instances. All other keywords were less common: “management” appeared 32 times, “development” 27 times, “sustainability” 26 times, “planning” 13 times, “law” 13 times, “energy” 13 times, and “business” 12 times. The least common keywords were “climate change”, “ethic”, “indoor air” and “health”. Thus, environmental modules prevailed in BSc study programmes.

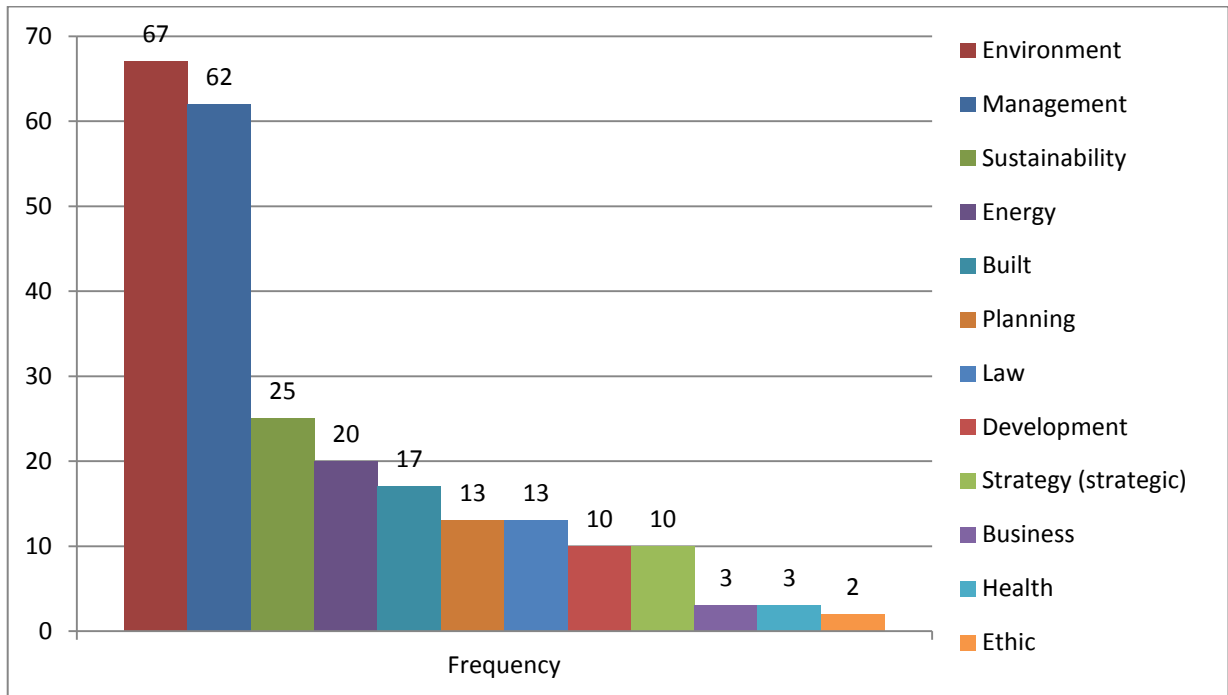


Figure 3. The most common keywords related to energetically and ecologically sustainable, affordable and healthy built environment in MSc study programmes offered by universities around the world

Figure 3 shows the keywords most common in the MSc study programmes. In contrast to the BSc cycle programmes, environmental modules did not dominate alone, with more modules on management, as shown in Figure 2: “environment” appeared 67 times and “management” as many as 62 times. “Sustainability” and “energy” were slightly less common, with 25 and 20 instances respectively. The least common keywords were “Business” and “Health” with 3 instances each, while “Ethic” appeared only twice throughout all MSc study programmes.

Finally, to determine the number of books available for each module related to energetically and ecologically sustainable, affordable and healthy built environment, the books listed on Amazon.com were analysed (Figure 4). The website was scanned for books related to the BSc, MSc, PhD modules suggested in the Project Proposal. The analysis revealed that the books covering the topic “Geographical information systems” made the largest pool with 10,270 titles. The numbers of books covering other topics were slightly lower: “Introduction to sociological methods” came second with 706 titles and “Introduction to renewable energy” came third with 412 titles. The numbers of books covering other topics varied between 10–200 titles. The modules “Micro and small business in local sustainable development” and “Planning, investment and development of built environment” come last with only one title for each.

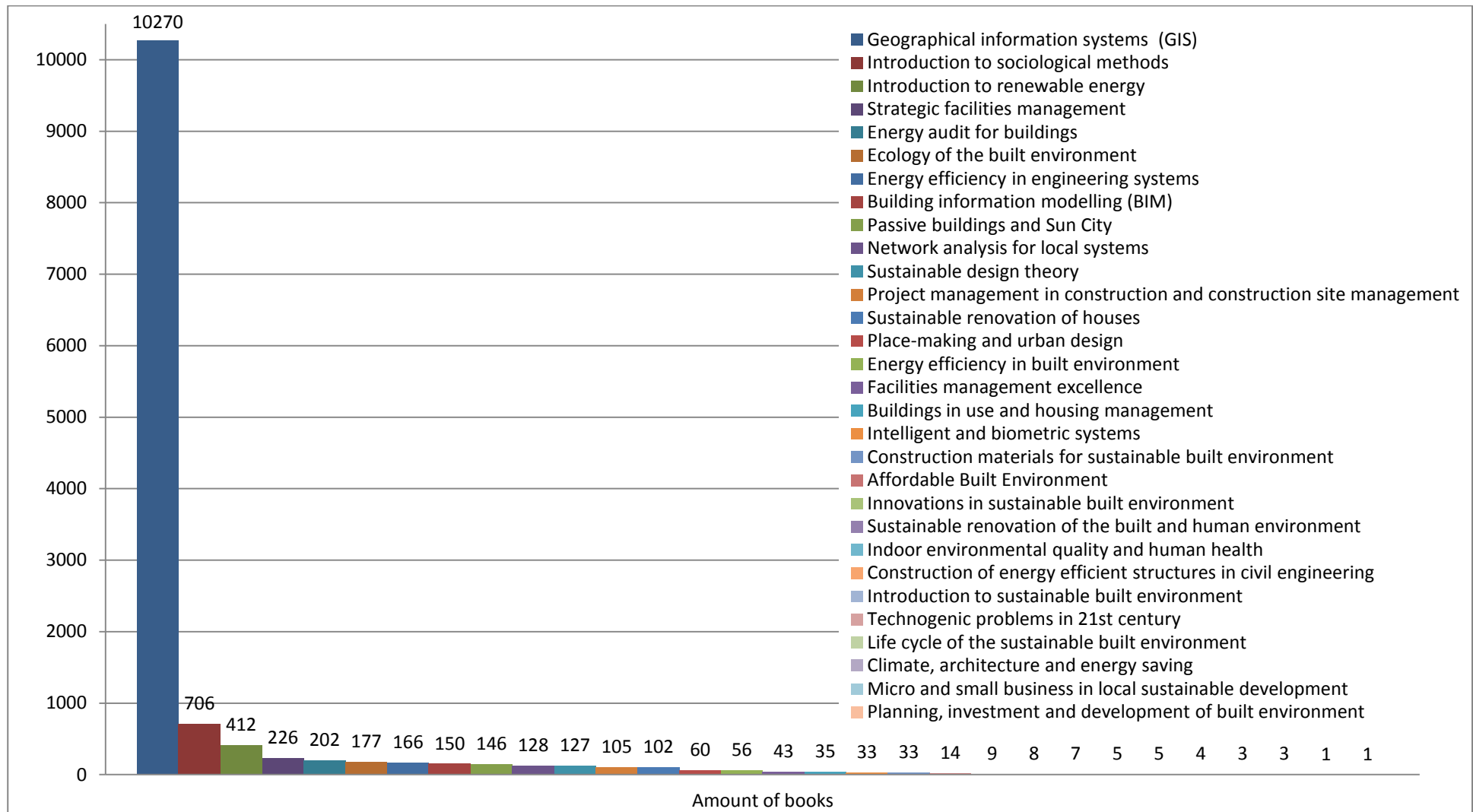


Figure 4. The number of books by the modules available in BSc, MSc and PhD cycles

3.1 Bsc/specialists programmes

BIRMINGHAM CITY UNIVERSITY

Website: <http://www.bcu.ac.uk/courses/planning-environment-and-development>

Programme title: **Planning, Environment and Development**

Qualification: BSc (Hons)

Duration: 3 years Full Time, 5 years Part Time, 4 years Sandwich (Planning, Environment ... 2013).

MODULES

Year 1

Module	Credits
Professions in Context	15
Principles of Planning	15
Sustaining the Built and Natural Environment	15
Building Construction and Inspection	15
Law for the Built Environment	15
Placemaking in Practice	15
Visualisation and Digital Mapping	15
Professional Practice Project 1	15

Year 2

Module	Credits
Professional Practice Project 2	15
Planning and Development Appraisal	15
Law for Property and Planning	15
Design and Development in the Built and Natural Environment	15
SMART Policies and Plans	15
Green Infrastructure Planning	15
Property Investment and Finance	15
Professional Practice Project 3	15

Year 3

Module	Credits
Inter Professional Project	15
Professional Practice and Managerial Skills	15
Conservation Issues in Practice	15
Managing Spatial Information and Data	15
Drivers of Change in Planning Development and Environment	15
Local Area Action Planning	15
Honours Research Project	30

UNIVERSITY OF CENTRAL LANCASHIRE

Website:

Programme title: **Sustainable Energy Management**

Qualification: BSc (Hons)

Duration: Full-time, Part-time, Sandwich (Sustainable Energy ... 2013b)

MODULES

Programme Structures				Awards and Credits
Level	Module Code	Module Title	Credit rating	
Level 6	NT3045	Energy Conversion, Distribution and Management	20	BSc (Hons) Sustainable Energy Management (Sandwich) Requires 480 credits including 120 notional credits BN2830 Industrial Experience
	NT3046	Alternative Energy Technology	20	
	NT3048	Engineering Dissertation	20	
	BN3010	Project Management	20	
		Optional Modules		BSc (Hons) Sustainable Energy Management Requires 360 credits including a minimum of 240 at Level 5 or above and 100 at Level 6
	NT3039	Environment & Safety Law	10	
	NT3053	Energy & the Environment	20	
	NT3054	Sustainable Design	20	
	NT3010	EIA and Environmental Management Systems	20	
	NT3044	Strategic Management in the Built Environment	10	
Level 5	NT2053	Electrical Supply and Distribution	20	Dip HE Sustainable Energy Management Requires 240 credits including a minimum of 100 at Level 5
	NT2055	Thermodynamics and Fluid Mechanics 2	20	
	NT2054	Mechanical Services Design	20	
	NT2064	Sustainability Science and Engineering	20	
	NT2059	Design Project 2	10	
	NT2061	Building Environmental Services	10	
	NT2057	Computing (CAD)	10	
		Optional Modules		
	NT2016	Environment and Development: Theory and Practice	20	
	NT2056	Fire Protection 1	10	
	NT2058	Control of Sustainable Building Engineering Systems	10	
	NT2062	Lighting Installations and Design	10	
		BN2830	Industrial Experience	
Level 4	NT1034	Thermodynamics and Fluid Mechanics 1	20	Cert HE Sustainable Energy Management Requires 120 credits at Level 4
	NT1035	Building Environmental Science	10	
	NT1036	Mathematics	10	
	BN1091	Construction Technology 1	20	
	NT1037	Introduction to Building Services and Design	20	
	BN1460	Law & Management Option Modules	20	
	NT1006	Environmental Hazards & Disasters	20	
	NT1028	Issues in Sustainability	20	
	EF2314*	Upper Intermediate English A	20	

	EF2324*	Upper Intermediate English B	20	
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SHEFFIELD HALLAM UNIVERSITY

Website: <http://www.shu.ac.uk/prospectus/course/1000/>

Programme title: **Built Environment**

Qualification: BSc (Honours)

Duration: 3 full-time

Subject area • Real estate

Related subjects • Construction, building and surveying (Built environment 2013b)

MODULES

Year one modules

- domestic construction technology and environmental services
- business planning • property referencing
- surveying (inspection and measurement of land and property)
- economics
- law for property professionals
- sustainable planning and environment
- computer-aided design

Year two modules

- development appraisal
- energy and carbon assessment of buildings
- residential and commercial lettings
- property valuation
- residential estate agency
- building pathology
- building conservation

Year three modules

- reflection of professional issues
- refurbishment and maintenance
- fire safety studies
- development practice
- project management
- theory and practice
- strategic facilities management or advanced building technology
- advanced building control surveying or advanced construction planning

THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Website: http://www.evmt.ust.hk/admission_new.html

Programme title: **Environmental Management and Technology**

Qualification: BSc

Duration: 4 full-time (Environmental Management ... 2013)

MODULES

4-Year Environmental Management and Technology Curriculum (2012 Intake)

Students studying a 4-year bachelor's degree are required to complete the following requirements:

- At least 120 credits
- University Common Core Requirements
- University English Language Requirement
- Program Requirement

Program Requirement

It consists of three parts: (1) fundamental courses (2) required courses and (3) electives.

Fundamental Courses (9 - 10 credits)

Course Code	Course Title	Credit(s)
COMP 1021 or COMP 1022P or COMP 1022Q or ISOM 2010	Introduction to Computer Science or Introduction to Computing with Java or Introduction to Computing with Excel VBA or Introduction to Information Systems	3
LANG 2081	English Language Course for IPO	3
MATH 1003 or MATH 1013 or MATH 1020 or MATH 1023	Calculus and Linear Algebra or Calculus I or Accelerated Calculus or Honors Calculus I	3-4

Required Courses (46 - 47 credits)

Business Courses

Course Code	Course Title	Credit(s)
ECON 2103 or ECON 2113	Principles of Microeconomics or Microeconomics	3
MGMT 2110	Organizational Behavior	3
FINA 2203	Fundamentals of Business Finance	3
ISOM 2500 or MATH 2411	Business Statistics or Applied Statistics	3 - 4
ENVR 3310	Green Business Strategy	3
ENVR 3410	Economics for Environmental Policy and Management	3
ENVR 4320	Corporate Environmental Accounting and Reporting	3

Environmental Courses

Course Code	Course Title	Credit(s)
CIVL 1170	Climate Change Risk, Mitigation and Adaptations	3
ENVR 2010	Environmental Science Fundamentals	3
ENVR 2110	Introduction to Sustainable Development	3
ENVR 3210	Environmental Technology	3
ENVR 3220	Energy Resources and Usage	3
ENVR 3420	Environmental Law and Regulations	3

Professional Development Courses

Course Code	Course Title	Credit(s)
ENVR 1000	Academic and Professional Development I	0
ENVR 2000	Academic and Professional Development II	0
ENVR 3000	Academic and Professional Development III	0
ENVR 4800	Environmental Management and Technology Seminar	1
ENVR 4980	Environmental Management and Technology Capstone Project I	3
ENVR 4990	Environmental Management and Technology Capstone Project II	3

Elective Courses (9 credits) Students should choose from the following courses to fulfill the EVMT elective requirements upon their interest. Students may concentrate their studies in one of the categories: business, social science, environmental science or engineering upon their interests.

ENVR Specials

Course Code	Course Title	Credit(s)
ENVR 2810	Environmental Management and Technology Study Trip I	1
ENVR 3810	Environmental Management and Technology Study Trip II	1
ENVR 3900	Internship/Learning Service	1
ENVR 4000	Special Topics in Environmental Studies	1-4
ENVR 4010	Independent Study	1-4

Environmental Business Courses

Course Code	Course Title	Credit(s)
ENVR 4310	Green Innovation and Entrepreneurship	3
ECON 2123	Macroeconomics	3
ISOM 2700	Operations Management	3
ISOM 4750	Business Project Management	3
MGMT 3120	Managerial Leadership	4
MGMT 3140	Negotiation	4
MGMT 4110	Business Ethics and Policy	4
MGMT 4220	Entrepreneurship and Small Business Studies	4
SOSC 2170	Environment and Business	3

Environmental Science and Engineering Courses

Course Code	Course Title	Credit(s)
ENVR 3230	The Atmosphere-ocean Environment	3
ENVR 4330	Environmental Geographical Information System	3
LIFS 2060	Biodiversity	3
LIFS 3160	Ecology	3
CENG 4720 or CIVL 4430	Environmental Impact Assessment and Management Systems or Environmental Impact Assessment	3
CIVL 4470	Air Quality Control and Management	3
MECH 4350	Indoor Air Quality in Buildings	3

Social Science Courses

Course Code	Course Title	Credit(s)
SOSC 1661	Contemporary Hong Kong	3
SOSC 1840	Government, Law & Society in China	3
SOSC 1850	Understanding Society	3
SOSC 2170	Environment and Business	3
SOSC 2780	Modernization and Social Change	3
SOSC 3110	Science and Technology in Hong Kong	3
SOSC 3140	Research Methods in the Social Sciences	3
SOSC 3230	The Chinese Economy	3
SOSC 4290	China's Sustainable Development	3
SOSC 4600	Understanding Chinese Politics	3

PLYMOUTH UNIVERSITY

Website: <http://www1.plymouth.ac.uk/courses/undergraduate/2179/Pages/CourseDetail.aspx>

Programme title: **Environmental Construction Surveying**
Qualification: BSc (Hons)
Duration: 4 full-time (Environmental Construction ... 2013)

MODULES

Stage 1

Core

ENBS102 Building and the Environment
ENBS111 Domestic Construction
ENBS114 Building Law
ENBS117 Environmental Building Science and Technology
ENBS119 Construction Applications and Management
ENBS120 Construction Applied Mathematics
ENBS121 ACAD Draughting
FAPY100 Stage 1 Placement Preparation
MATS109 Construction Materials
SURV110 Site Surveying

Stage 2

Core

ENBS234 Contract Procedures
ENBS241 Development and Construction Refurbishment
ENBS243 Technology of Large and Innovative Building
ENBS245 Building Surveying Principles and Practices
ENBS248 Energy, Science and Services
ENBS249 Advanced CAD Application
FAPY200 Stage 2 Placement Preparation

Stage 3

Core

FAPY302 Building Surveying and Construction Management Placement

Stage 4

Core

ENBS323 Built Environment Project 2
ENBS330 Development Management
ENBS331 Dissertation Project
ENBS332 Sustainable and Safe Construction
ENBS333 Building Surveying Practice
LAW383 Property and Environmental Law
MATS311 Building Conservation

Programme title: **Building Surveying and the Environment**
Qualification: BSc (Hons)
Duration: 4 full-time

MODULES

Stage 1

Core

ENBS102 Building and the Environment
ENBS111 Domestic Construction

ENBS114 Building Law
ENBS117 Environmental Building Science and Technology
ENBS119 Construction Applications and Management
ENBS120 Construction Applied Mathematics
ENBS121 ACAD Draughting
FAPY100 Stage 1 Placement Preparation
MATS109 Construction Materials
SURV110 Site Surveying

Stage 2

Core

AB2FLT Bldg Field Trips
ENBS203 Behaviour of Structures
ENBS234 Contract Procedures
ENBS241 Development and Construction Refurbishment
ENBS243 Technology of Large and Innovative Building
ENBS245 Building Surveying Principles and Practices
ENBS248 Energy, Science and Services
ENBS250 Environmental Economics for Construction
FAPY200 Stage 2 Placement Preparation

Stage 3

Core

FAPY302 Building Surveying and Construction Management Placement

Stage 4

Core

ENBS319 Building Surveying Project 2
ENBS328 Professional Practice
ENBS331 Dissertation Project
ENBS332 Sustainable and Safe Construction
ENBS333 Building Surveying Practice
LAW383 Property and Environmental Law

Optional

ENBS330 Development Management
MATS311 Building Conservation

STONY BROOK UNIVERSITY

Website: http://www.stonybrook.edu/commcms/sustainability/majors_edp.html

Programme title: ***Environmental Design, Policy and Planning***

Qualification: BSc (Hons) (Environmental Design ... 2013)

MODULES

A: Foundation Courses (33-34 credits)

MAT 125-C Calculus A

or

MAT 131-C Calculus I

ECO 108-F Introduction to Economics

SBC 111 Introduction to Sustainability Studies

SBC 115 Introduction to Human Demographics
ENV 115-E Chemistry, Life, Environment
SBC 113-E Physical Geography
SBC 114 Physical Geography Lab
SBC 117- Design Drawing AMS 102-C Elements of Statistics
SBC 201 Systems and Models
POL 102-F(4) Introduction to American Government
SBC 206 Economics and Sustainability

B: Career Leadership Skills (5 credits)
CSK 102 Career Leadership Skills: Working in Teams (1 credit)
CSK 302 Technical Writing and Communication (3 credits)

Plus one of the following (1 credit each):
CSK 101 Career Leadership Skills: Advocacy and Change

CSK 104 Career Leadership Skills: Negotiation and Conflict Resolution
CSK 105 Career Leadership Skills: Leadership Developing

C: Core Courses (31 credits)

(Students will be required to take: the 10 credits in Group 1; 6 credits from each of Groups 2 through 4; and 3 credits from Group 5)

1. Core Courses (10 credits)
GSS 313 GIS Applications and Design Lecture
GSS 314 GIS Application and Design Lab
SBC 354 Drawing for Design --- CAD
EDP 303 Spatial Economics
2. Historic and Theoretical Perspectives 300-level courses (6 credits)
SBC 200-F: Human Settlements: History and Future
EDP 307: Theories and Design of Human Settlements
3. Physical and Built Environment Upper Division Block (6 credits)
EDP 301: The Built Environment I
EDP 302: The Built Environment II
4. Policy, Politics and Regulations (6 credits)
EDP 309: Planning: Policies and Regulations

PLUS One of the following courses:

EDP 305: Risk Assessment and Sustainable Development
SBC 308-K: American Environmental Politics
SBC 309: Global Environmental Politics

5. Societal and Cultural Aspects (3 credits)
SUS 303: Demographic Change and Sustainability
SBC 307-K(4): American Environmental History
SBC 310: Migration, Development and Population Redistribution
SBC 312-F: Environment, Society and Health

One of the following can be substituted for any of the courses in Group 5.

NOTE: each course below has a prerequisite outside the major.

SUS 301 or PHI 366 Environmental Ethics
SBC 331 City, Suburb, Sprawl
EHI 322-G Human Ecology

D: Design Project Course (3 credits)
EDP 404: Environmental Design Project

E: Upper Division Writing Requirement

Proficiency in writing, oral communication, and computer literacy will be encouraged in all students. In addition to CSK 302, these skills will be developed within the context of other formal coursework and no additional credits are required. To meet the upper-division writing requirement, students must submit two papers from any 300-level or 400-level course in the major to the Director of the SUS Undergraduate Program.

KINGSTON UNIVERSITY LONDON

Website: <http://www.kingston.ac.uk/undergraduate-course/sustainable-development-2013/>

Programme title: **Sustainable Development**

Qualification: BSc(Hons)

Duration: Full time-3 years (Sustainable Development 2013a).

MODULES

Year 1

Understanding the Environment
Introduction of Human Geography
Digital Earth and Spatial Analysis
Investigating the Earth and Environment

Year 2

Sustainable Development Theory and Practice
Ecology
Land, Water and the Environment
Social and Cultural Geographies
Global Capitalism
Regional Studies in Sustainable Development
Fieldwork and Project Design

Year 3

Optional sandwich year

Year 3/4

Sustainable Development Research Project
Challenge of Climate Change
Land and Water Resources Management
Development Geography (including optional developing world fieldwork)
Global Rural Geographies
Biodiversity and Conservation
GIS for People and the Environment
Sustainable Urban Development

3.2 Msc programmes

BIRMINGHAM CITY UNIVERSITY

Website: <http://www.bcu.ac.uk/courses/planning-Environment-and-Development>

Programme title: **Environmental Sustainability**

Qualification: PgCert / PgDip / MSc

Duration: Fulltime - 13 month, parttime – 24 month (Environmental Sustainability 2013a).

MODULES

SEMESTER 1			
Postgraduate Certificate - 60 Credits			
Dynamic Natural Environments 15 Credits	Society, Economics and Environment 15 Credits	Policies and Plans 15 Credits	Green Design 15 Credits

SEMESTER 2			
Postgraduate Diploma - 120 Credits			
Law and Environmental Governance 15 Credits	Sustainable Development into Practice 15 Credits	Sustainable Futures 15 Credits	Energy Technologies 15 Credits

SEMESTER 3
MSc Award - 180 Credits
Research Project 60 Credits

Programme title: **Environmental Sustainability (Design and Construction)**

Qualification: PgCert / PgDip / MSc

Duration: Fulltime - 13 month, parttime – 24 month (Environmental Sustainability 2013b).

MODULES

SEMESTER 1			
Postgraduate Certificate - 60 Credits			
Dynamic Natural Environments 15 Credits	Society, Economics and Environment 15 Credits	Policies and Plans 15 Credits	Green Design 15 Credits

SEMESTER 2			
Postgraduate Diploma - 120 Credits			
Law and Environmental Governance 15 Credits	Sustainable Development into Practice 15 Credits	Sustainable Futures 15 Credits	Energy Technologies 15 Credits

SEMESTER 3
MSc Award - 180 Credits
Research Project 60 Credits

UNIVERSITY OF CENTRAL LANCASHIRE

Website: http://www.uclan.ac.uk/information/courses/msc_building_services.php

Programme title: **Building Services**

Qualification: MSc

Duration: Full-time – 1 year, Part-time 2-3 years (Building Services 2013).

MODULES

Programme Structures				Awards and Credits
Level	Module Code	Module Title	Credit rating	
Level 7	NT4026	MSc Building Services Dissertation	40	Masters Degree in Building Services Requires 180 credits at Level 7. Exit Awards: Postgraduate Diploma in Building Services Requires 120 credits at Level 7. Postgraduate Certificate in Building Services Requires 60 credits at Level7
	BN4508	Research Methods	20	
	NT4022	Sustainable Buildings	20	
	NT4021	HVAC Design for a Sustainable Environment	20	
	NT4023	Engineering Design Project	20	
	NT4025	Sustainable Electrical Services and Lighting	20	
		Option modules:		
	NT4024	Building Engineering Systems	20	
	BN4440	Strategic Project Management	20	
	BN4521	Facilities Management	20	

Website: http://www.uclan.ac.uk/information/courses/msc_urban_environmental_management.php

Programme title: **Urban Environmental Management**

Qualification: MSc

Duration: Full-time – 1 year, Part-time 2-3 years (Urban Environmental ... 2013).

MODULES

Programme Structures				Awards and Credits
Level	Module Code	Module Title	Credit rating	
Level 7	NT4011	Dissertation	60	Masters Degree in Urban and Environmental Management Requires 180 credits at Level 7. For the award of Distinction overall APM of 70% or above must be achieved including 70% or above in NT4011 For the award of Merit overall APM of 60% or above must be achieved including 60% or above in NT4011 Postgraduate Diploma in Urban and Environmental Management Requires 120 credits at level 7 Postgraduate Certificate in Urban and Environmental Management
	NT4007	Environmental Management		

		Within Organisations	20	Requires 60 credits at level 7
	NT4034	Integrated Urban Planning	20	
	NT4033	Environmental Pollution and control	20	
	NT4008	Waste Resources and Solutions	20	
	BN4108	Urban Regeneration	20	
	NT4032	Applied Ecology (optional)	20	
	NT4013	Practical Aspects of Waste Management (optional)	20	

SHEFFIELD HALLAM UNIVERSITY

Website: <http://www.shu.ac.uk/prospectus/course/1112/content/>

Programme title: **Building Surveying**

Qualification: MSc

Duration: Full-time, Part-time (Building Surveying 2013).

MODULES

Construction fundamentals
Professional skills
Law for the built environment
Economics for the built environment
Building pathology
Planning development and sustainability
Structural principles
Contract administration
Landlord and tenant law
Fire safety studies
Building surveying commercial studies
Refurbishment project
International project

MSc

Dissertation consultancy project

PLYMOUTH UNIVERSITY

Website: <http://www1.plymouth.ac.uk/courses/postgraduate/3607/Pages/CourseDetail.aspx>

Programme title: **Environmental Consultancy**

Qualification: MSc

Duration: full-time – 1 year (Environmental Consultancy 2013).

MODULES

BUS5102 Environmental Law and Ethics
EAR5210 Environmental Impact Assessment and Sustainable Development
ENV5111 Professional Practice for Environmental Consultants

ENV5113 Investigation and Assessment of Contaminated Environments
ENV5114 Environmental Protection and Research Project Planning
ENV5115 Ecological Survey, Evaluation and Mitigation
ENV5209 Work Placement Project
IMS5101 Research Skills
SCI5301 MSc Dissertation

Website: <http://www1.plymouth.ac.uk/courses/postgraduate/3607/Pages/CourseDetail.aspx>

Programme title: **Learning for Sustainability**
Qualification: MSc
Duration: full-time – 1 year (Learning for Sustainability 2013).

MODULES

Core

MLS5101 Learning, Education and Sustainability
MLS5102 Sustainability Skills: Research and Dissemination
MLS5204 Global Education: Theory and Practice

Optional

MLS5103 Ecological and Environmental Ethics
MLS5203 Ecological and Sustainability Literacy

KINGSTON UNIVERSITY LONDON

Website: <http://www.kingston.ac.uk/postgraduate-course/sustainability-built-environment-msc/>

Programme title: **Sustainability for Built Environment Practice**
Qualification: PgCert/PgDip/MSc/MA
Duration: PgCert: Full time – 1 semester; Part time – 2 semesters, PgDip/MSc/MA: Full time – 1 year
Attendance: Full time: 2 days a week
Part time: 1 day a week (Sustainability for Built ... 2013).

MODULES

Core modules

The Challenge of Climate Change
Environmental Law and Regulation
Economic Sustainability
Sustainable Environmental Management
Sustainable Cities
Regeneration
Research Methods
Research Proposal
Dissertation/ Critical Practice Project
Conference

Option modules

Biodiversity and Conservation
Minerals and Energy Resources
Social Sustainability

Waste Management and Contaminated Land Remediation

NORTHUMBRIA UNIVERSITY

Website: <http://www.northumbria.ac.uk/?view=CourseDetail&code=DTPSDE6>

Programme title: **Sustainable Development in the Built Environment**

Qualification: MSc

Duration: 3 years part-time (Sustainable Development ... 2013 b)

MODULES

Year 1

BE1104 - Dimensions of Sustainability (CORE, 20 Credits)

BE1105 - Sustainable Communities (CORE, 20 Credits)

BE1106 - Evolution of the Environmental Movement (CORE, 10 Credits)

BE1109 - Work based investigation into sustainability (CORE, 10 Credits)

Year 2

BE1107 - Low Carbon Design and Technology (CORE, 20 Credits)

BE1108 - Global Issues In Sustainability (CORE, 10 Credits)

BE1110 - Work based project on sustainability (CORE, 20 Credits)

BE1171 - Research Skills & Methods of Enquiry (CORE, 10 Credits)

Year 3

BE1111 - MSc Dissertation (Sustainable Development) (CORE, 60 Credits)

LONDON'S GLOBAL UNIVERSITY

THE BARTLETT SCHOOL OF GRADUATE STUDIES

Website: <http://www.bartlett.ucl.ac.uk/graduate/programmes/postgraduate/mscdiploma-facility-environment-management-singapore>

Programme title: **Facility & Environment Management (Singapore)**

Qualification: MSc (Facility & Environment ... 2013).

MODULES

Core modules

Introduction to Facility Management BENVGFEK

Management Concepts for Facilities BENVGFEL

Environment Management and Sustainability BENVGFEM

Service Operations Management BENVGFEN

Space and Workplace Management BENVGFEO

Facility Management Law BENVGFEP

Sustainable Facility Management Operations BENVGFES

Efficient Building Services Systems BENVGEE6

Social Dimensions of Sustainability BENVGEE9

Dissertation

MSc Research Report (60 credits) BENVGBE4
Assessment
Award

NELSON MANDELA METROPOLITAN UNIVERSITY

Website: [http://mscbuilt.nmmu.ac.za/mscbuilt/media/Store/documents/Curriculum/MSc-\(Built-Environment\)-Information-Sheet.pdf](http://mscbuilt.nmmu.ac.za/mscbuilt/media/Store/documents/Curriculum/MSc-(Built-Environment)-Information-Sheet.pdf)

Programme title: **Built Environment**

Qualification: MSc / PGD

MSc / PGD in the Built Environment with specialisations in:

- Project Management;
- Construction Management;
- Facilities Management;
- Property Economics and Valuation;
- Construction Health and Safety Management (Built environment 2013a).

MODULES

The syllabuses for the comprehensive set of courses in alphabetical order (core, fundamental and electives) for all the specialisations are presented below.

1. *Accounting and Project Finance*
2. *Advanced Measurement and Estimating*
3. *Building Energy Analysis and Management*
4. *Business and Construction Economics*
5. *Capital Equipment Purchasing*
6. *Construction Contracts and Procurement*
7. *Construction Marketing*
8. *Corporate Strategy*
9. *Design Management*
10. *Environmental Management*
11. *Facilities Management Contracts and Procurement*
12. *Facilities Operations Management*
13. *Health and Safety Management (A)*
14. *Health and Safety Management (B)*
15. *Human Resources Management*
16. *International Construction*
17. *Management Information System for Construction and IT Applications*
19. *Property Development Planning*
20. *Property Valuation*
21. *Project Strategy and PMBOK*
22. *Property Investment and Portfolio Analysis*
23. *Property Legal and Institutional Framework*
24. *Research Methodology*
25. *Risk Management*
26. *Strategic Asset and Facilities Management*
27. *Technology Management*
28. *Total Quality Management*

29. Treatise

THE UNIVERSITY OF NOTTINGHAM

Website:

<http://www.nottingham.ac.uk/engineering/departments/abe/postgraduate/msc/mscinsustainableenergyandentrepreneurship.aspx>

Programme title: **Sustainable Energy and Entrepreneurship**

Qualification: MSc

Duration: 1 year full-time (Sustainable Energy ... 2013a)

MODULES

The business element comprises of 6 modules:

Creative Problem Solving
Finance and Accounting
Innovation Management
Project Management
Marketing for Entrepreneurs
Science Technology Arts and Business

The technology element comprises 3 compulsory modules:

Regulation and Management of Energy Supply and Use
Renewable Energy Technology
Research Methodologies

You will then be able to choose three further optional modules from topics such as:

Acoustics and Lighting
Air Conditioning Technologies
Advanced Topics of Heat Transfer
Combined Heat and Power Systems
Combustion and Pollution Control
Cooling Technologies and Applications
Energy Conversion and Utilisation
Environmental Sustainability
Hydrogen Economy and Technology
Materials and Building Physics

UNIVERSITY OF BRIGHTON

Website: <http://www.brighton.ac.uk/set/prospective/built-environment.php?PageId=120#pg>

Programme title: **Built Environment**

Specialization:

Construction Management MSc (PGCert PGDip)

Facilities Management MSc (PGCert PGDip)

Project Management for Construction MSc (PGCert PGDip)

Environmental Assessment and Management MSc (PGCert PGDip)

Sustainability of the Built Environment MSc (PGCert PGDip)

Town Planning MSc (PGCert PGDip)

Qualification: MSc

Duration: 1 year Full-time; 2 years Part-time (Built Environment 2013c).

Construction Management MSc (PGCert PGDip)

MODULES

Core modules

Construction Management
Project Planning and Analysis
Construction Law and Procurement
Management of People and Organisations
Project Risk and Financial Analysis
Masters project
Sustainable Energy of Buildings
Sustainable Construction
Energy Assessment of Buildings
Environmental Impact Assessment

Facilities Management MSc (PGCert PGDip)

MODULES

Core modules

Facilities Management
Energy Assessment of Buildings
Project Risk and Financial Analysis
Management of People and Organisations
Project Planning and Analysis
Masters project
Construction Law and Procurement
Sustainable Energy for Buildings
Sustainable Construction
Environmental Performance

Project Management for Construction MSc (PGCert PGDip)

MODULES

Core modules

Project Management for Construction
Project Risk and Financial Analysis
Construction Law and Procurement
Management of People and Organisations
Project Planning and Analysis
Masters project
Environmental Impact Assessment
Sustainable Construction
Energy Assessment of Buildings
Environmental Policy and Law

Environmental Assessment and Management MSc (PGCert PGDip)

MODULES

Environmental Impact Assessment
Systems for Environmental Management
Environmental Law and Policy
Environmental Assessment in Practice
Ecological Principles
Research Methods and Techniques
Individual research project

Options from:

Environmental Impact of Buildings
Geographical Information Systems and Environmental Assessment
Hydrology and Hydrogeology
Sustainable Development
Water Resources Management
Water Treatment Technology
Energy Assessment for Buildings
Ecological Field Techniques
Geohazards
Environmental Auditing
Environmental Geology
Air Quality Management
Sustainable Energy for Buildings

Sustainability of the Built Environment MSc (PGCert PGDip)

MODULES

Core modules

Sustainable Construction
Sustainable Energy for Buildings
Energy Assessment for Buildings
Impact of Buildings on the Environment
Masters project

Options

Two from:

Introduction to GIS
Applications of GIS
Ecological Principles
Case Studies in Environmental Assessment
Air Quality Management
Systems for Environmental Management
Facilities Management
Overview

Town Planning MSc (PGCert PGDip)

MODULES

Planning Theory
Policy and Implementation in Town Planning
Sustainable Urbanism in Coastal Communities
Management of People and Organisations

International Practice in Property Planning
Learning Log
Masters Dissertation

Options including:
Introduction to Geographical Information Systems
Applications in Geographical Information Systems
Environmental Impact Assessment
Sustainable Energy for Buildings
Environmental Policy and Law
Case Studies in Environment Assessment

UNIVERSITY OF DUNDEE

Website: http://www.dundee.ac.uk/postgraduate/courses/advanced_sustainability_built_environment_msc.htm

Programme title: **Advanced Sustainability of the Built Environment**
Qualification: MSc/PGDip
duration: 1 year Full-time; 2 years Part-time (Advanced Sustainability ... 2013)

MODULES

Principles of Sustainable Built Environment
Spatial Analysis
Sustainability Assessment (Implications, Indicators & Assessment Methods and the Whole Life Value)
Students take one specialist module from those available that year, for example: Intelligent Buildings: Strategic Design and Management
Sustainability in Contemporary Cities
Zero-Carbon and Low Energy Housing Development: Strategies, Challenges and Design

Masters students pursue a research project on a specialist subject area developed from their specialist module or the Sustainability Assessment module.

3.3 PhD programmes

UNIVERSITY OF WASHINGTON COLLEGE OF BUILT ENVIRONMENT

Website: <http://www.be.washington.edu/Interdisciplinary/phdbuiltenvironment/>

Programme title: **Ph.D. Program in the Built Environment**

MODULES

a) Required Core Courses

All Ph.D. students in the Built Environment Program are expected to have the basic knowledge and skills covered by the program core. The core presents the intellectual and cultural context within which the built environment has been produced and interpreted and the basic means by which students will come to understand it and contribute to its development. Students are required to successfully complete a total of 21 credits of core work, distributed as follows:

History, Theory, and Ethics: 9 credits

Colloquium-Practicum (Research-Practice & Teaching-Learning):	6 credits
Research Methods and Design:	6 credits
Total	21 credits

History, Theory, and Ethics Sequence:

B E 551: The Contemporary Built Environment (3 credits) Autumn Quarter

The history of 20th–21st Century Built Environment covers major or landmark cases of complex built environment projects, emphasizing the multiple dimensions involved and their interconnections (financing and economics, regulatory systems and codes, environmental factors, materials and technology, energy systems and infrastructure, design intentions, construction processes, facility uses and client-occupant responses, subsequent adaptations).

B E 552: Theories of Knowledge and the Built Environment (3 credits) Winter Quarter

Systematic examination of the alternative epistemological frameworks applicable to studying the built environment. An analysis and explication of the differences among the theories of knowledge which account for their separation and often antagonism and an exploration of the similarities and relationships such that they might be understood as complementary or merged in a more comprehensive, pluralistic approach. Coverage includes the history behind the current problematics, the multifaceted character of the built environment, the major epistemological issues and fundamental concepts, and the dominant epistemological paradigms. The course provides the background for the diverse range of theories and methods used by built environment researchers.

BE 553: Ethics in Practice, Research, and Teaching (3 credits) Spring Quarter

The course will cover central readings in ethics, applying them through cases to built environment practice and research protocols. Coursework and exercises will provide the opportunity for students to reflect on case studies and problems, enabling them to become more conscious and responsible for their contributions and actions, especially as members of teams and within group projects. Emphasis will be given to both pluralistic and contending social values and problems (including social and environmental justice) and to the ethics of research (for example in regard to client and data confidentiality, informed consent, fidelity, and veracity).

Colloquium-Practicum

B E 550: Colloquium-Practicum on Research-Practice and Teaching-Learning (6 quarters at 1 credit per quarter) Autumn-Winter-Spring Quarters

The regular format is that of a weekly meeting at which faculty and students make presentations of current built environment research issues and professional projects. Intended to provide a synthetic and interdisciplinary introduction and regular update of emerging problems and directions in built environment research and practice. In addition, the course provides the occasion for program members' interaction and collegiality. During the autumn quarter, second-year students instead attend a Practicum on Teaching and Learning once a week; during the winter and spring quarters the second-year students resume participation in the general Colloquium, presenting their work in progress that focuses on either their academic research or research issues in professional practice (during which time they will be working individually with senior faculty or experienced professional "employer" mentors under a contact system to produce an agreed-upon product (for example, a grant proposal, journal article, or parallel professional outcome such as a report or information technology tool) which is then submitted for usual peer evaluation. The practicum provides for processes of critical reflection during the research and production that allows the student the chance to gain systematically deeper understanding of the research and practical process and strategies for overcoming the problems and errors that seem unavoidable in the course of a life-time career.

Research Methods and Design

Students must complete 6 credits of course work. Because of the wide variety of methods appropriate to students in research methods and design in the three specializations, there is no specific set of courses that all students must take. Rather, in order to customize the preparation for each student, the methodologies may be selected from the list of offerings below, with the guidance of their advisor and provisional committee, and are intended to provide the skills for the specific approach to be undertaken in the student's dissertation research project. In choosing the 6 credits, special attention should be given to considering a balance between methods that clearly will be called for and a broader consideration of approaches presenting challenges that need to be critically met or alternatives that might prove fruitful from a non-traditional perspective. The research methods and design courses from which the students can choose to satisfy the core requirements and from which they may also select courses for additional advanced work include (but are not limited to):

Anth 536 Seminar in Visual Anthropology
Anth 572 Environmental Anthropology Research Methodology
Arch 588 Research Practice
Arch 597 Research Practicum
C Lit 599 Special Seminar (Research Methods)
CS&SS 527 Survey Research Methods
CS&SS 567 Statistical Analysis of Social Networks
DXARTS 411 Applications of Digital Technologies to Humanities Research
EdPsy 490 Basic Educational Statistics
EdPsy 501 Human Learning and Educational Practice
EdPsy 588 Survey Research Methodology and Theory
EdPsy 591 Methods of Educational Research
Engl 562 Discourse Analysis
Geog 425 Qualitative Methodology in Geography
Geog 460 Urban Geographic Information Systems
Geog 505 Spatial Dimensions of Chinese Development
Hist 530 Comparative Colonialisms: Methodological and Conceptual Approaches
Hist 595 Historical Practices
Ocean 452 Spatial Information Technology in Ecosystem Sciences
HCDE 517 Usability Testing
Soc 506 Methodology: Quantitative Techniques in Sociology
UrbDP 422 Urban and Regional Geospatial Analysis
UrbDP 519 Qualitative Research Planning
UrbDP 520 Quantitative Methods in Urban Design and Planning
UrbDP 591, 592, 593 Doctoral Seminar: Researchable issues and research methodology.

b) Fundamental Areas of Study

Three fundamental areas of specialization in built environment knowledge and practice are offered within the BE Built Environment Doctoral Program: 1) sustainable systems and prototypes; 2) computational design and research in environmental design, planning, and related activities; 3) history, theory, and representation studies. Each student will select one of these areas, within which she or he will take their advanced and specialized coursework and, eventually, conduct their dissertation research project. Each student will be required to take 30 course credits in the chosen area of specialization during their first several years in the program, before undertaking the qualifying examinations.

A broad selection of courses, both within the College of Built Environments and in other University of Washington units, is available to provide the content of the three areas of specialization. Given the already diverse, interdisciplinary character of each of the areas, as well as the anticipation that each student's intended trajectory will be unique and because of the inherently interdisciplinary character of the areas and the fact that they already involve a wide variety of disciplines and departments, the requirements for the total number of course credits have not been further specified among sub-categories commonly utilized (terms such as "primary" and "secondary"; "concentration" and "supporting" are not necessary). Nor is there specified a set of required courses for all students within each fundamental area; rather, with the guidance of their advisor/chair and provisional

committee, each student will create a customized curriculum that addresses their broad intellectual interests while building expertise in their chosen area.

c) Examinations

After the student has completed the coursework (normally in about five quarters), she or he will take the examinations to demonstrate mastery over the core and (one) chosen area of specialization. The qualifying examination will consist of written responses to three questions, followed by an oral examination on the material. Two of the questions will cover the core area: one on theory and historical-cultural issues, a second on research methodology and research design. The third question will cover an aspect within the chosen fundamental area that focuses upon the student's intended dissertation subject matter and approach. The written and oral examinations will be composed, conducted, and evaluated by the student's formally appointed dissertation committee. The written portion will be a take-home examination, due within seven days of being received by the student. If the written answers are determined to be acceptable, the student will undertake the oral examination. In the event that the student does not pass one or more sections of the examination, she or he will be given a second opportunity.

d) Dissertation

When the student has identified a dissertation topic, the dissertation committee will be selected. The chair of her or his committee must be a member of the Built Environment Program faculty with expertise in the area of specialization and intended dissertation research project ("a member of the Graduate Faculty with an endorsement to chair doctoral committees"). Other committee members will be chosen to complete the substantive and methodological expertise necessary for guidance and evaluation of the student's work. All dissertation committee members must be members of the Graduate Faculty. The Graduate Faculty Representative will be selected by the usual graduate school procedures. Dissertation research will be guided by the committee, with regular meetings of the chair and student and at least annual meetings of the entire committee and the student. Dissertation credits will be credited under BE 800; 30 credits are required.

As noted, the dissertation should be in one of the three fundamental areas of knowledge and practice of the built environment. The dissertation project for the Built Environment Program is intended to be original research that contributes new knowledge and/or approaches to practice. (Doctoral students are required to write a dissertation that significantly advances the state of knowledge in the field.) The dissertation must demonstrate an understanding of the theory and methods related to the area of knowledge in which the dissertation is based, as well as the relevance and appropriate background information. Thus, the strategies and content of the dissertation provide the culmination and integration of the student's learning and experience, an especially important contribution in this newly developing interdisciplinary field.

Upon completion of the dissertation research project and approval of the correctly formatted document by the dissertation committee, the student schedules his or her oral defense of the dissertation. The final examination consists of the student's oral defense of the dissertation before that Dissertation Committee. The student subsequently will incorporate into the dissertation appropriate changes recommended by the Committee before the final awarding of the degree. Because the student must successfully defend her or his research before the Ph.D. can be granted, she or he may repeat the defense if the initial defense is unsatisfactory (Ph.D. Program ... 2013).

CLEMSON UNIVERSITY

COLLEGE OF ARCHITECTURE, ARTS AND HUMANITIES

Website: <http://www.clemson.edu/caah/pdbe/students/index.html>

Programme title: ***PhD in Planning, Design and the Built Environment***

The Ph.D. program in Planning, Design and the Built Environment is designed as an interdisciplinary, three year post master's degree program. In most cases students will enter the program with a master's degree in one of the

design disciplines of architecture, landscape architecture, planning, construction science or real estate development. Students with advanced preparation may take slightly less than three years. Students from other disciplines including engineering, business or the social sciences may be required to take prerequisite coursework as the core courses require some previous coursework experience.

The curriculum is divided into five content areas:

- core courses,
- concentration courses,
- elective courses,
- comprehensive examination, and
- Dissertation research.

Students will select a field area from the traditional fields of architecture, landscape architecture, planning, construction science or real estate development to build disciplinary as well as interdisciplinary foundations. Concentrations might be drawn from areas such as:

- Built Environment + Health
- Restoration, Sustainability + Land Ecology
- Regional/Community Design + Development
- Technology, Materials + Construction Processes

Core Courses—The core consists of 29-35 hours of coursework. Those hours will include advanced theory/history, advanced methods courses generally taken outside the college, a readings course within a primary field area, a contemporary issues seminar, courses in research design and teaching technique, a colloquium and workshop. The core provides a foundation with some flexibility to tailor curriculum to individual needs within primary fields of study as well as a forum to address issues of the built environment in an interdisciplinary setting.

Concentration Courses—Concentration courses may be taken within or outside the college. These courses add both breadth and depth in the student's area of concentration. Students develop an individualized course of study to reflect their individual focus and career objectives. Coursework must be approved by the student's faculty advisor and committee members.

Electives—These courses add additional breadth and depth to the program. Students may add to their concentration coursework, selecting diverse offerings to complement concentration or developing a minor with nine hours in a second concentration.

Degree Plan and Comprehensive Exam—Students will be assigned a program advisor on entering the program. A program evaluation will be conducted and a dissertation advisor and committee will be selected at the end of the first full year of study. A curriculum plan for the remainder of the degree program will be developed at that time. Comprehensive and oral examinations will be administered following the completion of the second full year in the program. Dissertation credit cannot be taken until comprehensive exams are scheduled.

Dissertation Research—Students will develop a dissertation in their area of concentration. A minimum of 24 hours in dissertation research will be taken (PhD in Planning ... 2013).

MODULES

First Year Courses

FALL

PDBE 801 Advanced Theory (3)

PDBE 804/5/6/7/8 Readings in the Fields of Real Estate Development, Architecture, Landscape Architecture, City and Regional Planning, or Construction Science and Management (3)

PDBE 810 Contemporary Issues (3)

PDBE 812 Seminar (1)

Advanced Methods Course (e.g., EXST 801) (3)

Fall Credits: 13

SPRING

PDBE 804/5/6/7/8 Readings in the Fields of Real Estate Development, Architecture, Landscape Architecture, City and Regional Planning, or Construction Science and Management (3)

PDBE 812 Seminar (1)

Advanced Methods Course (e.g., EXST 803) (3)

Electives or Concentration Courses (e.g. CRP 870 Sustainable Development) (6)

Spring Credits: 13

Second Year Courses

FALL

PDBE 812 Seminar (1)

PDBE 815 Research Design (3)

Electives or Concentration Courses (9)

Fall Credits: 13

SPRING

PDBE 812 Seminar (1)

PDBE 816 Research Practicum (3)

PDBE 820 Instructional Design Delivery (3)

Electives or Concentration Courses (6)

Spring Credits: 13

Third Year Courses

Dissertation Research (24)

Total Credits: 76

** Elective Courses—All Electives Must Be Approved by Advisory Committee

4 Recommended themes for BSc, MSc and PhD modules

4.1 Themes for Bsc/specialists modules

Recommended themes in the BSc/ specialists modules:

- Introduction to sustainable built environment (Loftness and Haase, 2013, Graham, 2003, Stefanovic and Scharper 2011);
- Planning, investment and development of built environment (Howes and Robinson, 2005)
- Advanced construction technologies for energy efficient buildings (Kruger and Seville, 2012, Chiras, 2000, Jayamaha, 2006)
- Project management in construction and construction site management ((Mincks, and Johnston, 2010, Ritz, 1993)
- Energy audit for buildings (Al-Shemmeri, 2011, Thollander and Palm 2012, Dall'O', 2013)
- Energy efficiency in engineering systems (Kanoglu, et al. 2012, Harris, 2011, Stepanov, 2011)
- Sustainable renovation of houses (Gelfand, and Duncan, 2011, Lubeck, 2010)
- Introduction to renewable energy (Nelson, 2011, Boyle, 2004)
- Construction materials for sustainable built environment (Spence and Kultermann, 2010)
- Geographical Information Systems (GIS) (Heywood, et al. 2012, Longley, et al. 2010, DeMers, 2008, Jensen, and Jensen, 2012)
- Building Information Modelling (BIM) (Crotty, 2011, Smith and Tardif, 2009, Eastman, et al. 2011)
- Buildings in Use and Housing Management (Nieboer, et al. 2012, Rosahn and Goldfeld, 2012)
- Introduction to Environmental Quality, Human Health and the Built Environment (Frank, 2003)
- Affordable Built Environment (Koones, 2010)
- The Ecology of the Built Environment (Graham, 2002, Loftness and Haase 2013)
- Introduction to sociological methods (Denzin, 2009, Hughes and Sharrock 2007, Punch, 2005)

4.2 Themes for Msc modules

Recommended themes in the MSc Modules:

- Life cycle of the sustainable built environment (Crawford, 2011)
- Place-making and urban design (Dannenberg, et al. 2011, Carmona, et al. 2010)
- Introduction to renewable energy (Nelson, 2011, Boyle, 2004)
- Construction materials for sustainable built environment (Spence and Kultermann, 2010)
- Geographical Information Systems (GIS) (Heywood, et al. 2012, Longley, et al. 2010, DeMers, 2008, Jensen, and Jensen, 2012)
- Building Information Modelling (BIM) (Crotty, 2011, Smith and Tardif, 2009, Eastman, et al. 2011)
- Buildings in Use and Housing management (Nieboer, et al. 2012, Rosahn and Goldfeld, 2012)
- Introduction to Environmental Quality, Human Health and the Built Environment (Frank, 2003)
- Affordable Built Environment (Koones, 2010)
- The Ecology of the Built Environment (Graham, 2002, Loftness and Haase 2013)
- Introduction to sociological methods (Denzin, 2009, Hughes and Sharrock 2007, Punch, 2005)
- Climate, architecture and energy saving (Watson and Labs, 1993)
- Energy efficiency in built environment (Nieboer, 2012)
- Renewable energy applicable in construction and operation of buildings and structures (Trubiano, 2012)
- Passive buildings and Sun City (Allen, 2012, Chiras, 2002)
- Construction of energy efficient structures in civil engineering (Watso and Labs 1993)
- Sustainable renovation of the built and human environment (Gelfand, and Duncan, 2011, Lubeck, 2010)
- Real estate development following the principles of sustainability (Miles, et al. 2007, Balmori and Benoit, 2007, Keeping and Shiers, 2004)
- Project and people management in the built environment (Senaratne and Sexton, 2011)
- Strategic facilities management (Booty, 2009, Atkin and Brooks, 2009)
- Facilities management excellence (Booty, 2009, Atkin and Brooks, 2009)
- Cultural side of economic sustainable development (Asefa, 2005, Goldin and Winters, 1995)
- Micro and small business in local sustainable development (Rogers, *et al.* 2007)
- The agencies of territorial and sustainable development governance (Sedlacko and Marinuzzi, 2012, Voss, et al. 2006)
- The initiatives for the local development with a bottom – up approach (Pike, *et al.* 2010, 2006)
- Network analysis for local systems
- Sociological methods used for sustainable urban development (Denzin, 2009, Hughes and Sharrock 2007, Punch, 2005)
- Indoor environmental quality and human health (Gammage and Berven, 1996)
- Technogenic problems in 21st century

4.3 Themes for PhD modules

Recommended themes in the PhD modules:

- Sustainable design theory ((DeKay, 2011, Walker, 2006, Palazzo and Steiner, 2011)
- Innovations in sustainable built environment (Newton, *et al.* 2009)
- Intelligent cities and smart built environment (Deakin and Al Waer, 2012)
- Intelligent and biometric systems
- e-Networking in the sustainable built environment.

5 Conclusions

Market need analysis for higher education in built environment has been performed to identify the evolving needs in the market of built environment and the need for energetically and ecologically sustainable, affordable and healthy built environment. Literatūros analizės metu buvo nustatyti pagrindiniai įgūdžiai ir žinios, kuriuos turi turėti civil engineers and project managers, norint išsiaiškinti, kokiems moduliams bus skiriamas prioritetas. Atlikus išsamią literatūros analizę buvo išsiaiškinta, kad the graduates should have sufficient knowledge and skills for ensuring effective implementation of team goals within the whole life cycle of the project (production,

management, supervision, disposal, etc.) and to manage project development process and assessment of the results gained. The graduates shall be able to assess economical, social and environmental context, i.e. understanding of commercial and economical context of engineering process and understanding of the importance of high level professional and ethical behaviour for civil engineering. The graduates shall have particular knowledge about precise materials, products, tools, processes, and technologies, effective application of technical literature or other information sources and understanding of legislative acts and industrial standards, regulating engineering activity. Also students shall understand the basis of engineering science and technologies (essence, methods, differences and similarities of research spheres, nature of laws, theories, descriptions, objectivity, role of the experiment) and research practice (research systems, relations with clients, information systems, integration importance). Students shall be able efficiently to work on their own or in team. Students shall be able to perform effective communication with engineering community and broad public with the help of different methods and understand the importance of continuous studying and shall have the intention to do it all the life.

Norinti išsiaiškinti, kokiems moduliams teikiamas prioritetas pasaulio mastu buvo išanalizuota 15 pasaulio universitetų pateikiamos BSc, MSc, PhD study programės in promoting energetically and ecologically sustainable, affordable and healthy built environment. Taip pat atlikta jų statistinė analizė, kurios metu paaiškėjo, kad didžiausias dėmesys tiek BSc, tiek MSc studijų pakopose skiriama moduliams environment and management tematika, taip pat pakankamai daug modulių development ir sustainability klausimais. Atlikus pasaulio universitetuose siūlomų programų ir jose pateikiamų modulių analizę buvo rekomenduoti BSc, MSc, PhD moduliai to implement at universities of Belarus, Russia and Ukraine.

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