

CHAPTER 1

THE EDUCATION SYSTEM

This Chapter is undoubtedly the longest in this book, encompassing the education systems throughout our member countries.

(INSERT IF APPLICABLE: We are greatly indebted to our partner organisation(s) in Japan (and the US?) for providing comparable information on their own education systems.)

An explanation of the questions asked of members is set out below:

General Education System at present: ECCE members were asked to provide information on the education system in their own countries.

This outlines the university education available for civil engineering students. Where members are aware of future developments about to take place, these are also outlined.

More specific details regarding names of universities in a member country or specific departments are appended in an Annexe at the end of this chapter.

Environmental training within Civil Engineering Education: As a result of discussions and concerns expressed by ECCE's Environment Task Force, additional questions were asked in relation to the environment.

The additional questions were as follows:-

- 1.1 Are modules in environmental understanding available in your country as part of an undergraduate programme?
- 1.2 Are such modules mandatory?
- 1.3 How are civil engineers taught about the environmental implications of their work?
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Bologna Process, application of: ECCE's Education Task Force, chaired by Professor Manoliu of Romania, has been looking at the changes being brought about in civil engineering education by the Bologna process. The Bologna Process is considered to be the most important and wide-ranging reform of higher education in Europe since the immediate aftermath of 1968. It aims to create a 'European Higher Education Area' by 2010 which will allow for mobility of staff and students and recognition of their qualifications. It seeks to frame diversified national systems into a common frame based on three outcome levels – Bachelor, Master and Doctoral. An application of such a system to the training of professional civil engineers who will then bear responsibility for major infrastructure projects is generating much discussion across the EU. A civil engineering perspective of this process is set out as an Addendum to this Chapter (pages 41- 53).

Foreign language learning: In late July 2003, the European Commission announced that it had now adopted an action plan for 2004-2006 with a view to boosting language learning. The objectives stated that "Language learning is a lifelong activity. Teaching should start as early as possible (even at pre-school level) and quickly cover two languages in addition to the child's mother tongue, and should continue into higher education and adult education". An additional question to members sought to ascertain if language learning was encouraged within civil engineering education in Europe.

COUNTRY	
Croatia	<p><u>General education system at present</u></p> <p><i>University Education</i></p> <p>University level civil engineering studies are organized at four out of six Croatian Universities. The civil engineering studies cover all areas of civil engineering: structures, water engineering, roads and railways, construction management, construction materials, geotechnics, etc. The time needed to complete the civil engineering studies has recently been extended to 4.5 years or nine semesters. In the course of these studies, students are required to pass approximately 45 examinations and to prepare the bachelor's degree thesis. At the end of the studies, students obtain the title of Graduate Civil Engineer. This category of professionals is educated for high-level professional work in the design, construction supervision, complex construction work as well as for scientific research. Master of Science (MSc) level may be obtained after additional two years of studies, and doctoral level (PhD/ScD) three years after completion of MSc studies.</p> <p><i>High School Education</i></p> <p>The civil engineering curriculum is offered at five technical high schools. The studies last three years or six semesters. Students are required to pass 30 examinations and to write a final diploma paper, after which they obtain the title of Civil Engineer. This category of students is educated to work on construction projects and at various public administration positions.</p> <p><u>Future situation</u></p> <p>The new law on higher education has been in force since September 2003. The orientation of the higher education system is now shifting towards the Bologna system (3+2+3 system), although the new law also proposes an alternative solution (4+1+3). Three educational levels are currently planned, and should formally be implemented as of the academic year 2005/2006.</p> <p>These three steps are :</p> <p>Level 1: Three-year undergraduate studies - Bachelor of Science in Civil Engineering</p> <p>Level 2: Two-year graduate studies - Graduate Civil Engineer</p> <p>Level 3: Three-year postgraduate studies - PhD/ScD (Doctor of Civil Engineering)</p> <p>In Croatia, higher education civil engineering programs are offered at the following universities: University of Zagreb, University of Split, University of Rijeka and University of Osijek.</p> <p><u>Environmental training within Civil Engineering Education:</u> modules are to be introduced at levels 2 and 3. These modules will be compulsory at level 2 and voluntary at level 3. Some environmental topics have recently been introduced in water engineering courses. Environmental courses are offered at university-level inter-faculty postgraduate studies in chemistry, civil engineering, space planning, social sciences, as well as in health and law sciences.</p> <p><u>Bologna process:</u> After the oncoming implementation of the Bologna program, the curriculum tailored to this system is expected to offer more flexibility to</p>

	<p>students and teacher alike. The construction industry is not included in this process and has not formulated a clear opinion about the oncoming changes.</p> <p><u>Foreign language learning</u> (English and German) is obligatory for all degrees of engineering studies. Students entering the university already have some basic knowledge of foreign languages, as foreign languages are taught in Croatia continuously as of the age of nine. At the university level, foreign language studies focus on broadening of professional vocabulary, and on development of speaking skills.</p>
<p>Cyprus</p>	<p><u>General Education System at Present</u></p> <p>The University of Cyprus is a new University and the engineering faculty was established in 2003. Civil engineering courses started in the University in September 2003. Until now, all Cypriot Civil Engineers were educated in foreign universities, mostly British, Greek and American universities. Only the Government run Higher Technical Institute offered 3 year diploma courses for Technician Engineers. There are also a number of private colleges offering courses for Technician Engineers.</p> <p><u>Environmental training within Civil Engineering Education</u></p> <p>There are modules in environmental understanding as part of the undergraduate programme. Some of the modules are mandatory.</p> <p>Specific lectures and seminars are organized by the Cyprus Technical Chamber and the Civil Engineers Associations in order to educate civil engineers about the environmental implications of their work.</p> <p>The University of Cyprus has not yet fully adopted the system, but is in the process of adopting it.</p> <p>The University of Cyprus offers two civil engineering four year full time courses.</p> <ul style="list-style-type: none"> (a) B.Sc. in Civil Engineering and (b) B.Sc in Civil Engineering and Environment <p>Postgraduate M.Sc. and Ph.D. research courses will soon be available in the University of Cyprus.</p> <p><u>Bologna process</u>: Since the University of Cyprus is just starting the civil engineering courses, they can easily adopt the Bologna System.</p> <p><u>Foreign language learning</u>: The English language is taught as a subject in the civil engineering degree. Other languages may be taken as optional.</p>
<p>Czech Rep</p>	<p><u>General education system at present</u></p> <p>The main principles in preparation of Bachelor and Master degree programmes at civil engineering faculties in the Czech Republic were defined with regard to the following issues: valid legislation on higher education, Accreditation Committee requirements, professional chambers demands, the Union of Entrepreneurs in Building Industry and EU directives for the profession. Proposed and mostly already approved study programmes are evaluated from the point of view of their link to the completed type of college (high school) as well as with regard to the professional requirements especially in Bachelor degree (BC) programme and with respect to student mobility within the Czech Republic and abroad during their studies. The linkage to the system of the life-</p>

long learning is described.

Czech Civil engineers mainly graduate from three Universities:

- CVUT Praha , Faculty of Civil Eng.
- TU Brno, Faculty of Civil Eng.
- TU Ostrava, Faculty of Civil Eng.

Faculties of civil engineering in the Czech Republic underwent an accreditation procedure in June 2001. The accreditation has been granted for a limited period according to the Act on Universities and its amendments of 1 July 2001.

Standard study length in a BC programme is between three and four years, in a Master programme between one and three years. Another option is to study in a self-paid study programme within life-long learning. Successful graduates of such programme can be granted as much as 60% of credits enabling them finishing full studies including granting a diploma.

The common background for preparation of study programmes was dealt with at the general meeting of civil engineering faculties of the Czech and Slovak Republics in September 2001. The decisions were made about starting BC studies beginning from the academic year 2003/2004 at the latest. It was indicated that at the faculties of civil engineering in Prague and in Ostrava, a standard length (4-year) BC programme is being prepared. The decisions seem suitable due to an amendment of the Act no. 360/1992 Coll. on authorized architects and authorized engineers and technicians in construction industry.

The amendment should determine the requirements for the European Commission regulation no. 85/384 on mutual recognition of diplomas, certificates and similar documents in the field of architecture, containing the provisions for facilitation of the right to carry out business and to free services movement in the field of construction industry. The studies in the programmes of Structural engineering and Architecture should take into consideration the requirements of the aforementioned regulation as well as the recommendations of the Accreditation committee sent to the Czech faculties that provide the study programme indicated above.

Environmental training within Civil Engineering Education

Concepts and trends:

The environmental protection and sustainable development can be classified among very important topics for all three stages of civil engineering education in the Czech Republic (bachelor, master, doctor). A major target is to synthesise education the ecological and environmental knowledge with the gamut of civil engineering disciplines. Properly trained civil engineer must be able to protect the environment and effectively to use resources.

The all Czech Civil Engineering Faculties have approved new structured study programmes, branches of study and subjects curricula from the previous academic year. The programmes are design so that, after completion, the graduate will:

- acquire high-quality knowledge related to environmental protection and sustainable development;
- get familiar with legal regulations in the Czech Republic and EU (Planning and Building Law);
- be able to analyse, investigate and manage the projects in his branch of study also from point of environmental aspects;
- be able to develop environment-friendly policy with full responsibility towards the society.

The higher education institutions have prepared compulsory and elective

	<p>courses devoted to environmental protection and sustainable development, for example Civil Engineering and Environment, Environmental Protection, Environmental Engineering, Air Pollution, Environmental Hydraulics, Environmental Impacts, Water Quality and Pollution Control, Applied Ecology for Engineers, Ecology, Environmental Impact Assessment, Environmental and Remote Sensing, Environmental Geology, Environmental Protection of Urban Area, Pollution Control of Urban Areas, Soil and Groundwater Protection, Waste Disposal, etc.</p> <p>Some problems of this issues are embedded in subjects Building Construction, Building Physics, Maintenance and Rehabilitation of Buildings, Construction Quality, Building Services Systems, Sanitary Engineering, Water Supply and Sewer Systems, Water Treatment, Design of Buildings, Advanced Design in Building Construction, City Planning, Regional and Urban Planning, Analysis of Urban and Environmental Systems, Land Use Planning, Planning and Building Law, etc.</p> <p>Due to Czech law on higher education all courses can be attended by the public and are also regularly offered by Czech Chamber of Chartered Engineers and Technicians as a part of the life-long system.</p> <p><u>Bologna process:</u> Since the University of Cyprus is just starting the civil engineering courses, they can easily adopt the Bologna System.</p> <p><u>Foreign language learning:</u> The English language is taught as a subject in the civil engineering degree. Other languages may be taken as optional.</p>
Estonia	<p><u>General education system at present</u></p> <p>There was a unitary Engineering education system and unique study programmes in all of the Soviet Union until 1991 when Estonia regained its independence.</p> <p>Pre-university education lasts for 12 years in Estonia.</p> <p>There are three higher educational institutions:</p> <ul style="list-style-type: none"> • Tallinn Technical University • Estonian Agricultural University (located in Tartu) • Tallinn College of Engineering <p>The education of civil engineering specialists at Tallinn Technical University lasted 5 years and the courses met the requirements of the traditional curricula of diploma engineers until 1994. In addition an applied engineering scheme (lasting 4 years) was introduced in 1991 and the Faculty of Civil Engineering started to provide higher education for production purposes. That scheme was not viable and admission to the applied scheme then ceased. The structures, which had been developed within the framework of the 1992 academic reforms in TTU after Estonia regained independence, enabled radical reorganisation, updating the university education system and the system of disciplines. In 1995 the transition to bachelor studies was implemented. However, students of earlier admissions continued their studies according to the curricula of diploma engineers. The field of civil engineering was extended to the domain of civil engineering and the study fields were narrowed down to the fields linking close specialities and enabling organisation of common basic, general and core studies.</p> <p>Since 1995 new students have applied for admission directory to the domain of civil engineering. The competition between students for available places funded from the state budget has been 2 - 2.5 people per place and is gradually increasing.</p>

Until 2002, the nominal time of studies was four years for the bachelor's degree, 4 years for diploma studies (three specialities) and two years for the master's degree and four years for the doctor's degree. Starting from autumn 2002, new curricula were introduced for engineers, established on integrated curricula of bachelor and master studies. The nominal duration of studies will be 5 years and the completion of such a course will give qualifications equalling that of the master's degree courses, whereby the University can award master's degrees to graduates. Graduates from the engineering diploma studies may continue studies for a doctorate, with the nominal time being 4 years. The previous system had not allowed for providing civil engineers with adequate knowledge and skills by the time they graduate.

There is an 'imaginary' line in the new curricula of civil engineering study field after 120 credits (nominal time of 3-year studies) and after passing examinations in certain defined disciplines. Essentially this would mean meeting the requirements of the bachelor's degree programme.

According to the new curricula for engineers the study field of architecture and civil engineering in the domain of civil engineering is divided into three specialities, which in turn allows differentiation in specialisation.

<i>Civil and building engineering:</i>	<i>Building engineering</i>
	<i>Construction economics and management</i>
<i>Environmental engineering:</i>	<i>Water engineering</i>
	<i>Heating and ventilation</i>
	<i>Environmental management</i>
<i>Transport engineering</i>	<i>Road engineering</i>
<i>and engineering survey:</i>	<i>Engineering survey</i>
	<i>Logistics</i>

Graduates entering the civil engineering profession may start working as practising engineers, and after some years of practice may apply for Chartered Engineer status or for diplomas of European engineers. They can also continue their studies in the doctoral studies programme and after graduation choose the profession of a professor or researcher.

Logistics is a separate field, belonging to the domain of services and the study field of transport services. The nominal duration of studies is three years for a bachelor's degree and two years for a master's degree. Students are admitted to the Faculty of Civil Engineering and formally they will remain in the Faculty of Civil Engineering. The undergraduates in logistics are offered comprehensive knowledge of engineering, economics, law and information technology, which will enable graduates to take up responsible posts in all sectors.

In addition to the courses defined earlier, post-graduates with a bachelor's degree will be admitted to master's degree courses in the coming 2-3 years. They will be offered master's degree programmes in civil engineering, environmental engineering and transportation engineering according to the earlier curricula.

University studies are organised in compliance with the University Law and Standard of Higher Education.

Estonia considers that the development of its economy today requires effective solutions to the complex problems which civil engineers are faced with. Individual designs used in construction, and the renovation of old buildings improve the urban and rural environmental and emphasise the specific ethnic features of Estonia's towns. The range of building materials has grown considerably, computers are increasingly used in all stages of construction and co-operation with small enterprises is expanding. European countries, including

	<p>Estonia, are going over to common norms of design. All this makes the work of civil engineers challenging on the one hand, but interesting on the other.</p> <p>(Further details supplied as an Annex)</p> <p><u>Environmental training within Civil Engineering Education</u> <u>Bologna process</u> <u>Foreign language learning</u></p>
<p>Finland</p>	<p><u>General Education System at present</u></p> <p><i>(Details supplied - document not reproducible in electronic form at present as it is in 'Adobe Acrobat' and can not be inserted into this MS Word document)</i></p> <p><u>Environmental training within Civil Engineering Education</u> <u>Bologna process</u> <u>Foreign language learning</u></p>
<p>France</p>	<p><u>General Education System at present</u></p> <p>The French education system is based on compulsory secondary scholarship up to the age of 16. It is followed by the “Lycée” which, after 3 years studies leads to the “Baccalauréat” certificate.</p> <p>Later on, the title of “Ingénieur Diplômé” could be obtained, using one of the following ways (Around 25,000 Engineers each year, all engineering disciplines in total). All of them require 5 years of studies, following a 2+3 scheme). This title offers the “Master Degree”.</p> <ul style="list-style-type: none"> - Engineers ‘Grandes Ecoles’ System (54%) (‘Grandes Ecoles’ are higher educational institutions that award degrees after 5 or 6 years of study following the 'baccalauréat') <ul style="list-style-type: none"> o 2 years in “Lycée” Classes, after Baccalaureat, preparing for the entrance Examination to ‘Grandes Ecoles’ o Examination o 3 years of Engineering Studies in a ‘Grandes Ecole’ - Integrated Studies in Engineers ‘Grandes Ecoles’ (29%) <ul style="list-style-type: none"> o 2 years of high education as Integrated cycle of the Grande Ecole o Continuous Control of Knowledge o 3 years of Engineer Studies - Engineering Studies within the Universities (13%) <ul style="list-style-type: none"> o 2 years’ study to obtain “Diplôme Universitaire de Technologie (DUT)” or “Diplôme d’Etudes Universitaires Générales (DEUG)” o Selection based on Studies File and Interview (Or Examination) o 3 years of Engineering Studies - ‘Grande Ecole’ or University/Enterprise Alternation Formation, in connection with Continuous Education (4%). <ul style="list-style-type: none"> o 2 years’ study to obtain the ”Diplôme Universitaire de Technologie (DUT)” or “Brevet de Technicien Supérieur (BTS)” o Selection based on Studies File and Interview o 3 years of studies, alternatively in a ‘Grande Ecole’ and in firms. <p>Moreover, a title of “Ingénieur–maître” can be delivered by “Instituts Universitaires Professionels (IUP)”. Another way to obtain an Engineer Diploma, is through “Instituts des Techniques d’Ingénieur de l’Industrie (ITII)”, is</p>

	<p>developed in Chapter 14, because linked to the continuous education process.</p> <p>Generally speaking, Civil Engineers engaged in private business are mainly graduated from “Ecole Spéciale des Travaux Publics”, “Ecoles Nationales Supérieures des Arts et Métiers”, “Instituts Nationaux des Sciences Appliquées”, “Ecoles Nationales des Mines”, “Ecoles Centrales”, “Ecole Nationale des Ponts et Chaussées”, “Ecole Nationale des Travaux Publics de l’Etat”, “University Engineering Schools” (Open list).</p> <p>Central and local public Authorities recruit “Ingénieurs Diplômés” in Civil Engineering, as civil servants, mainly from “Ecole Nationale des Ponts et Chaussées”, “Ecole Nationale des Travaux Publics de l’Etat”, “Ecole d’Ingénieurs de la Ville de Paris”.</p> <p><u>Environmental training within Civil Engineering Education</u></p> <p>In the Schools of Engineering, there are generally no specific Environment Studies. Nevertheless, the “Ecole Centrale de Nantes” includes a “Département de Génie Civil et Environnement” in which Environment has an important place.</p> <p>But, Environment is a significant component in all main technical matters, then Environment is part of the “Basis culture” of Students. For example, Environment and Sustainable Development are treated in water supply, waste treatment (etc..) and they are major points taken in account by Students at the time of the “Designs”.</p> <p>Moreover, in some High Schools, Environment is effectively introduced as a specific option carried out a final step of Studies.</p> <p><u>Bologna process</u></p> <ul style="list-style-type: none"> • <u>The Bologna Declaration (3, 5, 8-year System).</u> <ul style="list-style-type: none"> ○ As indicated previously, the French Education system for Engineers through High Schools is based on a (2+3) system, different from the (3+2) Bologna system. <p>Nevertheless, in “Grandes Ecoles”, efforts are in progress in order to adapt their practice to the new system. (For example a “Bachelor Diploma” delivered at ESTP after 3.5 years of studies).</p> <p>The “Engineers Diploma” is delivered after 5 years of studies, in agreement with the Bologna Declaration. “Engineer Diploma” applies as “Master” graduation. Organisation of specific European Masters (Professional Masters, Research Masters...) is in progress in several High-Schools.</p> <p>Doctorate Degree in 8 years in France is also in agreement with the Bologna Process.</p> ○ In Universities, the implementation of the (3,5,8) System is in progress. The 3-year level, named “Licence” can, under some conditions, allow Students to have access to Engineers High Schools. <p><u>Foreign language learning</u></p>
<p>Germany</p>	<p><u>The General Education System at present</u></p> <p>The education of civil engineers takes place at institutions of higher education and requires at least 4 years of full time studying and teaching. Normally there are two types of academic institutions: Technical Universities (TU) and Universities of Applied Sciences (Fachhochschulen (FH)).</p>

Entry requirements to civil engineering courses: The entry requirements are a little bit different. Students of FH have to pass a successful technical education of 12 years and to undergo practical training of up to six months before entering the FH. A lot of the young people have a full professional education as carpenter, bricklayer etc. and in addition a 13-years education (Abitur). The entry requirement for TU-students is simply the successful passing of the Abitur.

The duration of undergraduate study for FH-students is 4 years of full-time study. It normally includes a full practical placement semester (normally the 5th semester) and finishes with a diploma thesis about a problem of the building industry. The thesis is part of a second practical placement and is normally supervised and examined by the university and - very often - the respective company.

The education at TU needs at least 5 to 6 years and is more theoretically based. In the middle of the education there is a pre-diploma examination, but no practical experience is required. The education finishes with the diploma thesis which is normally the result of a complex research programme.

Both graduates get the degree of "Dipl. Ing." (diploma engineer); the graduates of FHs are awarded "Dipl. Ing. (FH)", those from universities have no additional indication. Both civil engineers can enter the building job market immediately. The salary and the status in governmental bodies are a little bit different. Whereas FH-engineers normally find their working places in building and related companies at the building sites and in the middle management, TU-engineers are more research-oriented and work at the respective places.

Environmental training within Civil Engineering Education:

Nearly all universities (technical, scientific and applied) offer modules connected with environmental understanding.

Some of these are mandatory for every student e.g. building/environmental physics, waste water treatment etc. In addition a number of universities offer specialisation programmes for civil engineers to work later as environmental civil engineers.

There are very few special modules targeting this very topic. One will find such questions and implications as part of the normal educational modules. But they are mostly more technically or legally treated. Ethical aspects are a rather small part in the education and up to now a special module on ethics in the built environment is seldom. Seminars and the experience of the students during their practical placement semester are most appropriate to this question.

Bologna process

The immediate future for civil engineering education as a result of the Bologna process

The Bologna process introduced the two tier system: this is completely changing the German education system, but not only for civil engineers. All German universities have to follow this line and most of them start this system with the enrolment of students at least in winter semester 2005/2006.

The education of a Bachelor in civil engineering is open for all universities, the required duration is 6, 7 or 8 semesters and shall train the students for employability. The following education of a Master is also open for all universities and the required duration is 2, 1 1/2 or 1 year - depending on the time taken to achieve the Bachelor degree. The given title of a Master shall include the difference in education as "more research" or "more practically" oriented. The Bachelor degree will not have such an indication.

	<p>All new study programmes must be modularized. Their content has to be judged by the study load and credited by ECTS (European Credit Transfer (and Accumulation) System). All programmes have to be accredited by official accreditation agencies.</p> <p>In the field of civil engineering there are two such agencies:</p> <p>ASIIN the accreditation agency for education in engineering and natural sciences and informatics of the German VDI (Verein Deutscher Ingenieure) and that of the German Building Industry.</p> <p>Both agencies follow the recommendations of the German building associations and companies to provide at least 3 ½ years' education for a Bachelor in Civil Engineering degree.</p> <p>Foreign Language Learning</p> <p>Foreign languages are a must for all German students.</p> <p>All students and, thus, all (civil and construction) engineers are have learnt at least two languages at school. English is obligatory and often starts in the third class of school at the age of 8 or 9 years. The second foreign language starts in the 7th class, and a third one is offered in class 9.</p> <p>On top of this English language knowledge, all students have the possibility to attend English classes to learn professional and standardized words and discussion or rhetoric skills. In a number of civil engineering educational curricula with a clear target for internationalisation and cooperation with partner universities these lectures (often two modules totalling 4 hours per week for a whole year) are obligatory. English is sometimes not treated as a “real foreign” language, because it shall be part of the professional world of a civil engineer.</p> <p>Concerning the international aspect of a civil engineering education, in close co-operation with a partner university and a two or three semester study period abroad, students have to learn a second foreign language in-depth in order to attend the classes abroad and to work on a building site there. Very often these are the great languages like French, Spanish or Russian or that of a neighbouring country e.g. Dutch which many students had learnt at school.</p> <p>For German civil engineers the Chinese language is becoming more and more important.</p>
<p>Hungary</p>	<p><u>Education System</u> (Please provide an outline of the education system in your country)</p> <p><u>Environmental training within Civil Engineering Education:</u> Modules in environmental understanding are available in Hungary as part of the undergraduate programme. Such modules are not mandatory.</p> <p>- <i>1.3 How are civil engineers taught about the environmental implications of their work????</i></p> <p><u>Bologna process:</u> <u>Foreign language learning:</u></p>
<p>Ireland</p>	<p><u>Education System</u></p> <p>1. Pre-University Education</p>

Pre-university education in the Republic of Ireland comprises primary education (usually from ages 6-12) and secondary education (usually from ages 13-18). Secondary education is normally for 6 years with state examinations at the end of year 3 (Junior Certificate) and year 6 (Leaving Certificate). The examinations in each subject can be taken at 'Ordinary' or 'Higher' level. Secondary education follows a broad curriculum, with most pupils taking between 6 and 8 subjects at Leaving Certificate. The majority of students take Mathematics, English and Irish and select their remaining subjects from the sciences, languages, business, art, music and vocational courses. From the perspective of engineering, a worrying trend in the last decade has been the reduction in number of students taking physics and chemistry. In Ireland, in year 4 of the secondary system many schools offer a so-called 'transition year'. This is based more on project-related activities than formal classes/examinations, and students are also given the opportunity of gaining some limited work experience. There is also a significant number of post-Leaving Certificate courses available in vocational subject.

2. General View on Engineering Education

2.1 Engineering education at under-graduate level.

Engineering education in the Republic of Ireland normally comprises a four year undergraduate course (but in some cases five years – see 3.1.1. below) leading to a Bachelor of Engineering Degree (BAI, BEng, BE, BScEng depending on the institution).

Engineering Degree courses are accredited by the Institution of Engineers of Ireland (IEI). Graduates from accredited degree courses can achieve professional recognition through the IEI by seeking election as a Chartered Engineer, usually after having acquired at least four years relevant experience and postgraduate training.

2.2 Engineering education at postgraduate level

Masters programmes are of two types: taught courses (usually one year full time, two years part time) or research (usually two years). The degree awarded is an MSc.

Doctoral programmes are nominally of three years' duration, but often take four years or longer to complete. The degree awarded is a PhD.

3. CIVIL ENGINEERING EDUCATION

3.1 Undergraduate Education

In the Republic of Ireland undergraduate degree courses in civil engineering and related disciplines are offered both by university colleges and by institutes of technology (Its). Summaries of the relevant university and IT degree courses are set out sub-sections a) and b) below, while comments on such details as contact hours and term lengths are included in c).

Degree courses in civil engineering (university colleges)

There are four university colleges in the Republic of Ireland that offer undergraduates degrees in civil engineering (listed in Annexe to this chapter). All of these degree courses are of four years' duration, and are accredited by the IEI.

3.2 Civil engineering education at post-graduate level

The one year taught masters courses usually run from September to September. They typically comprise lecture terms (or semesters), written examinations, and a major dissertation (the latter to be completed over a three-to five-month period).

Masters by research and doctoral these are examined by internal and external

	<p>examiners appointed by the university; the assessment process include a viva voce. In some institutions, research students are required to take a limited number of relevant courses from taught masters programmes.</p> <p><u>Environmental training within Civil Engineering Education:</u></p> <ul style="list-style-type: none"> - 1.1 Are modules in environmental understanding available in your country as part of an undergraduate programme? - 1.2 Are such modules mandatory? - 1.3 How are civil engineers taught about the environmental implications of their work? <p><u>Bologna process:</u> In February 2004 the IEI published its position on the Bologna Declaration in a document entitled “A New Structure for Engineering Education in Ireland – Implementation of the Bologna Declaration”. This advocates a five-year integrated Master Degree programme as the new educational standard for the title of Chartered Engineers, with a Bachelor degree awarded after third year.</p> <p><u>Foreign language learning:</u></p>
<p>Italy</p>	<p><u>Education System</u></p> <p>The new structure of the academic studies in Italy is compliant with the Declaration of Bologna (3+2) and is regulated by the following Ministerial Decrees:</p> <ul style="list-style-type: none"> - 3 November 1999, n. 509, “<i>Regolamento recante norme concernenti l'autonomia didattica degli atenei</i>”(Regulation on the didactic autonomy in universities); - 4 August 2000, “<i>Determinazione delle classi delle lauree universitarie</i>” (Definition of the classes of tje academic Lauree); - 28 November 2000, “<i>Determinazioni delle classi universitarie specialistiche</i>” (Definition of the specialistic academic classes). <p>In compliance of these decrees, the structure of the study courses has two levels: Laurea (I level) and Laurea Specialistica (II level).</p> <p>The Laurea is awarded after a three-year study course and its objective is to supply general, scientific methods and contents and particular professional skills. After the Laurea you may:</p> <ul style="list-style-type: none"> ○ have access to the labour world immediately, ○ continue to study to be awarded the ‘Laurea Specialistica’, ○ apply for a I level Master. <p>The Laurea Specialistica is awarded after a further two-year study course and its objective is to supply an advanced formation and a high qualification in specific sectors. After a ‘Laurea Specialistica’ you may:</p> <ul style="list-style-type: none"> ○ have immediate access to the labour market, ○ continue to study to be awarded a Doctorate, ○ apply for specialisation courses, ○ apply for a II level Master. <p>Those who wish to matriculate in a ‘Laurea Specialistica’ holding a ‘non cognate Laurea’ or having followed a three-year ‘Laurea’ course targeted to the labour market, shall acquire some education credits. Some ‘Laurea’ courses maintain their five-year duration because they are regulated by European rules relevant</p>

to the mutual recognition among the European Union Member States (in particular those relevant to the medical and architectural professions).

'Debts' and 'credits' in education and training

The debts and credit system was introduced by the academic reform. The formation debt shows gaps in the formation against standard requirements, that is to say, against the minimum unavoidable skills to apply for a 'Laurea' course or a 'Laurea Specialistica' one.

The academic formation credit (CFU) is a unit of time measured to define the work required by students. Various activities, individual study included, are comprised in the hours constituting the credit. An academic year requires an amount of work from students conventionally fixed as **60 credits**. The 'Laurea' is awarded with **180 credits**. The 'Laurea Specialistica' is awarded having acquired **120 credits** which are added to the 180 of the 'Laurea' (300 credits altogether).

The acquisition of credits corresponding to a discipline is linked to having successfully passed an exam or another kind of control. It is important to emphasise that the recognition of credits does not depend on the mark acquired during examination: credits are not marks.

Credits are adopted in the whole university system to facilitate students both to move from one course to another and from one university to another, also abroad.

Recognition and protection of professional title

Article 167 of the Royal Decree 31 August 1933, n. 1592 'Testo Unico delle leggi sull'istruzione superiore' (*Act on the laws concerning academic education*) provides that any academic title can be awarded only by Universities and by Istituti Superiori (High Level Institutions). As the academic title has therefore a legal value, its abuse is punishable by article 498 of the 'Codice di Procedura Penale' (*Code of Criminal Procedure*).

According to Dpr.328/2001, Section A and B are created in the 'Albo Professionale of the Ordine degli Ingegneri' (*Professional Register*) Each Section is divided in the following Sectors:

- a) *civil and environmental*;
- b) *industrial*;
- c) *of computer science*.

The members of Section A are entitled to use the following titles, protected by law:

- a) the members of the *civil and environmental* sector are entitled to use the title of **ingegnere civile e ambientale**;
- b) the members of the *industrial* sector are entitled to use the title of **ingegnere industriale**;
- c) the members of the *computer science* sector are entitled to use the title of **ingegnere dell'informazione**.

The members of Section B are entitled to use the following titles, protected by law:

- a) the members of the *civil and environmental* sector are entitled to use the title of **ingegnere civile e ambientale iunior**;
 - b) the members of the *industrial* sector are entitled to use the title of **ingegnere industriale iunior**;
 - c) the members of the *computer science* sector are entitled to use the title of **ingegnere dell'informazione iunior**;
- To be enrolled in Section A of the 'Albo', it is compulsory to hold a five-year

	<p>academic title ('Laurea specialistica' or 'Laurea' of the old academic system) awarded by an Engineering Faculty and to have successfully passed a State Exam.</p> <p>To be enrolled in Section B of the Albo, it is compulsory to hold a three-year academic title ('Laurea' or Academic Diploma of the old academic system) awarded by an Engineering Faculty and to have successfully passed a State Exam.</p> <p>The Engineering Faculties The Engineering Faculties are presently open in 40 Italian universities (Details are attached in an Annexe at the end of this chapter).</p> <p><u>Bologna process:</u></p> <p>No training period is required by law during the academic formation or before sitting for the State examination.</p> <p>After the reform, it is generally previewed, both in the Laurea and in the Laurea Specialistica courses a period of training (compulsory in some cases) by companies or professional societies. This training generally lasts six months and awards 8/12 formation credits.</p> <p>To be enrolled in Section B of the Albo , it is compulsory to hold a three-year academic title (Laurea or Academic Diploma of the old academic system) awarded by an Engineering Faculty or a Polytechnic and to have successfully passed a State Exam.</p> <p>To be enrolled in Section A of the Albo , it is compulsory to hold a 3+2 year academic title (Laurea Specialistica) awarded by an Engineering Faculty or a Polytechnic and to have successfully passed a State Exam.</p>
<p>Lithuania</p>	<p><u>The Education System</u></p> <p>Historical background: Up to 1991 there was very strict Engineering education system and unique study programmes in all Soviet Union including Lithuania. Starting from 1991 the Civil/Engineering education system in Lithuania experienced major reform. Lithuania was one of the first post Soviet Union counties which introduced a two tier education system even before the Bologna declaration had been signed.</p> <p>The status quo: Since 2000 there has been a non–university sector within the higher education system, i.e. colleges have been established.</p> <p>Pre-university education: It is usual for pre–university education to last 12 years. Pre-university education may be obtained in:</p> <ul style="list-style-type: none"> ▪ ordinary secondary school; ▪ gymnasium; ▪ vocational school. <p>Undergraduate study: The duration of undergraduate studies in universities is 4 years. Having finished the basic academic studies, graduates gain a Bachelor's degree and the right to study for a Master's degree or to continue studies in a specialized professional field.</p> <p>Masters Degree:The duration of Master's degree studies is 1.5 - 2 years including time for preparing the thesis.</p> <p>The education of specialized studies is 1 year. At the end of these studies</p>

	<p>students defend their final project and get a professional higher education engineering qualification.</p> <p>Doctor's degree: studies and preparation of the dissertation takes 4 years.</p> <p>Permanent residents and citizens of Lithuania seeking to undertake studies at undergraduate and postgraduate level are admitted according to the competition rules and without specific entrance examinations.</p> <p>Persons from foreign countries are admitted to the universities according to signed contract.</p> <p>The non–University sector of studies is expanding.</p> <p>There are 5 higher education institutions in Lithuania, having university study programs in Civil Engineering. These are listed in an Annexe at the end of this Chapter.</p> <ul style="list-style-type: none"> ▪ Vilnius Gediminas Technical University – web site http://www.vtu.lt ▪ Kaunas University of Technology - web site http://www.ktu.lt ▪ Klaipeda University - web site http://www.ku.lt ▪ Lithuanian University of Agriculture - web site http://www.lzua.lt ▪ Siauliai University - web site http://www.su.lt <p>Non-University study programs in Civil Engineering are possible in:</p> <ul style="list-style-type: none"> ▪ Vilnius College of Construction and design http://www.vsdk.lt ▪ Technical Collage of Kaunas http://www.ktk.lt <p><u>Environmental training within Civil Engineering Education:</u></p> <p>One of the faculties in Vilnius Gediminas Technical University is named as an Environmental Engineering faculty. Modules of environmental understanding are mandatory for the students of that faculty.</p> <p>For the rest of Civil Engineering students such modules are not mandatory. There are no special programmes of Environmental implications for Civil Engineering graduates in their work.</p> <p><u>Bologna process:</u></p> <p><u>Foreign language learning:</u></p>
<p>Poland</p>	<p><u>The Education System:</u></p> <p>General description of academic education system in Poland</p> <ol style="list-style-type: none"> 1. Polish Civil Engineers graduate from 19 Universities of Technology and from two Academies which have an Agricultural and Technical Profile. Every University is composed of departments (mechanical, civil engineering, architectural, chemistry etc), those of teaching chairs – cathedras or institutes, eg. steel structures, concrete structures, accousties etc). Each has a Departments of Civil Engineering and Environmental Engineering or Sanitary Engineering. The organisation of High Schools is regulated by the State Law of Academic Education. <p>About 10,000-20,000 students study on each University of Technology yearly, but in the Civil Engineering Department the average number of students is about 2,000.</p> <ol style="list-style-type: none"> 2. The basic type of studies are daily studies, no fees, with eleven semesters – 5.5 years duration with the graduation diploma and professional

	<p>degree of Master in Engineering. They are concluded with the diploma - master or engineer thesis - based on structural design or research work and proper examination. In general, about 5,000 – 6,000 persons graduate as a Master of Science in Civil Engineering yearly in Poland, with an average 60% effectiveness of studies.</p> <p>There are also full paid engineering „weekend studies" usually supplementary to working technicians, equal to baccalaureate certificate. Lectures, design corrections and laboratories for them are organised on Saturdays and Sundays. Their duration is 3.5 – 4.0 years, the curriculum is less theoretical, and the graduates obtain a diploma as 'engineer'. This grade is much less popular, counts about 30%, its numbers total 1,000 - 1,500 persons yearly.</p> <p>3. There are doctorate studies, organised at the six main Universities in Poland. For these a supplementary two years over and above a masters education is required. Participants in this level of study must possess outstanding M.Sc. diplomas and must write their doctor's thesis in theory or research during a supplementary 2 year period. They receive a state grant and are obliged to fulfil some additional academic work to that of normal students. The legal permission to grant the doctors' diplomas is situated in 10 Civil Engineering departments according to number and quality of staff.</p> <p>Assistants are also obliged to write the doctor's thesis in a period that must not exceed seven years. Those who fail to do so are dismissed from the university. The number of doctorate degrees awarded annually is around 50.</p> <p>4. The second and highest scientific degree in technology as in social sciences is the habilitated doctor. It is awarded after the special procedure, quality and quantity of publications and written and <i>recensed</i> (=listed?) monograph. Permission for proceeding of habilitation¹ procedure has been legally granted to main 10 Civil Engineering Departments in Poland. Nevertheless the independent elected Central Commission must accept the habilitation degree awarded by the University for the Scientific Degrees and Scientific Title. The number persons with accepted habilitation degrees reach 10 persons yearly.</p> <p>5. The highest scientific level is presented by the ordinary professor title, accepted and granted by the same Central Commission after evaluation of research, teaching and publication issues. About 10 persons receive this Scientific Title yearly, their average age is 50 - 60 years old.</p> <p>6. The following professional and scientific grades exist in Poland: Professional degrees: Engineer, Master of Science in Engineering Scientific degrees: Doctor of Science in Engineering, Habilitated Doctor in Engineering Sciences, Professor in Engineering Sciences</p> <p>7. Number of obligatory hours during the 5 years academic course is limited to 2,400 1,800. Supplementary 800 hours during the curriculum are designated for diploma work, which normally consists of structural design (architecture,</p>
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¹ “Habilitation” is a term used within the university system in some European countries including Poland and Germany. It can be used to describe a qualification, the process of obtaining it or the thesis (in German ‘Habilitationsschrift’) which is part of that process. It is considered a higher level qualification than a Ph.D.

	<p>calculation and drawings) executed using computers, or a report of research work. Every year there are competitions at university and all-country level for the best diploma designs.</p> <p>8. It must be stated that about 10% of diplomas are on the highest international level confirmed by the FEANI, SEFI and competition jury statements.</p> <p>The independent Main Council fixes the minimum curricula for Science and Academic Education. All university professors elect its members and its duty is to define and check the quality of education. There is voluntary accreditation of the civil engineering departments, but without the presence of professional associations or industry.</p> <p>This is to be changed during the transformation according to the adaptation of the Polish Legislation to European Union Standards. Professional practice during studies exists, but it is very short - during the inter semester vacations. There is a system – professional practice comprises geodesy after the first year, a worker’s job on a construction site after the second, and management practice after the third year.</p> <p><u>Environmental training within Civil Engineering Education:</u></p> <p>Three kinds of studies relating to environmental education exist in Polish Universities of Technology:</p> <ol style="list-style-type: none"> (1) Ordinary studies in Departments of Environmental Engineering or Sanitary Engineering, e.g. in such disciplines as water supply, sewerage, central heating, water treatment. (2) Obligatory subjects type of Environmental Engineering or Environmental Protection in all types of engineering specialities. (3) Undergraduate studies relating to environmental protection directed to different kinds of engineering activity areas. <p>The common interest in environmental protection problems amongst civil engineers is reinforced by Polish Building Law which introduced an obligation to prepare special elaboration related to evaluation of influence of each type of new designed engineering construction on environment.</p> <p><u>Bologna system of education</u></p> <p>The Bologna system of education is in progress in Poland. A special State Statute is to be introduced in 2004. Polish Universities of Technology prefer to introduce two-step studies for civil engineers: 4-years or 5-years studies after which an ‘Engineer’ title or ‘Master of Science’ title in different specialisations is granted when two different path of studies (Engineer or Master) are separated after the third year of studies.</p> <p><u>Learning of other languages</u></p> <p>Learning of another languages is a requirement in order to obtain a civil engineering degree in Polish Universities of Technology.</p>
<p>Portugal</p>	<p><u>The Education System</u></p> <p>After 12 years of school, students can apply to an university or to a polytechnic school and enter according to the Numero Clausus of each University.</p> <p>Engineers graduated from a 5 years University course or from a 3+2 years Polytechnic course. Universities also can give the degree of Master (2 years) and PhD (3 years).</p>

	<p>There are several public and private engineering universities in Portugal (around 30 courses of civil engineering). The main ones are the following public ones:</p> <p>Instituto Superior Técnico and Universidade Nova (in Lisbon)</p> <p>Universidade do Porto - FEUP (in Oporto)</p> <p>Universidade de Coimbra - FCTUC (in Coimbra)</p> <p>Universidade do Minho (in Guimarães)</p> <p>The engineering courses are periodically evaluated by Ordem dos Engenheiros (OE) and only those approved lead to an automatic admission of the students to OE. The students from other courses need to make an examination to enter OE.</p> <p><u>Environmental training within Civil Engineering Education:</u></p> <p>Modules in environmental understanding are available in Portugal as part of an undergraduate programme in courses approved by OE. They are mandatory. Civil engineers are taught about the environmental implications of their work through a mandatory course on environmental impacts in their undergraduate courses.</p> <p><u>Bologna system of education</u></p> <p>It is not yet decided with regard to the 3+2 system proposed by the Bologna Declaration. Presently graduation in civil engineering is a 5 years course. With Bologna it may change to graduation in 4 years plus 1 year Master, or 3+2 what already exists in the polytechnic schools. OE decided to accept as engineers only the students with a 5 years undergraduate course.</p> <p><u>Learning of other languages within civil engineering courses</u></p> <p>The learning of another language is not a requirement in civil engineering courses but all students know the English language and another language (French or Spanish) from their secondary school education.</p>
<p>Romania</p>	<p><u>The Education System</u></p> <p>The present situation</p> <p>The Romanian higher education in engineering belongs to the “Continental system still present in most European countries, characterized by the existence of two parallel forms of engineering education: of short duration, with a nominal duration of 3 years, and of long duration, with a nominal duration of 5 years.</p> <p><u>Short-duration degree:</u> The short duration programme lends to an engineering degree equivalent to a Bachelor or Science (B.Sc.)degree from the universities in which the Anglo-Saxon or two-tier system is present. In Romania this degree is named :”Inginer-colegiu “.</p> <p><u>Long cycle or ‘Master’ degree:</u> The long education programme is an integrated programme leading straight to an engineering degree equivalent to Master of Science (M Sc) degree from the universities in the countries with the two-tier system .In Romania this degree is named “Inginer diplomat”.</p> <p>Under certain circumstances, graduates of the short duration programme can continue the engineering education in the long duration programme.</p> <p>The integrated 5-year programmes are offered at the following universities:</p> <ol style="list-style-type: none"> 1. Technical University of Civil Engineering of Bucharest 2. University “Politehnica” Timisoara 3. Technical University “Gheorhe Asachi”of Iasi 4. Technical University of Cluj-Napoca

5. University "Ovidius" Constanta
6. University "Transilvania" Brasov
7. University Orada
8. University Petrosani

The short 3-year programmes are offered by University Colleges belonging to the four technical universities (Nos. 1- 7 above).

Admission to higher education is open to those who have completed 12 years pre-university education and hold a baccalaureate diploma. The entrance examination is organised by each institution at the beginning of July. A "numerus clausus" system is applied. The number of places is approved by the Ministry of Education, based on the proposals made by each University Senate.

The curriculum of the five year programme has two years devoted to general education (basic sciences : mathematics, physics, chemistry, mechanics and subjects such as building materials, strength of materials, surveying, engineering drawing, programming languages, socio-humanities etc.), followed by one year for engineering sciences (structural analysis, theory of elasticity and plasticity, fluid mechanics, soil mechanics, reinforced concrete etc.) and two years for applied engineering, including the final semester for work on a diploma project.

The three year programmes are more oriented toward the practical aspects of civil engineering.

In the first year (two semesters) the curriculum is identical for all degree programmes (specializations) of a given field, prevailing subjects in basic sciences and general engineering disciplines. The second and the third year are devoted to common core engineering subjects and to subjects pertaining to the area of specialization, including a final project in the sixth semester.

Environmental training within Civil Engineering Education:

Faculties of Hydrotechnics from the Technical University of Civil Engineering Bucharest, University "Politehnica" Timisoara and Technical University "Gheorghe Asachi" Iasi offer a specialization on "Sanitary Engineering and Environmental Protection" within the 5-year integrated programmes.

The environmental implication of the civil engineering works are presented in all engineering disciplines, mainly through case studies and emphasis put on the ethical responsibility of civil engineers.

Bologna process:

Important changes to be introduced beginning with the academic year 2005/2006, as a result of the Bologna process

Discussions concerning the introduction of the two-tier system in engineering education in Romania started after the Sorbonne Declaration, at university level or at national level, taking place mainly under the auspices of the National Council of Rectors, and became particularly vivid in the autumn of 2003, when a draft of a "Law on the organisation of university studies" became public.

After being adopted by both Chambers of the Parliament of Romania, the Law was promulgated on 24th June 2004 and became valid on the 7th July 2004.

The main provisions of the Law are:

- University studies in Romania are organized in three cycles
- The first cycle, with a duration of 3-4 years (180-240 ECTS credits) is

	<p>called "Licenta" (synonym to "Licence" in French). The Law stipulates that for the engineering education the first cycle is of 4-year duration. The qualification level acquired by the graduates of the first cycle should be adequate for providing employability.</p> <ul style="list-style-type: none"> • The second cycle, with a duration of 1-2 years (60-120 ECTS credits), called "Master". The cumulated duration of the cycle I, Licence studies, and of the cycle II, Master studies, should correspond to at least 300 ECTS credits or 5 years. (The Consortium of Technical University in Romania agreed for a duration of 1.5 years (90 credits for the second cycle). • A very important provision of the Law is found in the article stating that for <i>professions regulated by European norms, recommendations or good practices universities can offer integrated programmes with duration between 5 and 6 years, leading to Diplomas equivalent to a Master degree diploma.</i> • The third cycle corresponds to doctorate studies and have normally a duration of 3 years, which in justified cases, (for instance experimental studies) can be extended with 1-2 additional years, pending the approval of the Senate of the university. • The existing, short duration 3-year programmes are going to be dismantled, unless they can be transformed into programmes corresponding to the <i>licence level</i>, an option which is not going to be made in the engineering field where only one kind of first cycle programmes, of 4-year duration will be offered. <p>The provisions of the Law will be applied starting with the academic year 2005/2006.</p> <p><u>Learning of other languages</u></p>
<p>Russia</p>	<p><u>General education system at present</u></p> <p>Presently there are two parallel systems in higher Engineering Education in Russia:</p> <p>Diploma Engineer (DiplEng) (traditional one) – 5 or 5,5 years duration (completed Secondary Education – 11 years study is compulsory) and</p> <p>Bachelor-Academic (BAc) – 4 years duration (completed Secondary Education – 11 years study is compulsory) and Master-Academic (MAc) – 2 years (BAc or DiplEng Degrees are compulsory).</p> <p>The main aim of the BAc – MAc system is to prepare graduates for scientific, research and education activity with further education on post-graduate courses to prepare PhD Thesis's. This is why the amount of students, who want and are capable to take this route, is not more than 10% of the whole.</p> <p><u>Future Educational System</u></p> <p>After Russia signed the Bologna Agreement in 2003, it was decided to introduce two-tier system "BEng/MEng system" in addition or instead of DiplEng.</p> <p>It will be on the decision of the University and Ministry of Education and Science of RF of which systems "DiplEng", "BAc/MAc", "BEng/MEng" or all of them to exist in either University or Educational Institution. It will depend on educational possibilities of the Educational Body (quality of educational staff, technical equipment (labs, computers), etc).</p> <p>In the two-tier system, the new structure will be 4+1 or 4+2, but for some specialties 5+2.</p>

	<p>There will be a selection after the first degree, allowing a restricted number of holders of the first degree to continue. It is anticipated that the State will finance Universities' educational expenses: 70% for BEng/BSc (4 years), 20% DiplEng (4+1 years) and 10% MEng (4+2 years).</p> <p>The new system will start approximately in 2007.</p> <p><u>Environmental training within Civil Engineering Education:</u></p> <ul style="list-style-type: none"> - <i>1.1 Are modules in environmental understanding available in your country as part of an undergraduate programme?</i> - <i>1.2 Are such modules mandatory?</i> - <i>1.3 How are civil engineers taught about the environmental implications of their work?</i> <p><u>Bologna process:</u></p> <p>The new Bachelor's degree (see above) will correspond to the Bologna requirement, being in itself relevant to the job market and will be suitable for mobility.</p> <p><u>Foreign language learning:</u> The curricula of both types of degree courses presently offered by universities providing civil engineering education in Romania comprise, in the first two study years, a foreign language course as a compulsory subject.</p> <p>The number of hours per hours per week and the package of languages from which the students are to choose one are decided by each university. For instance, at the Technical University of Civil Engineering of Bucharest two hours/week are allotted for the foreign language which can be chosen from English, French, German, Spanish, Italian, Russian and Japanes. A foreign language is also offered at the level 3rd and 4th study year, but as an optional subject.</p>
<p>Slovak Republic</p>	<p><u>General education system at present</u></p> <p>Slovak Civil engineers are graduated mainly in 3 Universities:</p> <ul style="list-style-type: none"> • The Slovak University of Technology, Faculty of Civil Engineering in Bratislava • University Žilina in Žilina, Faculty of Civil Engineering • Technical University in Košice, Faculty of Civil Engineering <p>There are other faculties educating partial parts of Civil Engineering in Slovakia.</p> <p>The civil engineering programme aims at the professional training in the field of design and realisation of various types of structures which are important for the professional performance in a broad scale of Civil Engineering. Graduates of the Bachelor degree course are qualified for the position of an assistant on investment, design, realisation and operational teams, in state and local administration and in the private sector as well as qualified for Master's degree course.</p> <p>Graduates of the Master's degree course can find a position as a designer or a building contractor of residential and civil buildings, manufacturing plants, building services, engineering, transportation, water resources and hydraulic structures, and the reconstruction and modernisation of structures.</p> <p>The Act No 131/2002 Coll. from February 21, 2002 about universities and about changes and annexes of certain acts is in agreement with the Bologna</p>

Declaration.

The Bachelor Diploma is delivered after 3 or 4 years of studies (6 or 8 semesters) depending on the Study Programme. The architecture and the building construction Bachelor studies have duration of four years, other Bachelor studies have a duration of three years.

The “Engineer's Diploma” is delivered after 5 years of studies in agreement with the Bologna Declaration, this Diploma applies as “Master graduation”.

The assessment of studies is based on a credit system. All universities offer educational modules, some of these are mandatory. There is also an

Environmental Engineering Programme.

The Programme aims at the training of specialists in environmental structures, environmental engineering of internal and external environment, waste management, landscape and urbanised territories, transport management and longevity of structures. The Programme also includes the environmental sciences, geo-informatics, project and personnel management, programming and automation of engineering and environmental land and commercial law.

The graduate is suitable for positions as an executive state administration employee in the field of environmental politics, local administration, environmental protection, water management, engineering networks, waste management and environmental management. Other possibilities are landscape planning designer, environmental structures designer and environmental project manager.

The Doctorate Degree: The universities also offer a Doctorate Degree in agreement with the Bologna Process.

The internal study has 3 years' duration; the external study has a 5-year duration. The basic condition for the PhD. study is that the candidate needs to have a Master degree (five years studies).

The departments in the faculties are mainly focused on:

- Concrete Structures and Bridges
- Transport Construction and Traffic Engineering
- Theoretical Geodesy
- Surveying
- Geo-techniques
- Land and Water Resources Management
- Hydraulic Engineering
- Building Structures
- Steel and Timber Structures
- Mapping and Land Consolidation
- Mathematics and Constructive Geometry
- Economics and Building Industry Management
- Physics
- Structural Mechanics
- Material Engineering
- Building Technology
- Sanitary Engineering
- Building Services
- Architecture
- Human Sciences
- Languages
- Physical Education
- Forensic Engineering

The Institute of Forensic Engineering at the Faculty of Civil Engineering in Bratislava

- Delivers forensic assessments in difficult issues demanding expert witnesses on construction claims advanced to trials and other tribunals for resolution in behalf of citizens and organizations according to Slovak state legislation.
- Provides lectures in Forensic engineering for full-time students.
- Provides 4-semester specialized post-graduate distance course for forensic experts and candidates specializing in Civil Engineering disciplines.
- Prepares specialized post-graduate distance course for forensic experts and candidates specializing in Geodesy.
- For Ministry of Justice provides periodical 5-year re-training and re-examination of experts registered in Lists of chartered forensic experts (in Slovak Republic are these lists administered at regional courts of justice).

Various faculties deliver certain services:

Library and Information Centre of the Civil Engineering Faculty in Bratislava is one of the best equipped and most progressive among all 34 academic libraries in Slovakia. approx. The Library and Information Centre offers lending services from more than 100,000 publications; wide range of domestic and foreign periodicals and individual learning facilities in a modern 2-floor study room; modern database centre with 20 PCs with access to many foreign scientific databases and electronic information sources and progressive document delivery service for all library users.

Centres of information technology provides for the students and employees of Civil Engineering faculties different services of information technology.

In accordance with the present legislation architects and engineers in certain profession need an authorisation (e.g. design) or qualification (e.g. site manager, site supervisor).

This authorization can issue only the Slovak Chamber of Civil Engineers for Architects and Civil Engineers (in architecture and in civil engineering professions). Candidates have to prove at least 5 years of training in the representative profession and show samples of their work. The Slovak Chamber of Architects may also issue authorization in design of building construction for architects and civil engineers.

Further Education and Lifelong Education for architects and civil engineers are provided by universities as well as by the Slovak Chamber of Civil Engineers which provides Life-long Education for all Engineers in Building.

International activities of Civil Engineering faculties

The international activities of faculties are mainly focused on the following priorities:

- Co-operation with institutions, faculties and departments active in research and curricula development in civil and environmental engineering disciplines
- Introduction of European Credit Transfer System as precondition for strengthening the Faculty's international position
- International monitoring of programmes taught on faculties together with more than 50 European leading higher education institutions active in the area of civil engineering education (EUCEET Socrates-Thematic network) as a step towards successful international evaluation
- EEGECS Socrates-Thematic Network

- International accreditation of the academic programmes of faculties
- Support of activities enhancing the Slovak University of Technology's international status as a research university
- Broaden active participation in existing programmes of international co-operation, such as TEMPUS, Inco-Copernicus, Leonardo da Vinci, Socrates/Erasmus, Action Austria-Slovakia and CEEPUS. Intensive exploitation of these links for networking activities
- Participation in research programmes. Besides non-European research partnerships special emphasis is given on Fifth and Sixth Framework Programme of the EU, bilateral research programmes with EU partners, and on consortia with partners from Central European region
- Increased participation of the faculties and its experts in bilateral and multilateral projects of cross-border co-operation
- Involvement of faculties expertise in EU pre-accession tools such as Phare and new programmes SAPARD and ISPA
- Initiate purpose-oriented links with industry and SME-s as partners for programmes of applied research

The faculties are currently affiliated with more than 60 international governmental and non-governmental scientific organisations. The faculties are an active member of the International Association of Civil Engineering Faculties (IACEF) and a guest member at the Permanent Conference of the German-Speaking Countries' Civil Engineering Faculties.

Environmental training within Civil Engineering Education:

The goal of Environmental Engineering Programme is to train specialists in environmental structures, environmental engineering of internal and external environment, waste management, landscape and urbanised territories, transport management and longevity of structures. The programme also includes the environmental sciences, geo-informatics, project and personnel management, programming and automation of engineering and environmental land and commercial law.

The graduate is suitable for positions as an executive state administration employee in the field of environmental politics, local administration, environmental protection, water management, engineering networks, waste management and environmental management. Other possibilities are landscape planning designer, environmental structures designer and environmental project manager.

Generally, some modules in environmental understanding are mandatory; some are voluntary, depending on the university/faculty/faculty department. However, environmental training is often incorporated in specialised subjects. Furthermore, at the Faculty of Civil Engineering of Technical University in Košice, students can choose specialisation "Environmental Engineering" that focuses on indoor building environment and outdoor environment of structures.

Bologna process:

Act No. 131/2002 Coll. from February 21, 2002 on universities and on changes and annexes of certain acts is in agreement with the Bologna Declaration.

Foreign language learning:

Students entering the university are expected to have some knowledge of at least one foreign language, since they have to learn foreign languages as of the elementary school.

The Faculty of Civil Engineering of the Slovak University of Technology offers students the possibility to study in English language. Students can learn English during their study with the possibility of taking the final state exam or TOEFL

	<p>exam. Furthermore, students have the possibility to learn English, German and French. Classroom instruction includes general conversation, grammar and specialised vocabulary and style appropriate to various civil engineering sub-specialities.</p>
<p>Turkey</p>	<p><u>General education system at present</u></p> <p>(i) Pre-University Education</p> <p>In Turkey, pre-university education can be described as being in two cycles, the first comprises eight years elementary education, the second is a three-year high school education. Entrance age for elementary education is generally 6-7 years' old and high school graduation age is generally at the age of 17-18.</p> <p>Elementary education is compulsory. Every Turkish citizen is obliged to have eight years elementary education. High school education of three years is optional in Turkey at present. New laws and regulations are being prepared for a compulsory four-year high school education. All schools in Turkey are under the government of the Ministry of Education.</p> <p>Elementary education in Turkey has a standard curriculum. Elementary schools can differ in the language in which education is provided. Most school educate pupils in Turkish but there are also schools teaching in English, German and French.</p> <p>There are types of high school in Turkey which have differences in curriculum. Apart from general high schools, there are science schools, occupation schools, public schools offering an intense and qualified education termed generally 'Anatolian high schools', and religious schools. The difference in the types of high school means that the university entrance system applies results differently; some high school types are graded lower or higher accordingly.</p> <p>(i) Engineering Education</p> <p>Engineering Education at undergraduate level</p> <p>The Turkish education system has been executing a two-tier system with a four year Bachelor degree, followed by two years for a Masters degree.</p> <p>There are 53 public, and 24 private universities in Turkey. 46 universities out of this total of 77 universities offer civil engineering education. Two universities (Istanbul Technical University, Yildiz Technical University) have civil engineering faculties, whereas 44 universities have civil engineering departments contained within engineering faculties. There are also vocational schools of higher education where short-term higher education is provided for specific occupations. These offer specific diplomas for technicians, nurses etc.</p> <p>Some universities combine engineering faculties with architecture, with individual departments existing therein. There are also pre-undergraduate programmes, with a similar degree system to the higher education offered for specific occupations. There are pre-undergraduate departments of civil engineering offering two year courses. By completing a further two years' education, students may complete their four-year regular undergraduate programme, in order to obtain an engineering degree.</p> <p>In order to provide a general view of students and teaching staff numbers in Turkish universities, the following figures have been obtained from research carried out in 2000-2001. At that time there were 1,306,000 undergraduate students, 84,334 graduate students and 86,854 teaching staff in public universities.</p>

Engineering Education at post-graduate level

Master or ‘Master-type’ programmes

Engineering higher education for a Masters degree involves thesis study within the two-year period allotted; this may be extended if necessary. This remains the main difference between European implementations of master degree without thesis, modified for the 5 years’ period set out in the Bologna Declaration. The 5 years programme as ‘4+1’ has started to be applied without thesis, in parallel to the current engineering education system, which is a fee-paying system. As the 4+1 system offers financial benefits, universities offer the programme according to demand.

Referring to the statistics set out in the previous section, the distribution of higher education students is uneven within the universities. Higher education programmes in universities differ from one another; some universities do not provide postgraduate education. Most of the leading universities provide a wide range of postgraduate engineering education, including teaching curriculum and research facilities.

When they graduate from the ‘first stage’ (two year) engineering postgraduate programme, students obtain a Master of Science (M.Sc.) degree, provided that the undergraduate degree is in engineering. It is possible to have postgraduate education in other engineering departments and/or universities, depending on the acceptance criteria. For postgraduate application, all Turkish universities require a minimum grade of LES (Higher Education Examination), differing between universities.

The Masters degree in engineering provides students both with an entrance into an academic career and specialisation in related areas. There are also postgraduate programmes where students from engineering undergraduate courses can have a higher degree of another discipline. These programmes do not qualify the students with a Master of Science degree, but provide a higher education diploma.

Doctorate programmes

The second stage of postgraduate degree in engineering in Turkey is the doctorate programmes, whereby students obtain a Doctor of Philosophy qualification upon graduation. Doctorate curricula and programmes differ from university to university, where researches on specialised areas are provided.

LES grades are required to apply for a doctorate education, as is the case with a Masters degree. The duration of the doctorate programmes is generally two years, which can be extended in relation to

research progress.

**(ii) Civil Engineering Education
Undergraduate Education**

Short description for each type of programme:

Civil Engineering education in Turkey has been developing in both qualified technical and academic aspects, and covers all areas of the discipline. The architecture of civil engineering education in Turkey has differences within all universities, but the general outline of Turkish civil engineering education system may be defined as follows:

All civil engineering departments have a four-year undergraduate programme, students who complete this successfully are entitled to a “Bachelor of Science in Civil Engineering” degree. Practical experience is generally required for the

degree and accordingly, students are required to go into summer practice at the end of their second and third years and to have a satisfactory record of their summer employment approved by the Department. During the fourth year, technical elective courses are offered by most of the universities, to enable the students to advance their knowledge in specific fields. General understanding of the Turkish civil engineering departments leads to separation of Divisions in the last undergraduate year as; Structural Mechanics, Hydraulics, Foundation Mechanics, Structural Materials, Transportation, Engineering Management. Some universities offer Geodesy, Earthquake Engineering, Environmental Engineering, etc., as separate divisions within the department. These divisions determine the post graduate specialisations in the department, where students also predetermine their selection in the last undergraduate year.

Course credits are based on the weight of the course in the overall curriculum. Basic sciences in first year amount to 4 credits, main courses in second and third years amount to 3 credits, main division courses in third and fourth years 4 credits, technical courses amount to 3 or 4 credits relatively. This distribution totals an average of 140 credits, which differs within universities. The above Curriculum was evaluated by the Accreditation Board of Engineering and Technology, Inc.(ABET), taken from Middle East Technical University (METU) as an example of one of three leading civil engineering departments in Turkey. Similar relations with ABET have been improvingly applied in other Turkish universities.

A credit system in Turkey has been studied recently by research groups in universities, integrated with European Credit Transfer System (ECTS) which has been started to be applied in several universities. Accreditation and credit systems are among recent studies for university education in Turkey.

Student Admission at undergraduate level

Student admission for undergraduate level study falls within the above-mentioned national examination procedure for the general education system. When they graduate from high school, students obtain the right to enter university examinations (ÖSS-Student Selection and Placement Exam) which covers all types of higher education entrance in Turkey. An average number of 1,500,000 sit the university entrance examination which is held annually. From this number, an average number of 200,000 students gain places in universities and departments for four year undergraduate education, evaluated according to the university entrance exam grade. An average of 300,000 students are also placed on short-term 'pre-undergraduate' programmes, vocational programmes, and open education faculty of distance education. Department minimum grade requirements are defined by education criteria integrated with demand on the department, which is implemented and declared by YÖK (Council of Higher Education). YÖK is a governmental institution, which was founded by law, managing and regulating the higher education system in Turkey. This authority is only given to YÖK, and the higher education system in Turkey is independent from the Ministry of Education.

Civil engineering education at post-graduate level

Graduate programmes differ from university to university. Some departments offer all division researches, whereas some only provide a limited division range. Graduate courses are offered in fields of specialization leading to the degrees of "Master of Science" and "Doctor of Philosophy". The course program for the M.Sc. degree is decided by the student's advisor according to the student's intended field of specialization and future career plans. Students are required to take a minimum-credit hours from the courses, generally applied as 60 credits, which are approved by the Department. A thesis is obligatory and

each student is assigned a thesis supervisor. For studies leading to Ph.D. degree, there are also credit and course criteria for each University. The Masters Degree generally lasts for 2 years, students may extend this if circumstances require. The Ph.D. degree is framed to a 3 year program, although they may also apply for an extension if required. Civil engineering graduate programmes in Turkey provide for the inculcation of state-of-art knowledge in applied science and technology and aim to create new and original information in all civil engineering disciplines. Specific attention is paid to national and regional research needs.

A number of civil engineering departments in Turkey provide major graduate level research activities. Using research facilities and laboratories, department students lead to specific studies on their divisions, also with accordance to international research studies of other universities.

(iv) Recent trends in engineering education in Turkey

The Higher Education Association (YÖK), founded in 1982, is an institution which determines the basic aspects and regulations of higher education in Turkey. YÖK is a governmental institution, which is governed by a committee, appointed by government. Therefore the accreditation and education structure studies have been progressing rather slowly, by individual efforts made by universities.

There is no legal accreditation bodies in Turkey related to university education, but several universities have been collaborating with international researches on the subject, as in the case of Middle East Technical University and Istanbul Technical University with ABET. Recently the Engineering Evaluation Committee (MÜDEK) has been studying the accreditation of universities and accrediting universities relatively since 2002. This independent committee has been supported by universities to be continued as it would initiate the overall accreditation system in Turkey. The committee board consists of academic colleagues as well as professional engineers and NGO representatives.

Rectors and deans of universities have been approaching the Bologna Declaration affirmatively, whereas there has not been a determined plan for Turkish implementation progress for further developments. Deans of engineering faculties have been gathering within the name of Engineering Faculty Deans' Council, which is a dynamic and effective formation for the higher education system in Turkey. Council has been studying international research projects, education related declarations and agreements, as well as national constraints and action plans. The reaction of this council to Declaration has been positive, and is being supported strongly. Professor Mustafa Tokyay, Member of Deans Council and Dean of the Engineering Faculty in the Middle East Technical University, has mentioned Council's intention to study the Bologna Declaration and project Turkish implementations in the forthcoming 9th meeting, based on decisions made in the 8th Council Meeting held in May 2004 in Izmir. The aim of the study would be to provide a common perspective of all engineering faculties on Declaration applications and the education system. TCCE has been progressing chamber-related studies on the topic, in parallel to university perspectives and research.

Accreditation system drafts and proposals have also been prepared by Turkish Chamber of Civil Engineers related to recent professional recognition studies as a projection on Turkish civil engineering education.

University departments observe and apply ongoing developments in the profession worldwide. Both national and international relationships between other civil engineering departments are considered essential for most civil

engineering education resources in Turkey. Whilst there is room for progress in the education system, the rate of advance is more than promising.

TCCE has been studying international agreements, studies and research projects. Examples of international participation include EUCEET, SEFI, ECCE Education Task Force etc. The Bologna Declaration has been a recent issue to be considered related to professional recognition and accreditation studies. The TCCE reaction to the Declaration is positive, though it must be mentioned that further studies must be carried out on content and quality of education. Rough implementations, applications without action plans and progress without future projections would be possible causes for system failures. Common platforms for academic and professional engineers must be realised for common studies. Student profile and Turkey's engineering perspective must be considered in international mutual implementations.

Accreditation system plans and professional recognition studies continue within the chamber, which will form the basis of education system projections. TCCE will be actively participating in both national and international studies with these perspectives, with the aim of providing solid and efficient practices.

Four year undergraduate education is given in 46 universities, followed by masters and PhD degrees in most of them.

(A list of these universities is presented in an Annexe at the end of this chapter).

Environmental training as a part of Civil Engineering Education

Environmental understanding is kept as a part of the system since the beginning of civil engineering education in Turkey. The subject has become an individual departmental education, but also continued to be held in civil engineering training. The modules of environmental understanding are provided in undergraduate programmes as related courses.

The mandatory education in civil engineering departments in Turkey consists of environmental understanding, although they may not be dedicated to the issue completely. Most of the universities give the aspect as optional courses.

The environmental implications of civil engineering are given as an essential fundamental of the discipline starting from introductory courses. Structure, hydraulics, geotechnics, management, transportation, geodesy, study of materials and other areas provide the importance of the environmental viewpoint within related courses.

Turkey and the Bologna Declaration

Turkish education system has been executing two-tier system as 4 years of bachelor degree followed by 2 years of master degree, which also can be concluded in one or one-and-half year. Engineering higher education for master degree involves thesis study within the 2 years term, to be extended if necessary. This remains the main difference between European implementations of master degree without thesis, modified for the 5 years in Bologna Declaration. 5 years program as 4+1, has been started to be applied without thesis in parallel to the current engineering education in Turkey, which is a fee-paying system. As 4+1 system has a financial point of view, universities offer the program related to the demand. It has been observed that demand on this program had been rare.

There is no considered new structure for Turkish education system, as current structure of 4+2 and 4+1(without thesis) is applicable within the framework of Bologna Declaration. Considering the high amount of engineering students in

Turkey, graduating every year, it would be possible to have a selection system for second cycle, as being applied currently. 46 civil engineering departments in Turkey are accepting about 3000 students, and graduating an average of 2000 students per year. With respect to the education quality and higher education fundamentals, accepting all candidates for master degree would depend on the demand and university conditions. In the case of higher demand would lead the system to select qualified candidates according to the cumulative grades, bachelor degree duration and Higher Education Test (LES). LES has been applied in Turkey two times a year, and is mandatory for all master and PhD applications. Acceptance grade of LES differs from universities to universities, as determined within. These criteria are the current selection considerations for higher education in Turkey, and would be possible that this system will not change in near future. Considering the 4+1 thesis free program, selection of candidates would be in question according to demand increase. Presently, as demand for this program can be covered by universities, minimum LES grade is the only requirement for selection.

Degrees of graduates are “civil engineer” for four year bachelor degree, and “civil engineer M.Sc.” for master degree. Considering international relations and national progress in Turkey, professional recognition system would eventually settle within a program and accreditation will be improved relatively based on current accreditation studies. Legalization process has started by European Union Office in Turkey General Secretariat, in which Turkish Chamber of Civil Engineers is being involved. This will lead to specific definitions and degree evaluations for graduate civil engineers. Turkish Chamber of Civil Engineers has been executing studies on professional recognition and accreditation, including life-time learning and training in profession executed by Chamber.

Turkey has signed to Bologna Declaration with the current system. ECTS and Diploma Supplement have been started to be applied in universities as mandatory. Though the content of credit system has been continued to be studied and international implementations have been made with parallel to education research projects, the current engineering education system is applicable relative to Bologna Declaration.

4+1 thesis free system is to be considered as the new system, which will be ongoing parallel to the current 4+2 system. Default first cycle of 4 years is to be continued as a 4 year study for the ongoing education system. Therefore, there has been no duration related degree determination for the Turkish implementation.

With the implementation of credit system and Diploma Supplement, the current Bachelor’s degree in Turkey is to be considered as suitable for mobility internationally. 4 year first cycle program might have differences with international 3 year applications in content point of view, but Turkish engineering degree duration would not change or shorten. Relevance to the job market can be considered for Turkish system, where further studies have been researched for higher correspondence.

Implementation of ECTS and Diploma Supplement has been mandatory for project involvements such as ERASMUS. Almost all universities in Turkey have introduced ECTS and Diploma Supplement, or will introduce in the following terms. Respectively, mobility possibilities are being provided, where it has to be mentioned that financial incompetence would affect Turkish mobility internationally. This effect can be expressed as an afford issue rather than legal or institutional aspects.

As mentioned previously, Council of Higher Education (YÖK) is a governmental institution, founded by law in 1982, which determines the basic aspects and regulations of higher education in Turkey. Implementation of ECTS was decided by YÖK, and declared to universities.

	<p>There are no legal defined accreditation agencies in Turkey, whereas universities have been executing accreditation with ABET. Recently, Engineering Evaluation Committee (MÜDEK) have been studying on accreditation of universities and accrediting universities relatively since 2002. This independent committee has been supported by universities to be continued as it would initiate the overall accreditation system in Turkey. The committee board consists of academic colleagues as well as professional engineers and NGO representatives.</p> <p>Rectors and deans of universities have been approaching the Declaration affirmatively, whereas there has not been a determined plan for Turkish implementation progress for further developments. Apart from the overall perspective for education, there have not been maintained specific strategies or plans in stable. Deans of engineering faculties have been gathering within the name of Engineering Faculty Deans Council, which is a dynamic and effective formation for higher education system in Turkey. Council has been studying on international research projects, education related declarations and agreements, as well as national constraints and action plans. Reaction of this council to Declaration has been positive, and is being supported strongly. Member of Deans Council and Dean of Engineering Faculty in Middle East Technical University, Prof. Mustafa Tokyay, has mentioned Council's intention on studying the Bologna Declaration and projecting Turkish implementations in the 9th Meeting to come, based on the decisions made in 8th Council Meeting in May 2004, in Izmir. Aim of the study would be providing a common perspective on Declaration applications and education system by all engineering faculties. TCCE has been progressing chamber related studies on the topic parallel to university perspectives and researches.</p> <p>Turkish higher education system does not have differentiations as in some Europe implementations. Structure of system is generally based on faculties, departments and institutes of few cases. Within this structure, there has not been observed different attitudes and interpretations of the process.</p> <p>Reaction of professional organisations to Bologna Declaration progress, can be expressed with the frame of Turkish Chamber of Civil Engineers reaction. TCCE has been studying international agreements, studies and research projects. These international participations can be exemplified as EUCEET, SEFI, ECCE Education Task Force, etc. Bologna Declaration specifically has been a recent issue to be considered related to professional recognition and accreditation studies. TCCE reaction for the declaration is positive, where it should be mentioned that further studies must be carried on the content and quality of education. Rough implementations, applications without action plans, progress without future projections would be possible causes for system failures. Common platforms for academic and professional engineers must be realised for common studies. Student profile and engineering perspective of Turkey must be considered in international mutual implementations. TCCE agrees with Turkish academic colleagues on 4 year bachelor's degree duration, as current curriculum would not be applicable in 3 years duration. Accreditation system plans and professional recognition studies are continuing within the chamber, which will form the basis of education system projections. TCCE will be actively participating in both national and international studies with these perspectives, with the aim of providing solid and efficient practices.</p> <p>Foreign language learning:</p>
United Kingdom	Civil engineering courses are given at universities across the UK. For 2003, there are courses accredited by the Joint Board of Moderators (JBM) for ICE and IStructE (the Institution of Structural Engineers) at more than 45

universities.

In the UK, universities are autonomous bodies and each determines its own admission policy and requirements. Therefore, the entry requirements for civil engineering studies vary, but most universities would ask for a minimum of three A-level exams, including mathematics.

Academic qualifications are not national awards, but granted by the individual institutions. Therefore, qualifications and titles may vary between universities. However, usually, most accredited universities offer the degrees MEng, given after a 4-year course, or BEng (Hons), given after three years of study. BEng graduates who wish to become Chartered Engineers may do a Matching Section, normally a MSc in Civil Engineering.

In addition to courses in Civil Engineering or Structural Engineering, several universities also offer specialised degrees in Civil and Environmental Engineering. At some universities, there are also MEng courses in civil engineering which include a foreign language.

Environmental training within civil engineering:

Environmental engineering modules are now found in most accredited courses, both at BEng and MEng level. Degree courses for which accreditation is sought are expected to contain elements which engage students with the broad range of environmental issues that will later inform and influence their actions as professional engineers. The Joint Board of Moderators (JBM) does not seek to be prescriptive as to how these issues are covered in courses; they might, for example, be the subject of taught classes or could be integrated within project or design work.

Bologna process:

The Bologna process has still had little visibility within the UK. It seemed at first that there was an impression that it would make other European systems similar to the British one, and consequently there was no need to do anything. Over the past twelve months, however, there have been more signs of engagement on the part of UK Ministers, with support for the process being balanced by expressions of intent to retain certain elements of the UK system, such as integrated Masters degrees, and a welcome stress on outcomes being the key feature of higher education programmes.

Foreign language learning:

Some universities offer MEng degrees which include a foreign language, but it is not obligatory to know a foreign language in order to study civil engineering.

ANNEXE:**ESTONIA:****Supplementary information on university education system**

In the first stage the civil engineering courses involve the study of basic subjects such as mathematics, physics, technical mechanics, geodesy and building materials. In addition they acquire knowledge of general engineering, economics and other disciplines such as micro- and macroeconomics, informatics, environmental protection. Numerous specialist subjects can be studied in the following stages including practical training to acquire the profession of a civil engineer.

The civil engineering curricula are internationally recognised.

GENERAL STUDIES 20.5 credits		
Philosophy	Science of risk and safety	Foreign language for academic purposes
Environmental protection	Organisation of studies	Micro- and macro-economics
Grounds of law	Foreign language for science and research	Economics in construction enterprises etc.
BASIC STUDIES 36.5 credits		
Mathematical analysis	Linear algebra	Chemistry
Differential equations	Descriptive geometry	Graphic construction design
Probability theory	Physics	Graphic construction design etc
CORE STUDIES		
CIVIL AND BUILDING ENGINEERING (53 credits)	ENVIRONMENTAL ENGINEERING (51.5 credits)	TRANSPORT ENGINEERING (53 credits)
Structures of houses	Thermal engineering	Fundamentals of transport engineering
Soil mechanics	Building physics	
Technical mechanics	Technical Mechanics	Soil mechanics
Structural mechanics	Structural mechanics	Technical mechanics
Organisation of construction Geodesy	Hydraulics	Structural mechanics
Building materials, etc.	Geodesy	Hydraulics
	Building materials, etc.	Geodesy
		Design of roads, etc.
SPECIAL STUDIES		
58 credits	59 credits	56 credits
Architecture	Hydrology and hydraulic structures	Organisation of road construction
Building physics	Heating and ventilation	Road construction materials
Foundations	Water supply	Road maintenance
Timber, masonry, reinforced concrete, steel and bridge structures	Water supply and drainage inside buildings	Timber, reinforced concrete and steel bridges
Renovation of buildings	Heat supply	Road construction
Building technology	Indoor climate of buildings	Traffic in towns
Construction management	Landscape ecology	Theoretical geodesy
Construction investments	Environmental	Global Positioning System

	management	
Economics of real estate	Waste water treatment	Digital cartography
Project management in construction etc.	Renovation of sanitary engineering systems	Photogrammetry
PRACTICE		
4 credits	4.5 credits	6 credits
OPTIONAL COURSES		
8 credits	8 credits	8 credits
GRADUATION THESIS		
20 credits	20 credits	20 credits
DIPLOMA OF ENGINEERS' STUDIES (equates to Master of Science in Engineering)		
Doctorate: 160 credits - speciality: Civil and Environmental Engineering		
DOCTOR OF ENGINEERING		

IRELAND

Supplementary information on university education system - The Engineering Faculties

There are four university colleges in the Republic of Ireland that offer undergraduates degrees in civil engineering.

National University of Ireland, Cork (also known as University College Cork)
National University of Ireland, Dublin. (also known as University College Dublin)
National University of Ireland, Galway, (also known as University College Galway)
University of Dublin, (also known as Trinity College, Dublin)

The National University of Ireland (NUI) courses at Cork and Galway are direct-entry civil engineering degree courses. NUI Dublin previously had a common entry for all engineering courses, with specialisation into the civil and other streams at the beginning of second year. This college has now changed to a direct entry system, although there is a common entry option for civil or mechanical engineering. The Trinity College Dublin (TCD) course has two common years, followed by two years in the civil or other stream. The NUI colleges award a BE (Civil) where TCD awards a BAI. As well as civil engineering, NUI Galway has introduced a four year direct-entry degree course in environmental engineering.

There are four institutes of technology that offer degree courses in civil engineering or related disciplines

Cork Institute of Technology	B.Eng in Structural Engineering
Dublin Institute of Technology	B.Sc in Structural Engineering
Sligo Institute of Technology	B.Eng in Civil Engineering
The Waterford Institute of Technology	B.Sc. in Construction Management

The Cork and Sligo courses are of five years' duration, comprising a two-year national certificate course, a one year diploma, followed by a two year degree course. Both the Dublin and Waterford degree courses are of four years' duration. The degrees in Cork, Dublin and Sligo are accredited by the IEI as satisfying the educational requirements for graduates seeking election to Chartered Engineer.

Terms, semesters, contact hours

There are considerable differences in the term and semester structures of the different university colleges and Its, so attempts to generalise must be treated with caution. Some university colleges follow a three-term system, while others have two semesters.

The total teaching period in the university colleges is usually about 24 weeks, commencing in September/October and finishing in April/May. They follow a two semester system, usually with a longer teaching period than the universities (30 weeks).

The total contact hours for the four-year degree programmes are generally below between 2,000 and 2,500.

Examinations are usually at the end of the academic year in the three-term system, or at the end of each semester with the other system.

Short description of the main features of the curriculum for each type of programme

The university civil engineering courses tend to focus on mathematics and the engineering sciences in the early years, and these subjects account for between 40% and 50% of the total contact hours over the four year degree programme. There is greater emphasis on the civil engineering subjects in the later years, although the opportunities for specialisation vary from institution to institution. A final year project is part of the degree assessment. As well as engineering topics the degree programmes also cover management, communication skills and other topics relevant to the engineer in society. There is perhaps less emphasis on foreign language and humanities courses than is the case with engineering degrees in some other European countries.

Less information is currently available for the Institutes of Technology (IT), but it is probably fair to say that the IT degree programmes – two of which comprise a two year degree that follows on from a three year national diploma – place a greater emphasis on applied subjects.

Industrial placements are a feature of many (but not all) civil engineering degree courses in Ireland. As well as giving undergraduates the opportunity of gaining some experience in the practice of engineering, they are seen as valuable in providing links between academia and industry.

ITALY

Supplementary information on university education system - The Engineering Faculties

The Engineering Faculties are presently open in 40 Italian universities – these are listed below.

Università Politecnica delle MARCHE
Politecnico di BARI
Università degli Studi della BASILICATA
Università degli Studi di BERGAMO
Università degli Studi di BOLOGNA
Università degli Studi di BRESCIA
Università degli Studi di CAGLIARI
Università degli Studi della CALABRIA
Università degli Studi di CASSINO
Università "Carlo Cattaneo" – LIUC
Università degli Studi di CATANIA
Università degli Studi di FERRARA
Università degli Studi di FIRENZE
Università degli Studi di GENOVA
Università degli Studi de L'AQUILA
Università degli Studi di LECCE
Università degli Studi di MESSINA

Politecnico di MILANO
 Università degli Studi di MODENA e REGGIO EMILIA
 Università degli Studi di NAPOLI "Federico II"
 Seconda Università degli Studi di NAPOLI
 Università degli Studi di NAPOLI "Parthenope"
 Università degli Studi di PADOVA
 Università degli Studi di PALERMO
 Università degli Studi di PARMA
 Università degli Studi di PAVIA
 Università degli Studi di PERUGIA
 Università di PISA
 Università degli Studi "Mediterranea" di REGGIO CALABRIA
 Università degli Studi di ROMA "La Sapienza"
 Università degli Studi di ROMA "Tor Vergata"
 Università degli Studi ROMA TRE
 Università "Campus Bio-Medico" ROMA
 Università degli Studi di SALERNO
 Università degli Studi del SANNIO di BENEVENTO
 Università degli Studi di SIENA
 Politecnico di TORINO
 Università degli Studi di TRENTO
 Università degli Studi di TRIESTE
 Università degli Studi di UDINE

LITHUANIA

There are 5 higher education institutions in Lithuania, having university study programs in Civil Engineering. These are listed below:

Vilnius Gediminas Technical University	web site http://www.vtu.lt
Kaunas University of Technology	web site http://www.ktu.lt
Klaipeda University	web site http://www.ku.lt
Lithuanian University of Agriculture	web site http://www.lzua.lt
Siauliai University	web site http://www.su.lt

Non University study programs in Civil Engineering are possible in:

Vilnius Collage of Construction and design	http://www.vsdk.lt
Technical Collage of Kaunas	http://www.ktk.lt

PORTUGAL

There are eight universities in Portugal which have Civil engineering Courses approved by the Ordem dos Engenheiros. These are:

IST – Lisbon
 UNL – Lisbon
 ISEL – Lisbon
 FEUP – Porto
 FCTUC – Coimbra
 UM – Guimarães
 UBI – Covilhã
 UTAD – Vila Real

SLOVAK REPUBLIC

Detailed information on University departments for engineering

The **Department of Concrete Structures and Bridges** concentrates its activities mainly in the area of concrete, reinforced structures and bridges. The main courses of the Department are Concrete Technology, Concrete Design, Advanced Reinforced Concrete, Concrete Bridges and Pre-stressed Concrete Design. Its instruction and research is supported by computer and experimental facilities and by the Laboratory of Concrete Structures.

The **Department of Transport Construction and Traffic Engineering** is a leading department for the education of engineers in the following specialisation: Roads, Motorways, Airports and Railways Planning and Construction as well as Traffic Engineering. It trains students to solve complicated transportation engineering problems of all kinds. Graduates are able to work in planning, geometric design and roads, airports and railway construction as well as in management and research.

The **Department of Theoretical Geodesy** covers education in Mathematical Geodesy, Physical Geodesy, Geodetic Astronomy, Satellite Geodesy, Processing and Analysis of Measurements, and Geo-informatics. Both the theoretical and practical aspects of geodesy are considered.

The **Department of Surveying** offers courses including Land Surveying, Engineering Surveying, Photogrammetry and Remote Sensing, Theories of Measurement and Data Processing, Underground and Mine Surveying, Measuring Systems in Engineering Surveying, Applied Analytical Photogrammetry, and Industrial Surveying. Surveying, Photogrammetry, and computer laboratories support the educational process and research.

The **Department of Geo-techniques** is usually an interdisciplinary department emphasising courses such as Geology, Engineering Geology, Hydrogeology, Soil Mechanics, Rock Mechanics, Foundations, Underground Structures, and Dams and Reservoirs.

The **Department of Land and Water Resources Management** offers courses in Hydrology, Hydropedology, Hydrometeorology, Irrigation and Drainage, River Channel Engineering and Restoration of rivers, soil erosion and Land Protection, Ponds and small Dams, GIS and CAD applications in water resources, and water resources management.

The **Department of Hydraulic Engineering** covers subjects including Surface and Groundwater Hydraulics, Construction, Economic and Ecological Problems associated with the Design, Construction, maintenance and reconstruction of Hydraulic Structures such as Weirs, Waterways, Harbours and structures for hydropower utilisation. Research and teaching is supported by a Laboratory of Hydraulics.

The **Department of Building Structures** delivers lectures in Building Construction, Studio Design, Typology, Thermodynamics, Acoustics, Day lighting, and the Energy Efficiency of Buildings. Students are trained in the design of construction units, elements, and details through theoretical and experimental methods of reasoning.

The **Department of Steel and Timber Structures** teaches subjects related to the Design and Construction of Steel and Timber Structures such as the Theory, Design, Construction and Experimental Analysis of Building Structures, Bridges, and Special Engineering Constructions with Steel, Timber and Composite Load-bearing Systems.

The Department's laboratory provides facilities for the experimental analysis of steel and timber structures used both in education and research.

The **Department of Mapping and Land Consolidation** is involved in the education of students in the areas of Mapping, Land Consolidation, Cartography and Cadastral Mapping. The educational and research activities are backed by geodetic instruments and a computer graphics laboratory.

The **Department of Mathematics and Constructive Geometry** covers all areas of education in mathematics and descriptive geometry. It co-operates with the other Departments in their research and consulting projects. Its teaching is supported by a computer laboratory. The Department's research focuses on the theory and applications of fuzzy sets, numerical analysis of nonlinear partial differential equations with applications to flow-in porous media, free boundary problems and image processing, topological graph theory, computer graphics, and non-standard measurement and integral theory.

The **Department of Economics and Building Industry Management** delivers the lectures and seminars in Management Basics, Management Information Systems, Economy, Financial Management, Project Management, Strategic Management and Marketing, Personal Management, Construction Costs and Price Estimation, Economics of the Building Industry, Management of Building Projects, Accounting, and in several lecture courses, such as Real estate economics, Application systems, Territorial marketing, Production management etc..

The **Department of Structural Mechanics** lectures subjects covering the theoretical background for static and dynamic analyses of civil engineering structures including Static's, Structural Mechanics, Dynamics of Structures, Theories of Elasticity and Plasticity, Rheology, Non-Linear Mechanics and Numerical Methods in Structural Mechanics.

The **Department of Physics** covers all areas of education in physics. It co-operates with the other Departments in their research and consulting projects. The Department's teaching is supported by laboratory equipment. The research targets of the Department focus on measuring and testing materials and constructions, properties of porous materials used in civil engineering, the computation of heat losses of building constructions, and the teaching of physics.

The **Department of Material Engineering** covers subjects such as Basic Chemistry, Building Materials, Chemistry of Building Materials, Ceramics, Binders, Concrete Technology, Pre-cast Concrete Technology and Testing.

The **Department of Building Technology** provides instruction in subjects including the Technology of Building Processes, Building Technology, Building-service Technology, Site Equipment Theory, Computer-Aided Preconstruction Design, Project Management, Preconstruction Design of Renovation, Environmental Protection during Construction, and Total Quality Management.

The **Department of Sanitary Engineering** offers subjects including the Chemistry of Water, Hydrobiology, Water Supply, Water Distribution, Water Treatment, Urban Drainage and Waste-Water Collection, Water Pollution Control, Waste Water Treatment, Sludge Treatment, and Waste Disposal. Design exercises, laboratory courses and fieldwork complement the instruction.

The **Department of Building Services** lectures on subjects such as Technical Equipment of Buildings, Internal Water and Gas Pipelines, Internal Drainage, TEB Machine Equipment, Ventilation, Heating, Air-Conditioning, Measuring and Regulation, Energy Supply of Buildings and Energy Management in Buildings.

The **Department of Architecture** provides a comprehensive architectural education, including the technical, artistic, special theoretical, and engineering disciplines, and

design of different building types for residential, commercial, social, industrial, agricultural and transport facilities. The Department's work also involves housing renewal, the preservation of historical monuments, interior design, urban planning and landscape design.

The **Department of the Humane Sciences** supplements the Faculty's training in civil engineering with subjects such as Political Science, History of Civil Engineering, Macroeconomics, Construction and Commercial Law, Ecology, General Law, Engineering Ethics, the Civil Code and Geo-ecology. Its research is focused on the humanisation of the environment.

The **Department of Languages** supports the Faculty's training in civil engineering with instruction in foreign languages (English, German, and French) at all levels. Classroom instruction includes general conversation, grammar and specialised vocabulary and style appropriate to various civil engineering sub-specialities. Instruction in the Slovak language is also offered for foreign students.

The **Department of Physical Education** supports the engineering training with an extensive offering of athletic activities, including aerobics, basketball, swimming, volleyball, football, skiing, gymnastics, water sports and tennis. Facilities include a large and a small gymnasium, a swimming pool, a dock and various athletic fields.

TURKEY

Supplementary information on the undergraduate curriculum

The undergraduate curriculum in Turkey as a general outline can be defined as follows;

First Year: Basic Calculus, Physics, Chemistry, Computer Programming, Geology, Technical Drawing, English Reading and Writing Skills, Introduction to Civil Engineering

Second Year: Differential Equations, Engineering Mathematics, Surveying, Engineering Mechanics, Materials Science, Engineering Economy, Mechanics of Materials, Non-technical electives and non-credit History/Literature courses

Third Year: Statistical Methods for Engineering, Structural Mechanics, Soil Mechanics, Foundation Engineering, Transportation and Traffic Engineering, Fluid Mechanics, Hydromechanics, Engineering Hydrology, Reinforced Concrete Fundamentals, Structural Analysis, Summer Practice

Fourth Year: Water Resources Engineering, Fundamentals of Steel Design, Summer Practice, Technical Electives according to student divisions and field of specialization with the content of design courses on Structure, Hydraulics, Foundation Engineering, Transportation, Materials Science. Technical Electives are given importance with the variety of engineering contents provided for students. Some of the technical options are; Structural Design, Applied Surface Hydrology, Planning and Design in Water Resources, Advanced Mechanics of Materials, Finite Elements, Construction Management in Practice, Railway and Metro Tunnels, Advanced Material of Construction, Highway Design, Computer Applications, Ground Improvement, Open Channel Hydraulics, Design and Construction of Special Structures, Advanced Structural Analysis, Pre-stressed Concrete, Coastal Engineering, Port Planning and Design, etc.

indicating those universities which provide a four-year undergraduate education

A four-year undergraduate education is given in 46 universities, followed by masters and PhD degrees in most of them.

1	Abant İzzet Baysal	University	Bolu
2	Afyon Kocapete	University	Afyon
3	Akdeniz	University	Antalya
4	Anadolu	University	Eskişehir
5	Atatürk	University	Erzurum
6	Atılım	University	Ankara
7	Balıkesir	University	Balıkesir
8	Boğaziçi	University	İstanbul
9	Celal Bayar	University	Manisa
10	Cumhuriyet	University	Sivas
11	Çukurova	University	Adana
12	Cyprus International	University	KKTC
13	Dicle	University	Diyarbakır
14	Dokuz Eylül	University	İzmir
15	Dumlupınar	University	Kütahya
16	Eastern Mediterranean	University	KKTC
17	Ege	University	İzmir
18	Erciyes	University	Kayseri
19	Firat	University	Elazığ
20	Gazi	University	Ankara
21	Gaziantep	University	Gaziantep
22	Harran	University	Şanlıurfa
23	Istanbul Kültür	University	Istanbul
24	Istanbul	University	Istanbul
25	İstanbul Technical	University	İstanbul
26	Izmir Advanced	Technology Institute	İzmir
27	Karadeniz Technical	University	Trabzon
28	Kırıkkale	University	Kırıkkale
29	Kocaeli	University	Kocaeli
30	Lefke Europe	University	KKTC
31	Mersin	University	Mersin
32	Mustafa Kemal	University	Hatay
33	Niğde	University	Niğde
34	Middle East Technical	University	Ankara
35	Ondokuzmayıs	University	Samsun
36	Osmangazi	University	Eskişehir

37	Pamukkale	University	Denizli
38	Sakarya	University	Sakarya
39	Selçuk	University	Konya
40	Süleyman Demirel	University	Isparta
41	Sütcü İmam	University	Kahramanmaraş
42	Trakya	University	Çorlu
43	Near East	University	KKTC
44	Yıldız Technical	University	İstanbul
45	Yüzüncü Yıl	University	Van
46	Zonguldak Karaelmas	University	Zonguldak