



The American University of Beirut
**Faculty of Engineering &
Architecture**

Department of Civil & Environmental Engineering

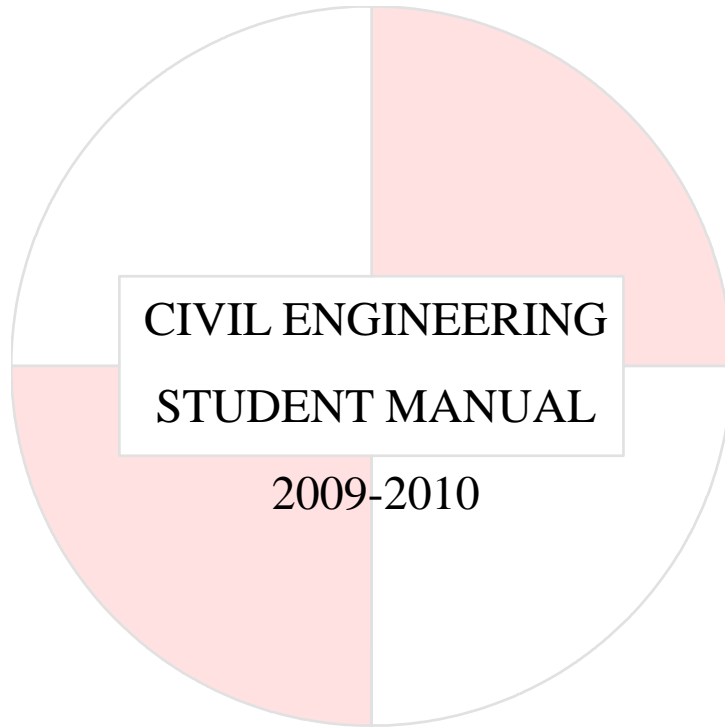
CIVIL ENGINEERING

STUDENT MANUAL

(2009-2010)



July 2009



**CIVIL ENGINEERING
STUDENT MANUAL**

2009-2010

Important Notice

Information in this document applies to the academic year 2009-2010. It is subject to change without notice. Students are responsible for checking their AUB e-mail and post-office boxes for announcements and information.

This manual can be viewed at the website of the Department of Civil & Environmental Engineering at:

<http://webfea.fea.aub.edu.lb/fea/cee/programs/undergraduate.aspx>.

Exam dates, summer training guidelines, final year project guideline, and many other useful documents and forms can also be viewed online under “Resources” at:

<http://webfea.fea.aub.edu.lb/fea/cee/index.aspx>

Contact Information

Department of Civil & Environmental Engineering
American University of Beirut
P.O. Box 11-0236
Riad El-Solh, Beirut 1107 2020
Lebanon
E-mail: cee@aub.edu.lb

AUB Phone: 01-350000/01-374374/01-340460/03-791313

Department/Office	Phone Ext.	Contact Person
CEE Department	3460	Zakeya Deeb
CEE Labs	3468	Christiane Chedid
FEA Dean's Office	3400	Haneen Deeb
FEA Student Services Office	3409	Alia Kazma
FEA Career's Office	3453	Nadia Moufarrej
FEA Computer Labs	3420	Kamal Mikati
IT Unit	3436	Ziad Shaaban
Eng. and Arch. Library	2630	Khaled Noubani
Registrar's Office	2570	
Admissions Office	2592	
Student Affairs	3170	
University Health Services	3000	
Emergency Room (AUH)	6604	
Ambulance	7777	
Fire	5555	
Protection Office	2400	

Foreword

Welcome to the Department of Civil & Environmental Engineering (CEE) and to a new academic year 2009-2010 that should be full of new challenges and activities. For new students, the coming months will bring them into a new world of a different structure and different rules pertaining to university student life.

The time that you will spend at AUB will be an opportunity for developing technical, academic, and social skills that will shape your future. You should not hesitate to seek the help and advice of your professors in all matters. The reward for us, faculty members, is to bear witness to your transformation from once undecided high school students into responsible, mature, self-confident, ethical, and creative civil engineers.

The Department of Civil & Environmental Engineering has a long and proud tradition of excellence. Our graduates have gone on to establish thriving companies and leading institutions. They have helped shape and develop Lebanon and the region, and have had a marked presence and contributions wherever they worked.

These are particularly exciting times for the Civil Engineering profession in general as well as for the CEE Department at AUB. Graduating civil engineers are benefiting from very stimulating work experiences in the region, many of which are related to mega projects in the building and infrastructure sectors; this has resulted in a booming job market and in highly competitive salaries for civil engineers. This trend has translated into higher student enrollment in the CEE department, which is being addressed by a gradual increase in the number of faculty members. The CEE Department also launched two PhD programs in fall 2007, one in Civil Engineering and the other in Environmental and Water Resources Engineering. Finally, this year (2009-10) the CEE Department is launching a new undergraduate program in Construction Engineering.

The CEE Department offers an integrated and broad undergraduate program without sacrificing technical depth, a program that competes with leading schools worldwide. The Civil Engineering Student Manual that you have before you is your guide to that program. It contains all the information that will help you make informed decisions regarding courses and all academic matters, and highlights the principal aspects and activities of our department. It is both a practical guide and a window through which you can peer into your future both at AUB and beyond. Please make use of it, consult it, and let us know what needs to be added or changed to make the future editions of this manual more useful. In the end, we wish all of you a productive and successful academic year 2009-2010.

Table of Contents

Important Notice.....	ii
Contact Information.....	ii
Foreword	iii
Table of Contents	iv
1. The World of Civil Engineering.....	1
2. Department of Civil & Environmental Engineering.....	3
2.1 Faculty	3
2.2 Supporting Staff	6
2.3 Facilities and Laboratories	7
2.3.1 Classrooms	7
2.3.2 Laboratories.....	8
2.3.3 Research Centers	10
3. Program and Curriculum	12
3.1 Program Mission, Educational Objectives and Outcomes.....	12
3.2 The Four-Year Program	12
3.2.1 Mathematics and Basic Sciences.....	13
3.2.2 Engineering	13
3.2.3 English, Arabic, Humanities, and Social Sciences	14
3.2.4 Summer Training and Project Courses	14
3.3 Minors.....	15
4. Advising.....	15
5. Student Evaluation	17
5.1 Probation.....	17
5.1.1 Placement on Academic Probation	17
5.1.2 Removal of Probation.....	17
5.2 Repeating Courses	17
5.3 Dismissal and Readmission.....	18
5.4 Dean’s Honor List.....	18
5.5 Graduation Requirements.....	18
6. Academic Rules and Regulations	20
6.1 General.....	20
6.2 Attendance	20
6.2.1 Classes and Laboratories	20
6.2.2 Examinations and Quizzes	20

6.3	Course Loads	20
6.4	Withdrawal from Courses	21
6.5	Incomplete Grade	21
6.6	Exam Rules	21
6.7	Student Conduct.....	22
6.7.1	General	22
6.7.2	Cheating	22
6.7.3	Dean’s Warnings	23
7.	Awards	24
7.1	Dean’s Award for Creative Achievement	24
7.1.1	Nature of Award.....	24
7.1.2	Number of Awards	24
7.1.3	Eligibility	24
7.1.4	Procedure for Nomination and Selection.....	24
7.2	Distinguished Graduate Award	25
7.2.1	Description	25
7.2.2	Nomination.....	25
7.2.3	Academic Performance	25
7.2.4	Character	25
7.2.5	Contribution to the Department.....	25
7.2.6	Voting.....	25
7.3	Penrose Award.....	26
7.3.1	Basis for Award.....	26
7.3.2	Nature of the Award.....	26
7.3.3	Nomination and Selection Procedures.....	26
7.4	Other Awards.....	26
8.	Activities	27
8.1	Student Employment.....	27
8.2	FEA Student Conference.....	27
8.3	Field Trips.....	27
8.4	Design Competitions.....	Error! Bookmark not defined.
8.5	Seminars and Movies	27
8.6	Civil Engineering Gala.....	28
8.7	Civil Engineering Society (CES)	28
9.	Career Opportunities and Graduate Studies	29
9.1	Career Opportunities.....	29

9.2 FEA Career Center.....	29
9.3 Graduate Studies at AUB.....	30
9.4 Graduate Studies Abroad	30
Appendix A: Historical Background	32
Appendix B: CEE Undergraduate Program Curriculum.....	34
Appendix C: Undergraduate Course Descriptions.....	36
Appendix D: Graduate Course Descriptions.....	39
Appendix E: Humanities and Social Sciences Courses	45
Appendix F: Frequently Asked Questions (FAQ)	49
Notes	56

1. The World of Civil Engineering

Civil Engineering is the field of engineering concerned with the planning, design, construction, and management of projects. Throughout the course of human history, Civil Engineering in its various incarnations played a pivotal role in shaping human societies and conditioning their progress. In fact, our discipline is the continuation and technical manifestation of one of the most ancient human skills, that of building and shaping the world around us.

Since the earliest recorded history and up to the present day, great monuments and magnificent civil engineering projects mark the march of civilization. The heritage is vast, spanning from the Pyramids of Egypt, the Pantheon in Greece, the Near Eastern dams and irrigation systems, and the Roman aqueducts and roads, to the impressive structures of modern times, including the Eiffel Tower, the Suez Canal, and today's skyscrapers such as the Empire State Building and Burj Dubai to name but a few. Such feats have been achieved through reason, creativity, perseverance, leadership and management of resources.

Even though Civil Engineering is an old discipline, it is by no means stagnant or outdated. The world of Civil Engineering today is a vibrant forward-looking and constantly evolving world. The profession has changed as the challenges thrown at it have increased in complexity. Today's civil engineers have to build higher, stronger, cheaper, in more challenging conditions, while meeting more stringent criteria of safety against natural hazards and environmental concerns. They have to provide better quality of life, for more people, under more restrictive conditions than ever before. Civil engineers are at the helm of projects that provide housing, clean water, and energy to a more and more demanding world.

The above examples clearly show that the field of Civil Engineering is broad. It encompasses several specific disciplines, the diversity of which offers a wide choice of careers. Hydraulic Engineering applies fluid mechanics to the design of hydraulic structures and water resources systems. Geotechnical Engineering applies soil and rock mechanics to the design of foundations and retaining structures. Environmental Engineering aims at minimizing negative impacts of both humans on environment and of the environment on humans. Structural Engineering is the science and art of designing and constructing buildings, bridges, and frameworks so that they can safely resist the forces to which they may be subjected. The world's airports, highways, rails, and mass transit systems are all the fruits of Transportation Engineering.

In addition to the above areas, the horizon of Civil Engineering is now broadening to encompass new fields such as bioengineering, intelligent infrastructures and smart systems, life-cycle design, real-time monitoring and rehabilitation, sustainable materials and space structures. Civil engineers are amongst the first users and developers of technology, whether it is computer applications, remote sensing, information technology, or smart materials, buildings, and highways.

The present booklet aims at helping you understand the world you have chosen to enter and become a part of. It is also designed to provide you with a practical guide to help you through some of the bureaucratic, academic and administrative hurdles that might lie ahead.

2. Department of Civil & Environmental Engineering

As early as 1913, the University recognized the need for engineering education and training in the Arab East, and courses in this field were offered in the School of Arts and Sciences. In 1951, a separate School of Engineering was established and curricula were initiated in Civil Engineering, Mechanical Engineering, Electrical Engineering and Architectural Engineering. In 1966, the School was renamed the Faculty of Engineering and Architecture (FEA) that comprised, among others, the Department of Civil Engineering, which was renamed in 1993 as the Department of Civil & Environmental Engineering (CEE). A more detailed historical background of FEA and AUB is available in Appendix A.

2.1 Faculty

There are currently 14 full-time faculty lines in the CEE Department (Table 1). These are distributed as follows: Construction Engineering and Materials (2), Environmental Engineering & Technology (3), Geotechnical (2), Structural (3), Transportation (2), and Water Resources (2). All of the full-time faculty members are Ph.D. holders from top U.S., U.K. and Canadian institutions of higher learning.

One additional faculty position in Structural Engineering is expected to be filled in the current academic year (2009-10).

Full-time faculty members of the CEE Department teach most of the Civil & Environmental Engineering courses in the undergraduate curriculum. The upper-year technical courses are taught by faculty members with a high level of expertise in their area of specialization. Some of the lower-level Civil Engineering courses are taught by competent part-time faculty members (Table 2).

The department is also served by visiting professors and local professional experts; they are mainly involved in teaching specialized graduate courses that are also open as technical electives to final year students.

Table 1. Full-Time CEE Faculty

Name	Title	Specialty	Off.	Ext.	E-mail
Assaf, Hamed	Assistant Professor	Water Resources	511	3474	ha49@aub.edu.lb
Ayoub, George	Professor	Environmental Engineering	348	3533	gayoub@aub.edu.lb
Basha, Habib	Professor	Water Resources	535	3482	habib@aub.edu.lb
Bou Zeid, Maya*	Assistant Professor	Transportation Engineering			
Chehab, Ghassan	Assistant Professor	Engineering Materials	Annex 107	3496	gc06@aub.edu.lb
El-Fadel, Mutasem	Professor	Environmental Engineering	342	3470	mfadel@aub.edu.lb
El Khoury, Hiam*	Assistant Professor	Construction Engineering			
Hamad, Bilal	Professor	Structures	309	3598	bhamad@aub.edu.lb
Harajli, Mohamad	Professor	Structures	328	3527	mharajli@aub.edu.lb
Kaysi, Isam	Professor	Transportation	307	3471	isam@aub.edu.lb
Mabsout, Mounir	Professor	Structures	325	3464	mounir@aub.edu.lb
Najjar, Shadi	Assistant Professor	Geotechnical	311	3532	Sn06@aub.edu.lb
Sadek, Salah	Professor & Geotechnical Chairman		326	3472	salah@aub.edu.lb
Saikaly, Pascal	Assistant Professor	Environmental Science	509	3493	ps00@aub.edu.lb

* Drs. Bou Zeid and Khoury are joining the CEE Dept this term (FALL 2009)

Table 2. Part-Time CEE Faculty

Name	Title	Specialty	E-mail
Azar, Kamal	Senior Lecturer	GIS	kazar@gistransport.com
Basha, Hisham	Senior Lecturer	Structures	hbasha@yahoo.com
El Jam, Farah	Instructor	Environmental	fe13@aub.edu.lb
Fawwaz, Yusuf	Lecturer	Transportation	yf01@aub.edu.lb
Haroun, Akram	Instructor	Structures	Akram.Haroun@dargroup.com
Hassbini, Hayssam	Instructor	IT	Hayssam.Hasbini@dargroup.com
Inglessis, Constantine	Associate Professor	Fluid Mechanics & Lab	cinglessis@yahoo.com
Kasti, Fouad	Lecturer	Structures	Fouad.Kasti@dargroup.com
Kasti, Najib	Lecturer	Structures	nk14@aub.edu.lb
Nader, Halim	Lecturer	Surveying	halimnader@hotmail.com
Nasreddine, Khaldoun	Lecturer	Geotechnical	kndine@hotmail.com
Nehme, Elias	Instructor	Transportation	Elias.Nehme@dargroup.com
Sadeck, Salah Eldine	Lecturer	CAD Course	dr_sadek@cyberia.net.lb
Saleh, Maha	Instructor	Geotechnical	Mahasaleh_80@hotmail.com

2.2 Supporting Staff

A total of 9 supporting staff members are currently available to support the CEE Department (Table 3). The list includes the laboratories manager, the Environmental Engineering Research Center (EERC) research associate, the laboratories supervisor, four technicians of various ranks (3 technicians and 1 assistant technician), the secretary of the department, and the secretary of the laboratories.

The laboratories manager (with support from the lab supervisor) manages and oversees the proper functioning of all laboratories for the CEE Department; directs the preparation of labs for educational sessions as advised by faculty; coordinates setup of required tools, equipment, and materials; ensures testing of equipment; conducts service testing as required by outside client; controls the inventory of equipment and instruments; and maintains adequate stock of parts, components, and materials. The basic functions of the EERC research associate are to prepare, maintain, and set up the environmental engineering laboratories for educational sessions, research, and experimental work. Both manager and associate assist in planning budgets and ordering of major and minor equipments and laboratory supplies. The various technicians assist in the preparation of the civil and environmental engineering laboratories for educational sessions, experimental work, and service testing, besides the routine laboratory tasks and assignments.

Table 3. Staff Members

<u>Name</u>	<u>Title</u>	<u>Specialty</u>	<u>Ext.</u>	<u>E-mail</u>
Asyala, Bashir	Technician	Materials Testing Laboratory	3466	ba18@aub.edu.lb
Bashir, Jamil	Technician	Soil Mechanics Laboratory	3468-3469	jb07@aub.edu.lb
Chedid, Christiane	Secretary	CEE Laboratories	3468-3469	ceelabs@aub.edu.lb
Daoud, Joseph	Technician	Environmental Engineering Research Center	3500-3501-3502	jd10@aub.edu.lb
Deeb, Zakeya	CEE Admin Asst.	CEE Department	3460-3461	cee@aub.edu.lb
Hallak, Khaled	Assistant Technician	Hydraulics Laboratory	3506	kh17@aub.edu.lb
El Khatib, Helmi	CEE Labs Manager	CEE Laboratories	3468-3469	he00@aub.edu.lb
El Sheikh, Abdel Rahman	Lab Supervisor	Materials Testing Laboratory	3466	as65@aub.edu.lb
Semerjian, Lucy	Research Associate	Environmental Engineering Research Center	3500	ls07@aub.edu.lb

2.3 Facilities and Laboratories

The Department of Civil & Environmental Engineering (along with most of its facilities and labs) is housed in the Bechtel Building. The environmental and hydraulics laboratories are accommodated in the CCC Scientific Research Building (SRB) on the north side of the Engineering compound.

2.3.1 Classrooms

The majority of the instruction takes place in Bechtel Building, primarily in classrooms at the fourth and fifth levels of the building. The largest classes are normally scheduled in the Engineering Lecture Hall, which is commonly used on a selective basis by the various departments of the Faculty. All of the classrooms are provided with equipment for projection of computer software-based presentations, in addition to traditional audio-visual teaching material such as slides and overheads projections. The lecture hall is undertaking major renovations during the summer

and fall of 2008. Two small and medium conference rooms equipped with adequate facilities are available for projects and seminars presentations.

2.3.2 Laboratories

The Civil Engineering program maintains specialized teaching and research laboratories for environmental, geotechnical, hydraulics, and structural engineering. Equipment and instrumentation are also available to conduct investigations and surveys in transportation and survey engineering. Computer facilities are available for student instruction and training. The laboratories are used for research purposes as well as to enhance teaching through hands-on experience in the various fields of civil and environmental engineering. Course projects and the newly introduced final year project make effective use of the facilities. The Civil Engineering Laboratories are also reputed in the local professional engineering community for the reliable and prompt testing services they offer in the various specialties. The laboratories are serviced by specialized staff, with one full-time faculty member serving as the faculty supervisor for each facility.

Structural and Materials Laboratory

The Structural and Materials Laboratory occupies an area of about 550 square meters in Bechtel Building (Level 1), and is equipped with an array of instruments and tools that provide for the carrying out of a series of experiments. Undergraduate students use the lab to experiment with various construction materials to satisfy the requirements of the Construction Materials and Technologies course (CIVE 320). In addition, a number of other undergraduate and graduate courses make use of the laboratory in projects related to building structural systems and testing components (CIVE 620, CIVE 625, CIVE 626). Besides the state-of-the-art testing equipment such as the 100 Tons Dynamic Capacity MTS and the Tinius Olsen Universal Testing Machine, the department has equipment to perform Petrographic Analysis and has completed the construction of a Strong Floor- Reaction Wall facility that is used for dynamic testing. The latter facility, put in action in Summer 2005, includes a hydraulic power supply unit, two hydraulic actuators, and a data acquisition system. Such a facility will be used by students and faculty in their research activities and will contribute to the improvement of undergraduate and graduate education in earthquake engineering. It will allow graduate students to conduct research aimed at evaluating the seismic performance of structural systems and test a wider range of specimens with respect to size, type, and shape of structural elements. Recent acquisitions also consisted of a CBR Testing Machine used in the evaluation of the performance and stability of rock and asphalt mixes, a Grinding Machine used for concrete samples preparation, a Pile Integrity Meter used for the evaluation of pile soundness and material properties, and a Rapid Freeze-Thaw System used for testing the durability of construction materials.

Soil Mechanics Laboratory

The Soil Mechanics Laboratory occupies an area of about 275 square meters in Bechtel Building (Level 2). The lab houses various equipment that are necessary for performing the basic geotechnical tests and more advanced tests such as triaxial

compression tests, direct shear tests, slope stability, and soil bearing capacity experiments. Laboratory work is required from undergraduate students, as part of Soil Mechanics and Laboratory course (CIVE 431), which introduces them to basic geotechnical principles and standard tests such as soil classification (sieve and hydrometer) and other soil properties (Atterberg limits, soil compaction, permeability, and consolidation). Sufficient equipment and space are available for performing tests simultaneously by several groups of students during one instructional lab session. Several foundation and soil behavior courses utilize the lab facilities for demonstrations or projects (CIVE 530, CIVE 630, CIVE 634). Recent lab acquisitions consisted of Direct Shear and Triaxial Testing Machines with Data Acquisition Systems used for studying soil properties, and an X-Ray Diffraction System used as a non-destructive procedure for the characterization of solid materials.

Transportation and Surveying Facilities

The Transportation and Surveying equipment are stored in a dedicated space of about 30 square meters in Bechtel Building (Level 2), and are typically used on site. The various facilities include instruments used in the Surveying course (CIVE 360) in which laboratory work and field measurements comprise the majority of the course work. Sufficient surveying instruments are available for six crews to work in the field simultaneously. These include traditional transits, theodolites, total stations, and levels. Modern instruments such as EDM and GPS units are also available for group work and demonstration purposes. Part of the Transportation Engineering and Laboratory course (CIVE 461) comprises a set of laboratory sessions that are oriented at carrying out field surveys related to transportation issues. To achieve these objectives, necessary equipment in the form of automatic counters and road detectors are made available to students. Such equipment is also used by students taking the Urban Transportation Planning (CIVE 661) and Traffic Engineering (CIVE 662) courses, as well as by graduate students conducting research work. In 2009, the CEE Department acquired a state of the art driving simulator for use in advanced courses and research.

Hydraulics Laboratory

The Hydraulics Laboratory occupies an area of about 120 square meters in SRB. The facility houses the basic equipment used in standard experiments, such as channels, flumes, hydrology system, which are normally present in hydraulic laboratories. Laboratory experiments are offered as part of the two basic undergraduate courses, Fluid Mechanics and Laboratory (CIVE 340), and Hydraulics and Laboratory (CIVE 440). Besides laboratory demonstrations, students are divided into groups to perform preset standard hydraulic experiments. In addition to existing equipment, a Basic Hydraulic Bench with accessories and a Particle Drag Coefficients Measurement Instrument are available for use in the hydraulics and fluid mechanics lab sessions. Two recent additions to the lab are a Flow Pipe Network and an advanced Hydrology System with Instrumentation.

Computer Laboratories

Computer laboratories shared by various departments of the Faculty are available to CEE students for instruction and project execution. Nine lab rooms are available that house a total of 180 PCs from Dell, Fujitsu Siemens, HP and Apple. Each lab has a scanner and laser printer in addition to other teaching equipment such as a mobile whiteboard, a fixed ceiling LCD projector with rollup projection screen and an audio system. All labs are secured by Access card readers on the main doors in addition to CCTV monitoring cameras connected to a centralized server.

The Information Research Lab, which is available to undergraduate students working on special projects, is also equipped with 7 state-of-the-art servers, 13 workstations, and other peripheral equipment (e.g. printers, plotters, scanners, DVD writer, camcorder, and a digital camera). Additionally, working space and computer stations are dedicated to CEE graduate and senior students in various departmental facilities and laboratories. Computers are typically supplemented by a collection of software related to specific fields of civil and environmental engineering and which are being updated regularly.

2.3.3 Research Centers

Environmental Engineering Research Center and Laboratories

The Environmental Engineering Research Center (EERC) and Laboratories occupy an area of about 300 square meters in SRB. The environmental laboratories facilities are equipped to allow students to conduct experiments and research that can investigate chemical, physical, and biological contaminants associated with water, air, and solid wastes. The laboratories are furnished with benches and storage facilities, and supplied with glassware and various chemicals, as well as state-of-the-art equipment and analytical instruments. As part of the Water and Wastewater Treatment and Laboratory course (CIVE 450), undergraduate students are expected to conduct a series of experiments in which they will be introduced to the methods of testing for basic water parameters such as pH, dissolved oxygen, alkalinity, water hardness, etc. Measurement of air pollutants such as SO₂, CO, ozone and NO_x is also an option for interested students. Package experimental setups are available to instruct students on various water treatment processes such as ion exchange, filterability index, reverse osmosis, settling columns, aerobic digestion, deep bed filters, sedimentation, aeration, flocculation (jar test), permeability, and fluidization. Many other undergraduate and graduate courses make use the lab facilities for demonstrations or projects (CIVE 351, CIVE 650, CIVE 651, and CIVE 753). The latest lab acquisitions, used in testing related to water and wastewater characterization, consisted of an Anaerobic Digestion Apparatus, an Atomic Absorption Spectrophotometer, an Automatic Titration System, a Microwave Digestion unit, a UV/VIS Spectrophotometer, a Nitrogen Evaporator, a Total Carbon and Inorganic Carbon Analyzer, a Total Nitrogen Analysis System and an Oil and Grease Analyzer.

Water Resources Center

The Water Resources Center (WRC) occupies an area of about 70 square meters in SRB. The center collects essential water resource studies to set up a national data management system. The interfaculty center provides a forum for information exchange and regional cooperation in rationalizing the planning and management of water resources in the region.

Transportation Research Unit

The Transportation Research Unit (TRU) focuses on the broad field of transportation which has wide interactions along several dimensions including:

- its interactions with land use, the economy, the environment, and social processes
- its role at various spatial scales ranging from urban to international
- its importance at various temporal scales ranging from real-time control such as application of Intelligent Transportation Systems (ITS) to long term sustainability assessment
- its role in facilitating the movement of passengers and goods

The vision of the Transport Research Unit is to become a regional Center of Excellence in transportation that would bring together researchers and experts from several relevant disciplines including civil engineering, urban planning, economics, environmental engineering and sciences, computer science, sociology, business (logistics and supply chain management), statistics, electrical and computer engineering, and others. One area of interest for TRU is raising the regional professional practice level in the transport domain to international standards.

The TRU has been commissioned by the Beirut Container Terminal Consortium (BCTC) to provide technical support, to conduct studies and research towards developing more efficient operational procedures at the container terminal, and to contribute to the development of software and information solutions for container terminals in general.

3. Program and Curriculum

3.1 Program Mission, Educational Objectives and Outcomes

The mission of the undergraduate program of the CEE Department is to provide a stimulating and supportive environment for high-standard education; to prepare graduates for a lifelong productive career in addressing problems in a rapidly-changing world, while instilling in them an appreciation of leadership qualities, professionalism, and ethics; to provide professional services of the highest quality to the community; and to contribute to expanding the knowledge and technological base in civil and environmental engineering.

The objectives of the CE program are to see our graduates move on to become:

- Engineers who hold central positions in various sub-disciplines of Civil Engineering in local, regional, and international practice.
- Graduates who are admitted and successfully completing advanced degrees in leading universities around the world.
- Leaders in their profession and in the service of their community.

The graduates of the Civil Engineering program will have acquired each of the following characteristics and abilities:

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to identify, formulate, and solve engineering problems.
- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- An ability to use the techniques, skills, and modern tools necessary for engineering practice.
- The broad education necessary to understand the impact of engineering solutions in a local and global, economic, environmental, and societal context.
- An ability to function on multidisciplinary teams
- An ability to communicate effectively.
- An understanding of professional and ethical responsibility.
- Knowledge of contemporary issues.
- A recognition of the need for, and an ability to engage in, life-long learning.
- Some experience in engineering practice or undergraduate research.

3.2 The Four-Year Program

The CEE Department offers the degree of Bachelor of Engineering, major in Civil Engineering. Undergraduate students accepted in the program are expected to complete the degree requirements in 11 terms (eight 16-week semesters and three 8-

week summer terms), spanning over four calendar years. Curricula and courses in the Department of Civil & Environmental Engineering are continuously revised to ensure that they meet the emerging needs of local and regional industries, consulting offices, contractors and government and international agencies.

The undergraduate curriculum of the CEE Department is composed of 143 credit hours, out of which 30 credit hours are non-technical. The courses cover all common areas in Civil Engineering, namely, Structural, Transportation, Geotechnical, and Environmental and Water Resources Engineering. The Civil Engineering curriculum provides the necessary mathematics, science, engineering, and general education components to prepare students for a successful career. General education courses in English, Arabic, humanities and social sciences are offered throughout the four years to enhance the students' communication skills and to provide them with the necessary liberal education. The basic engineering and science courses are offered in the first two years. The third and fourth years include mainly technical courses covering design, analysis, laboratory, and computer applications in the major areas of civil engineering. During the final year, the students select four technical elective courses and a final year project that allow them to enhance their knowledge in one or more specific areas, which best suits their interest and career desires. The CE undergraduate curriculum is summarized in a convenient tabular and flowchart format in Appendix B.

3.2.1 Mathematics and Basic Sciences

In general, the program of the first two years consists of general purpose courses in the areas of mathematics, science, culture, and English, in addition to basic courses in civil and other fields of engineering. Civil Engineering students take 15 credits in mathematics, covering calculus, differential equations, vectors and vector products, matrix analysis, complex variables, and other advanced analytical techniques. This also includes a course in probability and statistics. In addition, students complete 12 credits of basic science subjects, including physics, chemistry, and biology.

3.2.2 Engineering

All students in the Civil Engineering program complete 21 credits of basic engineering topics courses such as computing, electronics, mechanics, and engineering economy topics. From the third year on, the program includes courses in the various specialties of civil engineering totaling 66 credits. These courses span the areas of structural engineering and concrete design, soil mechanics, transportation and highway engineering, water resources, and environmental engineering. In addition, students take surveying, construction materials, construction management, and the recently introduced final year project. A brief description of the CE undergraduate courses can also be found in Appendix C.

During the final year, the CEE students can select four specialized CE technical elective courses from the various fields stated above, in addition to the two required courses: Foundation Engineering and Construction Management. These technical

electives will enhance the students' knowledge in the specific areas of civil engineering that best fit their interest and future career. Some of the courses involve a significant design component. One elective course can be taken from other departments pending advisor approval. The CE technical electives are listed and described in Appendix D.

3.2.3 English, Arabic, Humanities, and Social Sciences

The Civil Engineering curriculum includes also 10 courses (30 credits) selected by each student to cover the areas of ethics, Arabic, English, economics, humanities, and social sciences. The objective of these courses is to help shape and advance the knowledge of the future engineers in non-technical areas.

Students are expected to satisfy the following distribution requirements of English, Arabic, humanities, and social sciences courses:

- Two English courses (6 cr.), one of them being ENGL 206 (3 cr.). ENGL 203 (3 cr.), if required, will be considered as one of the English courses.
- One Arabic course (3 cr.) as determined by the Arabic Placement Test. Students who are exempted from Arabic should normally replace this requirement by taking ARAB 200, 203 or any other 3-credit course in Humanities.
- One course on ethics (PHIL 205, 206, 209, or 210) – (3 cr.)
- Three humanities course - (9 cr.)
- Two social sciences courses - (6 cr.)
- One economics course. All 200 level courses are acceptable excluding ECON 203 and 213 - (3 cr.)

Students in the Civil Engineering program are also required to take the 3-credit Technical English course (ENGL 206) that focuses on writing and oral communication skills, as well as preparation and presentation of technical papers. A selective sample of humanities and social sciences elective courses are listed in Appendix E.

3.2.4 Summer Training and Project Courses

Civil Engineering students are required as part of their studies to undergo training in a professional capacity, working in either contracting or consulting firms, in Lebanon or abroad. Such training is an integral part of the program (CIVE 500) and is typically done during the summer of the third year of studies. This experience consists of an intensive eight-week experience with a professional organization that provides opportunities for training and exposure to the real engineering world. Typical venues for such experiences have to be approved by the department and include local, regional and international design offices and construction companies. The FEA Career Center provides advice and services to assist students in securing summer internship training. In order to sharpen their communication and professional skills, students are required to prepare a written report describing their

training experience, and present a short oral presentation with supporting slides and visual aid.

The Final Year Project course (CIVE 501-502) was introduced during the year 2004-2005 in the curriculum to prepare the students for engineering practice. It is an important piece of work that requires the synthesis of the knowledge and skills acquired in earlier course work, some creativity and original thinking. The final year project allows students to specialize in a topic that they enjoy and in which they can prove themselves. It encourages teamwork and enhances communication skills through an oral and a poster presentation and a professional report write-up. It will also expose students to multi-disciplinary approaches by incorporating the economic, social, environmental, health and safety considerations. Guidelines for the summer training and the final year project can be obtained from the department and downloaded from the CEE website.

3.3 Minors

Many undergraduate CE students opt to complete a minor while completing the requirements of their BE degree in Civil Engineering.

In the Faculty of Engineering and Architecture, the Engineering Management Program offers a minor in engineering management that has been quite popular with CE students. This minor can be pursued starting as early as the fall semester of the third year of enrollment. To satisfy the requirements of this minor, a student must earn 18 credits of course work from the engineering management course offerings with a minimum grade of 70.

The Electrical and Computer Engineering department also offers a minor in Biomedical Engineering.

In addition, many departments in the Faculty of Arts and Sciences offer minors such as minors in Computer Science, Economics, Mathematics, Psychology, and Statistics. Also a minor in Business is offered by the Suliman S. Olayan School of Business.

4. Advising

Each class has an academic advisor selected from the CEE full-time faculty listed in Table 1. Students can check their advisor from the AUB-SIS (Student Information System). Advisors and advisees lists are also posted in the department.

Advising consists of assisting students at the time of course registration, namely in the choice of elective courses. Students placed on academic probation are given special advice in selecting courses to properly overcome their academic difficulties. The academic advisor helps the students in registration, course selection, and carries further the task of evaluating students at the end of each term, starting Term II. Students facing academic difficulties should consult with their advisors. A student services officer is also available in the FEA Dean's Office to assist students with problems related to registration, evaluation, and other matters. For problems of personal nature, university counselors are also available for help.

The CEE Department holds regular meetings between faculty members and the 1st, 2nd, 3rd and 4th year students to discuss various issues of academic interest. A welcome meeting is also organized by the department to the 1st year CEE students at the start of the fall semester. The meeting is an opportunity to introduce students to the world of Civil Engineering and to address concerns and answer questions by new students early on during the year.

Students should often consult this manual for useful information on advising and academic matters, rules and regulations, and major activities conducted by the department. Students can also view a resources page under the department website, which includes online access to various documents and forms, such as the student manual, course syllabi, exam dates, training and final year project guidelines, and petition and other forms. Students are also responsible for regularly checking their AUB e-mail and post-office boxes for announcements and information.

5. Student Evaluation

5.1 Probation

5.1.1 Placement on Academic Probation

A student is placed on academic probation if the student's overall average is less than 68 at the end of the 2nd regular semester; if the semester average is less than 69 at the end of the 3rd or 4th regular semester; or if the semester average is less than 70 in any subsequent semester, excluding the summer term.

For evaluation purposes, the minimum number of credits at the end of the 2nd regular semester should be 24 cr, and 12 cr. in each subsequent semester. Credits taken during a summer term are counted towards the semester average of the next regular semester. If the number of credits taken in any one regular semester is less than 12 cr. for approved reasons, credits taken during that semester are counted towards the semester average of the next regular semester.

Credits for incomplete courses will be included in the semester in which the incomplete courses were taken. The evaluation for that semester will be carried out as soon as the grades for the incomplete courses have been finalized.

5.1.2 Removal of Probation

Probation is removed when the student attains a semester average of 69 or more in the 3rd or 4th regular semester, or a semester average of 70 or more in any subsequent regular semester. Probation should be removed within two regular semesters, excluding summer, after the student is placed on probation, or when the student completes his or her graduation requirements.

5.2 Repeating Courses

A student who fails a required course with a grade less than 60 must repeat the course at the earliest opportunity. When a course is repeated, the highest grade is considered in the calculation of the cumulative average. All course grades will remain a part of a student's permanent record.

A student may repeat any course to improve his/her grade average. However, a student is not allowed to repeat a course more than three times, including withdrawals. Students enrolled in repeated courses will not be eligible to be placed on the dean's honor list at the end of the semester in which the repeated course is taken. Students will not be eligible to graduate with distinction or high distinction by repeating courses to improve their grades.

A student, who wishes to a repeat course in which s/he scored more than 70, needs to obtain the approval of the CEE department prior to registration.

5.3 Dismissal and Readmission

A student will be dismissed from the faculty for any of the following reasons:

- If the student's overall average is less than 60 at the end of the second regular semester.
- If the student fails to clear academic probation within two regular semesters, excluding the summer term, after being put on probation.
- If the student is placed on academic probation for a total of four regular semesters.
- If the student is deemed unworthy by the faculty to continue for professional or ethical reasons.

A student will normally be considered for readmission only if, after spending a year at another recognized institution of higher education, the student is able to present a satisfactory record and recommendation. Exceptions may be made for students who left the University for personal or health reasons. Transfer credit will be considered after departmental evaluation of a student's course work.

5.4 Dean's Honor List

To be placed on the Dean's Honor List, a student must:

- be carrying at least 12 credits in the term,
- not be on probation,
- have not withdrawn from or repeated a course in the term,
- have passed all courses and attained an overall average of 85, or of 80 while ranking in the top 10 percent of the class,
- not have been subjected to any disciplinary action within the University during the semester, and
- be deemed worthy by the Dean to be on the Honor List.

5.5 Graduation Requirements

To be eligible for graduation with the BE degree, a student must have:

- satisfied promotion requirements throughout the program,
- passed all the required courses and approved experience,
- attained a minimum cumulative course average of 70,
- attained a cumulative average of 70 or more in major courses as specified by the department,
- met the residence requirements, and
- satisfied the faculty as to the adequacy of the student's professional development and conduct.

To graduate with distinction or high distinction, a student must have a minimum average of 85 or 90, respectively, for the last 60 credits taken prior to graduation.

The Registrar of the University checks the overall average requirement and the CEE Department checks the major average requirement and recommends students for graduation with distinction and high distinctions. Students must also fill up and have the complete clearance form signed in order to proceed with graduation (for more information, check with the Dean's Office).

6. Academic Rules and Regulations

6.1 General

The Academic Rules and Regulations of the faculty can be found in the section of the Faculty of Engineering and Architecture in the University Catalogue. It is the responsibility of every student in the faculty to be thoroughly familiar with these rules and regulations.

6.2 Attendance

6.2.1 Classes and Laboratories

Students are expected to attend all classes, laboratories, design sessions or required fieldwork. All missed laboratory or fieldwork must be made up. Absence of a student, whether excused or unexcused, from any class session does not excuse the student from responsibility for the work done or announcements made during the student's absence.

Students who miss more than one-fifth of the sessions of any course in the first ten weeks of the semester (five weeks in the case of the summer term) may be required by the instructor to withdraw from the course with a grade of "W" for that course. Instructors provide their class attendance policy in the course syllabus.

6.2.2 Examinations and Quizzes

Students who miss an announced examination or quiz must present a valid excuse. Medical reports and qualified professional opinions issued by an AUB employee, AUH doctor, or by the University Health Services are accepted. The course instructor may then require the student to take a make-up examination. Should there be a question about the validity of any excuse presented by the student, the matter should be referred to the appropriate faculty committee. Absence from a final exam requires the student to submit a petition with valid excuse to the FEA Academic & Curriculum Committee before allowed to take a make-up exam.

6.3 Course Loads

Students can normally register for up to 17 credits per semester and 9 credits during the summer term. A student must carry a minimum load of 12 credits per semester to be considered full-time. A full-time student who wishes or is forced to reduce the load to less than 12 credits must first petition the FEA Academic & Curriculum Committee for permission to do so. Registration for 18 or 19 credits requires the approval of the academic advisor and department chair; relevant forms are available in the department and online. Students who wish to register for more than 19 credits must petition the Academic & Curriculum Committee for permission to do so. Their requests will be handled on a case-by-case basis. Petition forms are available at the FEA records office and online.

A student on probation will not be permitted to register for more than 16 credits if s/he is on academic probation P1, and no more than 13 credits if s/he is on academic probation P2 or higher. A student on probation will not be permitted to register for more than 7 credits during a summer term.

A student with incomplete grades and on good academic standing will not be permitted to register for more than 16 credits during a regular semester. A student with incomplete grades and on academic probation will not be permitted to register for more than 13 credits. Students with incomplete grades will be forced to drop courses to comply with the above-mentioned rules.

6.4 Withdrawal from Courses

A student may withdraw from courses, down to a minimum of 12 credits, not later than 10 weeks (five weeks in the summer term) from the start of the semester. A student cannot withdraw, or be withdrawn, from a course after the announced deadline unless approved by the FEA Academic & Curriculum Committee.

Students cannot withdraw, or be forced to withdraw, from a course at any time if this results in the student being registered for less than 12 credits without the prior approval of the Academic & Curriculum Committee. Students who withdraw or are forced to drop a course will receive a grade of "W".

6.5 Incomplete Grade

A student who receives an incomplete grade for a course must petition the Academic & Curriculum Committee within two weeks from the date of the scheduled final exam for permission to complete the course. Coursework must be completed within one month of the start of the next regular semester. In exceptional circumstances, the appropriate faculty committee may decide to give the student additional time to complete a course.

Incomplete course work will be reported as an "I" followed by a numerical grade reflecting the evaluation of the student available at the end of the semester. This evaluation is to be based on a grade of zero on all missed work and should be reported in units of five. If the work is not completed within the period specified, the "I" is dropped and the numerical grade becomes the final grade.

6.6 Exam Rules

Rules for quizzes and midterms are set by the course instructors. For final examinations, seating arrangements are posted at least half an hour before each examination session. Examinees are not permitted to read the examination questions before the head proctor announces the start of the examination, or to continue writing after the head proctor has announced the end of the examination. For closed-book exams, no books or papers other than the examination booklets may be used. All

booklets must be handed in at the end of the examination. No communication of any kind among examinees is permitted during an examination. Cellular phones should be strictly turned off during the exam. Examinees who need assistance during examination should seek the help of a proctor. Unless given permission by the head proctor, the examinees who leave the room for any reason will not be allowed to return and will receive credit only for that part of the examination that was undertaken. Students arriving late are allowed to join the exam, provided that no students have left the examination room. No additional time would be granted.

6.7 Student Conduct

6.7.1 General

A student who commits cheating and misconduct will be subject to disciplinary action. Misconduct refers to any improper behavior, on the part of a student, that disturbs the normal decorum of faculty activities or the integrity of its premises. This includes offensive behavior directed at academic personnel, non-academic personnel, or other students, and damage or defacement of university property. Serious violations shall be reported to the Dean, who may transmit the case to the Student Affairs Committee for consideration. The Committee shall recommend to the Dean the appropriate disciplinary action to be taken. The student subject to disciplinary action may appeal to the Committee. The penalty for misconduct shall be a Dean's Warning and may also include suspension or expulsion from the Faculty. The disciplinary action to be taken in each of these violations is described below. The full account of every disciplinary action shall be entered in the file of the student concerned.

6.7.2 Cheating

Cases related to cheating shall be reported to the Dean by the proctor of the exam, who may transmit the case to the Student Affairs Committee for consideration. The Committee shall recommend to the Dean the appropriate disciplinary action to be taken. The student subject to disciplinary action may appeal to the committee.

Cheating in Assignments

Cheating in Assignments stands for misrepresentation of student's own work. The instructor concerned shall handle such cases. The penalty for such cases shall be a Dean's Warning and a grade of zero on the assignment.

Violations of Examinations' Regulations

In all cases of violation, the student shall receive a grade of zero on the exam, a Dean's Warning, and be suspended from the Faculty for up to one academic year. In case of repetition of such acts, the student shall be expelled from the Faculty.

Plagiarism

Plagiarism is the act of appropriating material from sources other than the student's own. Plagiarism in papers, reports or homework will therefore be penalized as for violations of examinations' regulations.

Falsification of Documents

For any willful and clear act of falsification of any document requested or issued by the Faculty, the student shall be suspended from the Faculty for a specified period, or expelled from the Faculty. For any willful and clear act of falsification of any document submitted for admission to the Faculty, the applicant shall be barred from admission to the Faculty at any future date or may be permitted to reapply after a specified period. In such cases the Admissions Committee shall decide upon the penalty.

Impersonation

A student of the Faculty found to have impersonated others in faculty or university examinations, or to have been admitted to the Faculty as a result of impersonation, shall be expelled from the Faculty. An applicant to the Faculty found to have impersonated others, or to have been impersonated by others, in faculty or university examinations shall be barred from admission to the Faculty at any future date.

6.7.3 Dean's Warnings

A student who receives a Dean's Warning shall not be placed on the Dean's Honor List. A student who accumulates three Dean's Warnings shall be expelled from the Faculty. Dean's Warnings appear on the academic transcript of the student. The student may petition the Dean to have the Dean's Warning removed from the transcript after not being subject to any other disciplinary action for at least three regular terms following the term during which the first Dean's Warning was received.

7. Awards

7.1 Dean's Award for Creative Achievement

The Dean's Award for Creative Achievement has been initiated in the Faculty of Engineering and Architecture in December 1991. The objective of this award is to recognize and reward creativity among students of the faculty in their approach to academic work.

7.1.1 Nature of Award

The award consists of a certificate in testimony of creative achievement as well as inscription of the recipient's name on a special board placed in the Dean's reception room or in another appropriate future location. A student who receives the award three times will be presented with a \$500 prize.

7.1.2 Number of Awards

One award may be presented yearly, depending on eligibility, to a student in each of the following programs: Architecture, Graphic Design, Civil Engineering, Computer and Communications Engineering, Electrical Engineering, and Mechanical Engineering.

7.1.3 Eligibility

Undergraduate students from all classes in the Faculty of Engineering and Architecture who have demonstrated creativity in their approach to academic work as applied to projects, problem solving, laboratory, shop work, etc. are eligible without restriction. If the work in question is a group activity, the award may be made to each member of the group.

7.1.4 Procedure for Nomination and Selection

Faculty members shall submit to the Chairperson of the department concerned, at the end of the spring semester, the names of candidates for the award with justification and supporting material. Selection of the candidate for each program shall be made by the respective department and communicated to the Dean for voting by the faculty at the end of the academic year.

7.2 Distinguished Graduate Award

7.2.1 Description

The Distinguished Graduate Award will be given to the graduating senior student who demonstrates high academic achievement, outstanding character, and contribution to the department. One Award may be presented yearly, depending on eligibility, to a student in the Civil Engineering program. The Award will consist of an engraved plaque and a certificate signed by the Chairperson of the department and the Dean of the Faculty.

7.2.2 Nomination

The candidate should be nominated by at least three faculty members. The nomination should come in the form of a brief that addresses academic performance, character and contribution to the department.

7.2.3 Academic Performance

The candidate for the award should have been placed on the Dean's Honor List for Terms VII-XI and should have been nominated for graduation with distinction or high distinction.

7.2.4 Character

The nomination brief for the student should include a section addressing the student's character and should include examples that demonstrate it. Emphasis should be given to evidence of exemplary, ethical and responsible conduct inside and outside the classroom setting.

7.2.5 Contribution to the Department

The nomination brief should address and evaluate the contributions that the student made to the learning environment in the classes and to the department as a whole. This section should include supporting examples.

7.2.6 Voting

The successful candidate for the award should acquire the vote of at least two thirds of the voting faculty members of the department

7.3 Penrose Award

In 1955 Mrs. Stephen Penrose initiated the Penrose Award in honor of her late husband, President Penrose. The award is given annually to one graduating student from the Faculty.

7.3.1 Basis for Award

This award is made on the basis of the best combination of scholarship, character, leadership, and contribution to the university as a whole.

7.3.2 Nature of the Award

The award consists of engraving the recipient's name on a plaque that is kept on display in Jafet Library.

7.3.3 Nomination and Selection Procedures

Each member of the faculty is entitled to nominate one student. The nominee for the Penrose Award must have attained a cumulative average of not less than 75 based on terms VI, VII, VIII, and X for Engineering students, and have not repeated any of the above-mentioned terms. Upon receiving the nominations made by the individual faculty members, the Students Affairs Committee will study and appraise each nominee, and will then prepare a selected list of three names for presentation to the faculty for final voting and selection. The name of the nominee who obtains a simple majority of the votes will be transmitted to the Board of Academic Deans for final approval.

7.4 Other Awards

Other awards for best projects, papers, or posters may be presented during special academic events such as the Civil Engineering Contests and FEA Student Conferences.

The Abdel-Hadi Debs Endowment Academic Excellence Award is granted to one graduating student at FEA (graduate or undergraduate) for high research and academic scholar achievements.

Academic achievement is also rewarded through the Dean's Honor List (sec. 5.4) and graduation with distinction or high distinction (sec. 5.5).

8. Activities

Civil Engineering students are provided with opportunities for professional as well as social development during their pursuit of higher education. These include student employment, design competitions, student conferences, seminars and movies, field trips, participation in activities of local chapters, class gatherings, and galas. Students are strongly encouraged to take part in these departmental activities, as well as participate in other Faculty and University activities.

8.1 Student Employment

Student employment provides support to the laboratories operations and departmental activities. Student assignments include regular supervised lab testing, and special tasks assigned by the department. Students can also work on research projects which are funded by faculty. Interested students should inquire with the CEE Department, Lab manager, or faculty concerned for employment opportunities.

8.2 FEA Student Conference

A yearly Student Conference is organized by FEA, where students can exhibit their projects and present technical papers, which are published in a conference proceeding. Many awards are given during the conference for best paper and presentation.

8.3 Field Trips

A number of field trips are typically held by the department every year. Destinations include construction and rehabilitation sites, dams and hydraulic structures, treatment plants, sites of specific geotechnical and environmental interest as well as renowned design offices. Recent trips included the downtown Beirut reconstruction, environmental rehabilitation of dump site sites, marine works, Sofar-Mdeirij Bridge during construction, Saida Municipal Stadium site, Metropolitan City Center, Qaraoun-Litani Dam and Abd el-Al Hydroelectric Power Station, Dbaye water treatment plant, BCL Ready/Mix plant, Four-Seasons Hotel under construction, Rafic Hariri Beirut international airport, and to the Container Terminal at the Port of Beirut. Visits to major design offices in Beirut were also conducted. Recent office visits included Dar Al-Handasah (Shair & Partners) and Khatib & Alami – CEC.

8.4 Seminars and Movies

The CEE Department routinely holds several seminars per semester to expose students to professional issues and major plans, projects, and tools of interest to Civil Engineering. Speakers at these seminars include professional engineers, public figures, and researchers. Educational movies are also regularly shown and are open to all engineering students.

8.5 Civil Engineering Gala

The Civil Gala is a yearly tradition that celebrates the graduation of the yearly crop of civil engineers in a nice atmosphere of joyful memories and cheerful wishes. The Gala is attended by all CEE family, consisting from students from all years, faculty, and staff, and by FEA officials and guests.

8.6 Civil Engineering Society (CES)

The Civil Engineering Society (CES) is an active organization in the CEE Department promoting students' activities and sponsoring academic, professional, and social events. The society's aim is also to foster interaction between the various CE classes and provide student-to-student mentorship in matters related to academic programming and advising. The CES is governed by an elected cabinet consisting of 8 members (2 representatives from each of the 4 undergraduate years). A full-time faculty member serves as advisor to the Society. Recent activities of the CES included Christmas dinner, Spring Start Dinner, sponsoring seminars, organizing field trips, and summer camps. The CES also organized training workshops for CE students on AutoCAD, ROBOT, as well as Primavera. All students are strongly encouraged to join and be active participants in the society. Announcements for elections, recruitment, and events are publicly made.

9. Career Opportunities and Graduate Studies

9.1 Career Opportunities

In the Middle East, demand for civil engineers has been consistently high during the last three decades; this has been particularly the case in the Gulf region where engineers have been involved primarily in large public and private development projects. The emerging reconstruction activity in Lebanon and the Gulf offers ever increasing and expanding opportunities for civil engineers.

The past few years have been particularly exciting times for the Civil Engineering profession. Graduating civil engineers are benefiting from very stimulating work experiences in the region, many of which are related to mega projects in the building and infrastructure sectors; this has resulted in a booming job market and in highly competitive salaries for civil engineers.

The civil engineering graduate will generally work either in the private sector, or in government agencies. The fields open to the engineer are consulting, contracting, or management. Being interrelated, it is not unusual that these fields are combined during the performance of a project. The civil engineer can work as an employee, partner, or owner in consulting design offices (local or regional) in the departments of structures, transportation and planning, geotechnical engineering, environmental engineering, water resources, and computer software, and in contracting firms and construction management consultant offices.

The lines between what a civil engineer can or cannot do are becoming more blurred as more and more technology permeates the field itself and requires the Civil Engineers to be well versed and trained in all aspects of technology and at all levels. In addition, the Civil Engineering education provides a wide and diversified base of knowledge that qualifies graduating civil engineers to specialize in a variety of non-engineering fields such as Business Administration, Management, and Economics.

9.2 FEA Career Center

The FEA Career Center offers extensive employment services to employers, students and alumni. The objective of the center is to link the FEA current students and alumni with employers, and to help employers with their potential hiring process by providing opportunities for networking and employment. It is a support Center. The career services available for current students, alumni and employers include professional assistance, job opportunities and placement, recruiting and more. The FEA Career Center also provides advice and services to assist students in securing summer internship training.

9.3 Graduate Studies at AUB

The Department of Civil & Environmental Engineering offers a graduate program leading to the degree of Master of Engineering (ME): major, Civil Engineering (CE). The program prepares students through teaching and research for in-depth knowledge in the following fields of civil engineering: structures, transportation, and geotechnical engineering. The department also offers a graduate program leading to the degree of Master of Engineering: major, Environmental and Water Resources Engineering (EWRE) and another graduate program leading to the Master of Science (MS) degree: major, Environmental Technology Program (ETP) – Environmental Sciences Inter-faculty Program.

The CEE Department started offering in the fall of 2007 a PhD/doctoral program with majors in Civil Engineering (CE) and in Environmental and Water Resources Engineering (EWRE).

The various programs provide graduates with the necessary tools for professional practice and the pursuit of higher education. Admitted students may qualify to Graduate or Research Assistantship that cover tuition expenses or stipend.

Students may opt to pursue their graduate studies at AUB in other departments or programs, which relate to or complement their undergraduate studies, such as Engineering Management, Business, Urban Planning, etc; some programs may have special requirements or prerequisites that should be met before formal admission. For more details on the graduate programs, application procedures, and deadlines, refer to the AUB catalogue.

9.4 Graduate Studies Abroad

Students who plan to pursue their graduate studies abroad need to be aware of the requirements of the universities selected. While these may vary between institutions, common requirements include an application form, a statement of purpose, a transcript of records, TOEFL, Graduate Record Examination (GRE), and three letters of recommendations. Students should be aware of the deadlines set by universities, as some may be as early as December of the year preceding desired admission. Deadline for students applying for financial aid or assistance may also be set earlier. Students should therefore start the application process as early as possible. Most universities provide online access to information and application forms through their websites.

Appendix A: Historical Background

American University of Beirut

The American University of Beirut (AUB) is a private, non-sectarian institution of higher learning, founded in 1866, that functions under a charter from the State of New York. A private and autonomous Board of Trustees administrates the university. The mission of AUB is to enhance education, primarily the education of the peoples of the Middle East, to serve society through its educational functions, and to participate in the advancement of knowledge. AUB bases its educational perspective and methods and its academic organization on the American model of higher education. The university emphasizes scholarship that enables students to think for themselves, stresses academic excellence, and promotes high principles of character. It aims to produce men and women who are not only technically competent in their professional fields but also life-long learners who have breadth of vision, a sense of civic and moral responsibility, and devotion to the fundamental values of human life. The university believes in and encourages freedom of thought and expression. It expects, however, that this freedom will be enjoyed in a spirit of integrity and with a full sense of responsibility.

Faculty of Engineering and Architecture

As early as 1913, the University recognized the need for engineering education and training in the Arab East, and courses in this field were offered in the School of Arts and Sciences. By 1944, sufficient additional courses had been added to permit the granting of the degree of Bachelor of Science in Civil Engineering. The last class in this program graduated in June 1954. In 1951, a separate School of Engineering was established and curricula were initiated in Civil Engineering, Mechanical Engineering, Electrical Engineering and Architectural Engineering. In 1963, a program leading to the degree of Bachelor of Architecture was introduced, replacing the Bachelor of Architectural Engineering program, the last class of which graduated in June 1966. In that year, the School was renamed the Faculty of Engineering and Architecture. Since then, curricula have been under constant review, with changes introduced as necessary to keep pace with modern technology, to conform to sound developments in engineering and architecture education and to meet the evolving needs of the region. In 1986, a new undergraduate major in computer and communications engineering was added within the Department of Electrical and Computer Engineering. In 1992, a new major in graphic design was added within the Department of Architecture and Design.

The Faculty of Engineering and Architecture (FEA) is a leading professional school in the Middle East. Its mission is to offer American-style educational programs of the highest standard, to promote research and scholarly and creative activities by its faculty and students, and to provide services to the community at large, with special consideration to the needs and circumstances of Lebanon and the region. The FEA prepares its students, in a challenging and intellectually stimulating environment that

undergoes continuous improvement, for life-long learning, innovation, and leadership in their chosen careers and empowers them for a richer personal and professional life.

The Faculty of Engineering and Architecture (FEA) will enhance its status as a world-class professional school that attracts eminently qualified faculty of international caliber and outstanding students from the region. The FEA will contribute to the development of Lebanon and the region by providing education of the highest quality, promoting basic and applied research of international standing by its faculty and students, and rendering educational and professional services.

Bechtel - Engineering Building

The Bechtel Engineering building was completed in 1952 and dedicated in April 1955 in the presence of the President of the Lebanese Republic. It houses academic offices, classrooms, laboratories, and drafting rooms of the School of Engineering. The building was donated by Mr. Stephen D. Bechtel and associates of the Bechtel Corporation of San Francisco. Mr. Stephen Bechtel himself was one of the main donors as well as a strong supporter of the school. A number of engineering laboratory units are situated around the Bechtel building.

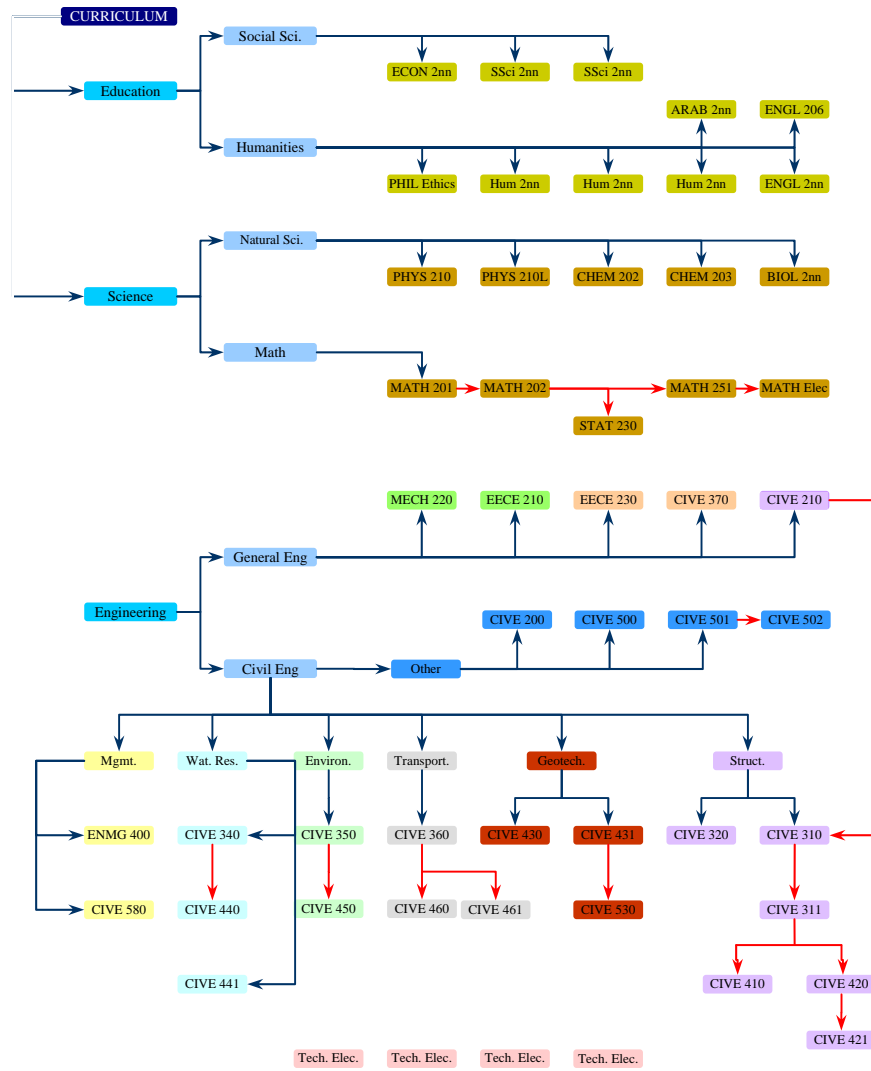


Figure B-1. Flowchart of the CE curriculum. Red arrows identify the pre-requisite courses and the required order of sequence courses.

Appendix C: Undergraduate Course Descriptions

- CIVE 200 Introduction to Civil Engineering** 2 cr.
An introductory course to the world of civil engineering including significant developments in the field, both current and future. The course gives an overview of civil engineering as a profession covering aspects of concept, design, and execution through: seminars, case studies, field trips, laboratory experimentation, and hands-on group project. Annually.
- CIVE 210 Statics** 3 cr.
A course outlining vector mechanics of forces and moments; free-body diagrams; equilibrium of particles and rigid bodies in two and three dimensions; plane and space trusses; frames and machines; axial, shear, and moment diagrams of beams and simple frames; friction; center of gravity and centroid; area moment of inertia; computer applications. Pre- or co-requisite: MATH 201. Every regular term.
- CIVE 310 Mechanics of Materials** 3 cr.
A course on stresses, strains, and stress-strain relationship; tension and compression; torsion of circular bars; bending and shear stresses in beams; combined stresses; stress transformation and Mohr's circle. Prerequisite: CIVE 210. Annually.
- CIVE 311 Structures I** 3 cr.
An introductory course covering influence lines; deflection of beams and frames by double integration method, moment-area theorems, and conjugate beam; introduction to indeterminate structures; approximate analysis of building frames. Prerequisite: CIVE 310. Annually.
- CIVE 320 Construction Materials & Technologies** 2 cr.
A course that covers the composition and properties of engineering construction materials through hands-on laboratory experiments. The course introduces students to developments in construction equipment and technologies and includes field demonstrations. Annually.
- CIVE 340 Fluid Mechanics and Laboratory** 3 cr.
A course that deals with fluid properties, fluid static, continuity equation, Bernoulli's equation, energy principle, momentum principle, laboratory experiments. Annually.
- CIVE 350 Environmental Engineering** 3 cr.
A course that introduces the fundamentals of environmental engineering. A screening course of major topics in environmental engineering including water and wastewater, environmental hydrology, environmental hydraulics and pneumatics, air, solid waste, noise, environmental modeling, and hazardous waste. Annually.
- CIVE 351 Environmental Microbiology** 3 cr.
A course that introduces the basic principles of environmental microbiology and discusses example applications from the natural and engineered worlds. The main goals of this course are to present an overview of important microorganisms involved in environmental systems, their ecology, their interactions with various pollutants, and their beneficial or harmful effects on humans. Prerequisites: CHEM 202 (or equivalent), MATH 201 (or equivalent). Annually.
- CIVE 360 Surveying** 2 cr.
A course on the theory of measurements and errors; linear measurements; surveying instruments; leveling; angles, bearings, and azimuths; stadia measurements; traversing-field aspects; traverse computations and adjustment; topographic surveying; triangulation. Annually.
- CIVE 370 Introduction to Information Technology** 3 cr.
An introductory course on computer hardware. This course covers Internet technology, database systems, and the use of software tools and their integration in projects to create, manage, and exchange information with reference to civil and environmental engineering applications. Annually.
- CIVE 410 Structures II** 3 cr.
A course on the stability and determinacy of structures; energy theorems and applications to trusses, beams, and frames; solution of statically indeterminate structures by flexibility (force) and stiffness methods;

Appendix C: Undergraduate Course Descriptions

introduction to the direct stiffness method; influence lines for indeterminate structures. Prerequisite: CIVE 311. Annually.

CIVE 420 Concrete I 3 cr.
A course that covers the mechanical properties of concrete materials; ultimate strength theory of flexure and shear; flexural and shear design of beams; service load behavior; bond properties of reinforcing bars; design of solid and ribbed one-way slabs. Prerequisite: CIVE 311. Annually.

CIVE 421 Concrete II 3 cr.
A course that builds upon Concrete I and covers continuous beams; short columns, slender columns, and biaxially bent columns; wall footings, concentrically and eccentrically loaded single column footings, and combined footings; staircases; bearing walls; cantilever retaining walls; two-way slabs. Prerequisite: CIVE 420. Annually.

CIVE 430 Engineering Geology 3 cr.
A course that discusses the composition and properties of rocks; geologic processes; geologic hazards; geologic structures and engineering consequences; terrain analysis and geologic mapping; interpretation and use of geologic maps; application of geology to engineering practice. Annually.

CIVE 431 Soil Mechanics and Laboratory 3 cr.
A course on soil classification and index properties; soil structure and moisture; compaction; seepage; effective stress concept; compressibility and consolidation; stress and settlement analysis; shear strength. Laboratory tests are conducted to familiarize students with soil characterization and the engineering behavior of soils. Prerequisite CIVE 310. Annually.

CIVE 440 Hydraulics and Laboratory 3 cr.
Flow in conduits, flow in open channels, flow measurements, and laboratory experiments. Prerequisite: CIVE 340. Annually.

CIVE 441 Engineering Hydrology 3 cr.
A course outlining hydrologic principles, rainfall-runoff analysis, flood routing, frequency analysis, and ground water hydrology. Annually.

CIVE 450 Water and Wastewater Treatment and Laboratory 3 cr.
A course that examines the quality and treatment methods of water and wastewater; testing for physical, chemical, and biological parameters. Prerequisite: CIVE 350. Annually.

CIVE 460 Highway Engineering 3 cr.
A course that examines road vehicle performance; principles of geometric design and highways; horizontal and vertical alignment; earthwork; intersections and interchanges; parking facilities; basic traffic models; queuing theory and traffic analysis; travel demand forecasting. Prerequisite: CIVE 360. Annually.

CIVE 461 Transportation Engineering and Laboratory 3 cr.
A course that introduces the field of transportation engineering through a presentation of the basics of traffic engineering, traffic flow theory, and pavement design. The laboratory component consists of carefully structured experiments that reinforce students' understanding of the academic concepts and principles. Annually.

CIVE 530 Foundation Engineering 3 cr.
A course that covers site investigations; evaluation of data from field and laboratory tests; estimation of stresses in soil masses; applications of principles of soil mechanics to determination of bearing capacity and settlement of spread footings, mats, single piles, and pile groups. Prerequisite: CIVE 431. Annually.

CIVE 580 Construction Management 3 cr.
A course on organizing for construction projects; pre-construction activities; bidding and contracts; fundamentals of construction planning, monitoring, and control; application of construction control tools: CPM, materials management, operations analysis, and quality control. Annually.

CIVE 581 Specifications and Cost Estimation 3 cr.
A course on the structure of construction documents and their interrelationships, bidding requirements; general and particular contract conditions; administrative and procedural requirements for construction; technical specifications; construction cost estimations process; unit rates determination. Annually.

Special Courses

CIVE 500 Approved Experience 0 cr.

CIVE 501 Final Year Project I 1 cr.
A chosen design topic and preparation of a detailed execution program for CIVE 502, through comprehensive research with the guidance and approval of the faculty. Annually.

CIVE 502 Final Year Project II 3 cr.
A supervised project in groups of normally three students aimed at providing practical design experience in a civil and environmental engineering application. Prerequisite: CIVE 501. Annually.

CIVE 503 Special Topics in Civil and Environmental Engineering 3 cr.

Appendix D: Graduate Course Descriptions

The 600 level courses are normally open to undergraduate students as 4th year technical electives. The 700 level courses may be open to undergraduates in exceptional cases, if approved by the department.

Structural Sequence

- CIVE 610 Advanced Structural Analysis** 3 cr.
A course that offers a review of matrix algebra; basic principles of structural analysis: stiffness, flexibility, and energy methods; direct stiffness method for plane and space trusses and frames; linear and nonlinear problems; special problems; computer programming. Prerequisite: CIVE 410.
- CIVE 620 Concrete Technology** 3 cr.
A course that examines portland cements; aggregates; fly ash and silica fume; admixtures for concrete; proportioning normal concrete mixtures; pumping concrete; consolidating, finishing, and curing concrete; durability; testing hardened concrete; high-strength concrete; light and heavy weight concretes; hot and cold weather concreting. Prerequisite: advanced standing level.
- CIVE 621 Special Topics in Concrete** 3 cr.
A course that reviews reinforced concrete design; wind load on structures; seismic design of structures; design of shear walls; brackets, corbels, and deep girders; torsion in concrete members; circular, rectangular, and elevated water tanks; spherical, conoidal, and ellipsoidal domes. Prerequisite: CIVE 421.
- CIVE 622 Prestressed Concrete** 3 cr.
A course on materials characteristics; prestress losses; working strength design procedures; composite construction; ultimate flexural strength and behavior; shear design; continuous prestressed concrete members. Prerequisite: CIVE 421.
- CIVE 623 Bridges** 3 cr.
A course that discusses types of bridges; influence lines; loads and their distribution on bridges; serviceability of bridges; methods of design of bridge deck, superstructure, and substructure. Prerequisites: CIVE 410 and CIVE 421.
- CIVE 624 Steel Design** 3 cr.
A course that examines loads on structures; philosophies of design: LRFD versus ASD; behavior, analysis, and design (according to AISC) of tension members, bolted connections, welded connections, compression members, and beams. Prerequisite: CIVE 410.
- CIVE 625 Strength. & Rehabilitation of Concrete Structural Systems** 3 cr.
A course on assessment of structural deficiency using analytical and field test methods; strengthening materials; strengthening of structural members in flexure, shear, and axial load; upgrading of gravity load-designed members for earthquake load resistance. Prerequisite: advanced standing level.
- CIVE 626 Earthquake Engineering** 3 cr.
A course that examines the nature of earthquake ground motion; seismic hazard evaluation in engineering practice; response analysis of structures and effect of soil conditions on structural response and behavior under earthquake ground motion; design of structures under earthquake loading. Prerequisite: advanced standing level.
- CIVE 632 Reliability Based Design of Civil Systems** 3 cr.
A course that covers applications of reliability theory with regards to assessing the safety and reliability of civil systems in the presence of uncertainty; decision making and risk analysis; definition of the probability of failure; modeling uncertainty in resistance and load; limit states and limit state functions; approximate and exact methods for assessing reliability; load and resistance factor design (LRFD) in structural and geotechnical engineering; basics of design code calibration; reliability assessments of existing structures,

updating reliability with load tests. Prerequisite: advanced standing level.

CIVE 710 The Finite Element Method 3 cr.
A course on matrix algebra; energy theorems; analysis of discrete member systems; interpolation functions; numerical integration; plane stress and plane strain problems; axisymmetric problems; problems in three dimensions; plate bending. Prerequisite: CIVE 610.

CIVE 711 Advanced Mechanics of Solids 3 cr.
A course that covers theories of stress and strain; stress-strain relations, generalized Hook's law; modes of failure, failure criteria; energy principles and applications; torsion; beams on elastic foundations; introduction to the theory of plates; thin-wall and thick-wall cylinder. Prerequisite: CIVE 310.

CIVE 712 Structural Dynamics 3 cr.
A course on analysis of vibration of single degree, multi degree, and infinite degree of freedom systems; free and forced vibration response; analysis of dynamic response by approximate methods; introduction to earthquake engineering. Prerequisite: advanced standing level.

CIVE 720 Behavior of Reinforced Concrete Members 3 cr.
A course on building codes; limit state design; mechanical characteristics of concrete and steel reinforcement; creep and shrinkage; flexure: moment-curvature and force-deformation relationships; columns: axial force-moment-curvature relationships; shear: mechanisms of shear resistance, and truss analogy; bond and anchorage of reinforcement. Prerequisite: CIVE 421.

CIVE 722 Advanced Steel Design 3 cr.
A course investigating stability, column strength, beam-columns, composite steel-concrete construction, plate buckling, plate girders, torsion, and combined torsion and bending. Prerequisite: CIVE 624.

Geotechnical Sequence

CIVE 630 Applied Foundation Engineering 3 cr.
A course on braced excavations, retaining structures, deep foundations, slope stability, and computer applications. Prerequisite: CIVE 530.

CIVE 631 Environmental Geotechnics 3 cr.
A course on geotechnical practice in environmental protection and restoration; methods of soil and site characterization for siting of waste repositories and site restoration; influence of physical and chemical processes in soils on the evaluation of contaminant distribution; design of waste containment systems including landfills, slurry walls, and soil stabilization; the applicability and use of geosynthetics; technologies for site restoration and cleanup. Prerequisite: CIVE 431.

CIVE 633 Soil Behavior 3 cr.
A course on soil mineralogy, soil formation, and composition; influence of geological factors on properties; colloidal phenomena in soils; soil structure; analysis of conduction phenomena (hydraulic, diffusive, thermal, and electrical); compressibility, strength, and deformation properties. Prerequisite: CIVE 431.

CIVE 634 Soil and Site Improvement 3 cr.
A course that covers compaction, admixture stabilization, foundation soil treatment, reinforced soil and composite materials, and material sites reclamation. Prerequisite: advanced standing level.

CIVE 731 Earth Dams 3 cr.
A course that examines hydraulic dams, rolled earth dams, homogenous dams, thin core dams, filters, causes of dam failures, seepage control, and seismic stability of dams. Prerequisite: advanced standing level.

CIVE 732 Geotechnical Earthquake Engineering 3 cr.
A course on causative mechanisms of earthquake, earthquake magnitudes, ground motion; influence of soil conditions on site response; seismic site response analysis; evaluation and modeling of dynamic soil properties; analysis of seismic soil-structure interaction; evaluation and mitigation of soil liquefaction and its consequences; seismic code provisions and practice; seismic earth pressures, seismic slope stability and

deformation analysis, seismic safety of dams and embankments, seismic performance of pile foundations, and additional current topics. Prerequisite: CIVE 431.

Transportation Sequence

- CIVE 660 Pavement Design** 3 cr.
A course examining highway and airport pavement design; flexible and rigid pavement types and wheel loads; stresses in flexible and rigid pavements; pavement behavior under moving loads; soil stabilization. Prerequisite: CIVE 461.
- CIVE 661 Urban Transportation Planning I** 3 cr.
An introductory course on methods and models used in transportation planning with emphasis on the urban context. Prerequisite: CIVE 461.
- CIVE 662 Traffic Engineering** 3 cr.
A course outlining traffic engineering studies; traffic control of signalized and unsignalized intersections; signal control hardware and maintenance; arterial performance and operations; network optimization. Prerequisite: CIVE 461.
- CIVE 663 Transportation Systems Analysis** 3 cr.
A course on transportation and traffic problems in modern society. Among the topics covered are travel forecasting problems and methods; theoretical techniques for traffic flow description and management; highway, railway, and runway capacity and performance characteristics; economic considerations; cost functions. Prerequisite: advanced standing level.
- CIVE 664 Design and Management of Transport Operations** 3 cr.
A course that covers the application of quantitative techniques from operations research and probabilistic analysis to transportation problems. Applications covered include: pickup and delivery systems, emergency urban services, facility location, and network problems. Prerequisite: ASST 310 or equivalent.
- CIVE 665 Transportation Economics** 3 cr.
A course that investigates the application of economic principles to the evaluation of projects and policies in the transport sector such as transport project benefits, costs, and financing, and pricing in the transport sector. Prerequisite: advanced standing level.
- CIVE 666 Transport Operations** 3 cr.
A course that introduces probabilistic and optimization methods for designing efficient operations in freight carrier, airline, transit, and traffic modes. Topics include crew and vehicle scheduling in freight, airline, and transit modes; vehicle routing problems in carrier systems; runway and air traffic operations; operations control in transit services; and fundamental relations and models of traffic flow. Prerequisite: CIVE 461.
- CIVE 760 Public Transportation** 3 cr.
A course on public transportation modes and services; single route, network, and strategic planning; tasks involved in system operations; management of public transportation; privatization issues. Pre- or co-requisite: CIVE 661.
- CIVE 761 Urban Transportation Planning II** 3 cr.
A course examining advanced topics in urban transportation planning; transportation systems management techniques; travel demand analysis; discrete choice modeling of travel demand. Prerequisite: CIVE 661.
- CIVE 762 Traffic Flow Theory** 3 cr.
A course on characteristics of traffic flow, density, and speed; models describing traffic flows; hydrodynamic analogue; computer simulation models. Prerequisite: CIVE 461 or equivalent.

Water Resources Sequence

- CIVE 640 Hydraulic Structures** 3 cr.
A course that covers closed conduit flow, water distribution systems, transient analysis, open channel flow, flood control, culvert hydraulics, design of various hydraulic structures. Prerequisite: CIVE 440.

- CIVE 641 Surface Water Hydrology** 3 cr.
A course on design storm, rainfall-runoff modeling, overland flow, flood routing, reservoir routing, simulation models, hydrologic design, urban hydrology, and stochastic hydrology. Prerequisite: CIVE 441 or equivalent.
- CIVE 642 Groundwater Hydrology** 3 cr.
A course that deals with properties of groundwater, groundwater movement, general flow equations, steady-state well hydraulics, seepage forces, unsteady well hydraulics, infiltration, and groundwater modeling. Prerequisite: CIVE 441.
- CIVE 643 Hydraulics of Open Channels** 3 cr.
A course that examines gradually varied flow theory and analysis, spatially varied flow, and numerical modeling of unsteady flow in open-channels. Prerequisite: CIVE 440.
- CIVE 644 Coastal Engineering** 3 cr.
A course on small-amplitude wave theory, finite-amplitude wave theory, conoidal waves, solitary wave theory, wave refraction, diffraction, and reflection, wave forces, and design of maritime structures (e.g., breakwaters). Prerequisite: CIVE 440.
- CIVE 645 Transport Phenomena in Surface and Subsurface Waters** 3 cr.
A course on advection, diffusion, and dispersion of pollutants; transport in rivers and estuaries; transport in groundwater; numerical modeling; design of wastewater discharge system. Prerequisite: advanced standing level.
- CIVE 646 Water Resources Systems: Planning and Management** 3 cr.
A course that introduces the main concepts and principles of water resources planning and management; logical steps in engineering planning and decision making; water resources systems analysis, modeling, simulation, and optimization; economic and financial analysis; flood protection and reservoir operation; and water resources management case studies. Prerequisite: advanced standing level.
- CIVE 647 GIS for Water Resources and Environmental Engineering** 3 cr.
A course that introduces the concepts and principles of Geographic Information Systems (GIS) from the perspective of water resources and environmental engineering. It provides coverage of state-of-the-art GIS methods and tools, specifically targeting water resources and environmental applications including: spatial and terrain analysis, geostatistical analysis, watershed delineation and identification of river networks, representation of groundwater and aquifer systems, time series analysis, and development of GIS integrated water and environmental models. Prerequisite: advanced standing level.

Environmental Sequence

- CIVE 650 Methods of Environmental Sampling and Analysis** 3 cr.
A course on sampling techniques and instrumental methods in environmental sciences; determination of pollutants in water, air, and soil; analytical techniques; adaptation of procedures to specific matrices; case studies. Prerequisite: advanced standing level.
- CIVE 651 Environmental Chemistry and Microbiology** 3 cr.
A course that deals with organic, inorganic, and physical chemistry; chemical equilibrium; reaction kinetics; acidity, alkalinity; composition, morphology, and classification of microorganisms; energy, metabolism, and synthesis; growth, decay, and kinetics; biological water quality indicators. Prerequisite: CHEM 202, BIOL 210, or equivalent.
- CIVE 652 Environmental Management and Decision Making** 3 cr.
A course that deals with mathematical programming techniques, multiobjective optimization, and the generation of alternatives, as these are used in environmental systems analysis and management; as well as introducing how considerations such as economics, uncertainty, equity, and other sociopolitical parameters may influence environmental management and decision-making. Prerequisite: advanced standing level.

- CIVE 653 Water and Sewage Works Design** 3 cr.
A course that examines the design of water and wastewater schemes, including design reports and a literature search on the development of conventional treatment processes. Prerequisites: CIVE 350 and CIVE 450.
- CIVE 654 Solid Waste Management I** 3 cr.
A course on nature and effects of solid wastes including hazardous wastes; engineering management principles, practices, and techniques for management of solid wastes administration; solid waste generation, storage, collection and transport, processing, resource recovery, and disposal; trip to a local facility. Prerequisite: advanced standing level.
- CIVE 655 Solid Waste Management II** 3 cr.
A course on the design of solid waste disposal schemes, including design reports and a literature search on the development of conventional treatment and disposal processes. Prerequisite: CIVE 654 or consent of instructor.
- CIVE 656 Air Pollution and Control I** 3 cr.
An introductory course on air pollutants, sources, and effects; emissions estimates, regulations, and monitoring techniques; particulate matter characterization; meteorology and atmospheric dispersion; air pollution control processes. Prerequisite: CHEM 202 or equivalent.
- CIVE 657 Air Pollution and Control II** 3 cr.
A course that examines process analysis, operational limitations, cost and performance, and evaluation of control process and equipment; case studies, field visits, and inspection of industrial installations. Prerequisite: CIVE 656 or consent of instructor.
- CIVE 658 Industrial/Hazardous Waste Management** 3 cr.
A course that deals with sources, quantity, and quality of industrial wastes; basic industrial waste treatment processes; major industries, types of wastes, and existing treatment practices; disposal and fate of industrial wastes. Prerequisites: CIVE 450 and CIVE 651, or consent of instructor.
- CIVE 659 Environmental Impact Assessment** 3 cr.
A course that outlines theories and procedures of assessing environmental impact; analysis of the impact of development on various measures of environmental quality; benefit-cost considerations in environmental impact assessment. Prerequisites: CIVE 450, CIVE 654, and CIVE 656; or consent of instructor.
- CIVE 750 Wastewater Reclamation and Reuse** 3 cr.
A course examining environmental issues in water reuse, risk assessment, water reclamation technologies, storage of reclaimed water, usage of reclaimed water, planning of wastewater reclamation and reuse. Prerequisites: CIVE 651 and CIVE 450, or CIVE 652.
- CIVE 751 Air Pollution Modeling** 3 cr.
A course that deals with mathematical models, air pollution meteorology, plume rise, dispersion and atmospheric chemistry, meteorological models, as well as Gaussian, statistical, and other special application models. Prerequisite: CIVE 656 or consent of instructor.
- CIVE 752 Environmental Case Studies and Conflict Resolution** 3 cr.
A course on case studies in environmental management: pesticide application, air pollution, solid waste landfilling, wastewater treatment facilities, oil exploration, ocean dumping, deep well injection, reservoirs, and water resources. Prerequisites: CIVE 450, CIVE 654, and CIVE 656; or consent of instructor.
- CIVE 753 Processes in Water and Wastewater Treatment** 3 cr.
A course on sedimentation, filterability, permeability and fluidization, ion exchange, aeration, flotation, membrane filtration, aerobic digestion. Experimental applications of processes. Prerequisite: CIVE 450 or consent of instructor.

Common Courses

- CIVE 670 Computer Methods in Civil Engineering** 3 cr.
A course on the use of the computer for analysis, design, and decision making in civil engineering, including programming, numerical, and CAD methods and applications. Prerequisites: EECE 230 and CIVE 370.
- CIVE 671 Numerical Modeling** 3 cr.
A course that deals with ordinary differential equations: initial-, boundary-, and characteristic-value problems; partial differential equations: steady state, time dependent, and oscillatory problems; techniques: Runge-Kutta, shooting, iterative, finite difference, and finite element methods. Prerequisite: advanced standing level.
- CIVE 672 Introduction to Geographic Information Systems** 3 cr.
An introductory course on Geographic Information Systems (GIS) and their applications in the planning and engineering fields, alternatives in computer-based graphics, data concepts and tools, network data management and planning applications, and implementation issues. This course is considered to satisfy the departmental requirements in all engineering graduate programs.
- CIVE 796 Special Projects** 3 cr.
- CIVE 797 Seminar** 0 cr.
A seminar that consists of current research or applied projects presented by faculty members, students, or invited speakers.
- CIVE 798 Special Topics** 3 cr.
- CIVE 799 Thesis** 6 cr.

Appendix E: Humanities and Social Sciences Courses

Engineering students are allowed to select humanities and social sciences elective courses from the list shown in the first column of Table E-1 and Table E-2, subject to confirmation by the department offering the course. The second column lists a selection of humanities and social sciences courses. For a more complete listing, please consult the catalogue.

Table E-1. Select List of Humanities Courses

Department	Sample of Courses
American Studies	AMST 215 Introduction to American Studies
	AMST 220 Shock of Modernity in America
AMST 215	AMST 230 Cult. Geography of North America
AMST 220	AMST 275 Special Topics in American Humanities
AMST 230	AMST 276 Special Topics in American Humanities
AMST 275 – AMST 276	AMST 299 Tutor. in American Humanities
AMST 299	
Arabic	ARAB 231 Arabic Poetry: The Heroic Age
	ARAB 232 Arabic Poetry: The Age of Conquest
ARAB 229 – ARAB 241;	ARAB 234 Abbasid Poetry
ARAB 243 – ARAB 247;	ARAB 236 Qur'anic Studies
ARAB 249	ARAB 238 Modern Arabic Poetry
	ARAB 239 Modern Arabic Novel
	ARAB 240 Modern Arabic Drama
	ARAB 244 Muslim Schools of Theology
Archaeology	AROL 201 Archaeology in Lebanon
	AROL 211 Methodology
AROL 201 – AROL 231;	AROL 213 The Human Story I: The Old Stone Age
AROL 235 – AROL 236	AROL 214 The Human Story II: The New Stone Age
	AROL 225 The Roman and Byzantine Near East
	AROL 236 Special Topics in Archaeology
Architecture – Associated Studies	ARCH 020 Beirut Modern
	ARCH 022 Colonialism, Nationalism
	ARCH 024 Contemporary Art in Lebanon
ARCH 020 – ARCH 029	ARCH 121 History of Art and Architecture I
ARCH 121 – ARCH 122	ARCH 122 History of Art and Architecture II
ARCH 223 – ARCH 224	ARCH 325 Contemporary Architecture
ARCH 325	

Table E-1. Select List of Humanities Courses (continued)

Department	Sample of Courses
Civilization Sequence Program	CVSP 201 Ancient Near East and Classical Civilizations CVSP 202 Medieval, Islamic & Renaissance Civilizations CVSP 203 Enlightenment and Modernity CVSP 204 Contemporary Studies
Sequence I:*	CVSP 205 Ancient, Medieval and Renaissance Civilizations
CVSP 201, CVSP 202	CVSP 206 Modern and Contemporary Studies
CVSP 205, CVSP 207	CVSP 207 Ancient, Medieval and Renaissance Civilizations
Sequence II:*	CVSP 208 Modern and Contemporary Studies
CVSP 203, CVSP 204	CVSP 251 Civilization Through the Arts
CVSP 206, CVSP 208	
CVSP 201 – CVSP 208 CVSP 215 – CVSP 216 CVSP 230 CVSP 250 – CVSP 251	* Students are required to take a sequence I course before taking a sequence II course.
English	ENGL 210 Literature of the Middle Ages ENGL 212 The Age of Shakespeare ENGL 214 Victorian Literature
ENGL 210 – ENGL 215 ENGL 219 ENGL 221 – ENGL 226 ENGL 229 ENGL 236 ENGL 240 – ENGL 243	
Fine Arts and Art History	FAAH 218 Conceptual Studio I FAAH 221 Art History I: Ancient and Classical FAAH 222 Art History II: Medieval FAAH 227 (A,B,C): Special Topics in Art History/Middle Eastern and Islamic (or equivalent) FAAH 235 Theories of Modern Art
FAAH 218 – FAAH 219 FAAH 221 – FAAH 224 FAAH 225 (A,B,C) FAAH 226 (A,B,C) FAAH 227 (A,B,C) FAAH 228 (A,B,C) FAAH 229 (A,B,C) FAAH 235 FAAH 238	
FAAH/Music 240-241 FAAH/Music 245 FAAH/Music 247-248 FAAH/Music 260-261	FAAH/Music 240 Western Musical Traditions I FAAH/Music 245 Music Appreciation; Historical Survey FAAH/Music 247 Music Theory I FAAH/Music 261 An Introduction to the World of Opera
FAAH/Theater 265 FAAH/Theater 270	FAAH/Theater 265 Introduction to Theater FAAH/Theater 270 Theater History
Graphic Design	GRDS 325 History of Graphic Design

Table E-1. Select List of Humanities Courses (continued)

Department	Sample of Courses
History	HIST 202 Introduction to Modern History of the Arab East HIST 212 Islamic History: Origins and Empire, 600-750.
All 200 level courses are allowed, up to HIST 274	HIST 213 Islamic History: The Rise and Fall of the Abbasids HIST 216 History of the Fatimid Imamate, 909-1171 3.0 HIST 217 Military Society in the Middle East HIST 220 Local Histories HIST 225 Byzantine Empire and Civilization, 330-900 HIST 245 History of Lebanon, 634-1920
Philosophy	PHIL 201 Intro. to Philosophy PHIL 205 Biomedical Ethics
PHIL 201, PHIL 205 – PHIL 206 PHIL 209 – PHIL 210 PHIL 213 – PHIL 219 PHIL 221 – PHIL 224 PHIL 230 – PHIL 232 PHIL 249	PHIL 213 History of Ancient & Medieval Philosophy PHIL 214 History of Modern Philosophy PHIL 216 Political Philosophy
Sociology-Anthropology	SOAN 215 Anthropology of America SOAN 217 Anthropology of the Body
SOAN 215 SOAN 217 SOAN 225	SOAN 225 Gender and Culture

Table E-2. Select List of Social Sciences Courses

Department	Sample of Courses
Economics	ECON 211 Elementary Microeconomic Theory ECON 212 Elementary Macroeconomic Theory
All 200 level courses are allowed, except ECON 203, ECON 213	
Education	EDUC 211 The School and the Social Order EDUC 212 Educational Laws and Policies
EDUC 211 – EDUC 213	EDUC 213 Introduction to Educational Administration
EDUC 215 – EDUC 216	EDUC 215 Learning and Human Development
EDUC 218	EDUC 216 Philosophy of Education
EDUC 221 – EDUC 223	EDUC 218 Children’s Literature
EDUC 225 – EDUC 226	EDUC 225 Child and Adolescent Development
Political Studies and Public Administration	PSPA 201 Intro. to Political Science PSPA 202 Intro. to Public Administration PSPA 210 Survey of Political Theory PSPA 211 Survey of Comparative Politics PSPA 212 Contemporary Trends in Public Administration PSPA 213 Survey of International Relations PSPA 214 Islamic Political Thought I PSPA 215 Islamic Political Thought II PSPA 225 Public International Law PSPA 232 International Conflict & Conflict Resolution PSPA 233 International & Regional Organizations PSPA 235 Human Rights, Democracy & Int’l Politics PSPA 236 Origins & Evolution of the Arab-Israeli Conflict PSPA 237 The Middle East in Int’l Politics since WWI PSPA 253 Politics & Government: Middle East PSPA 256 Politics in Lebanon
All 200 level courses are allowed, up to PSPA 278	
Sociology-Anthropology	SOAN 201 Introduction to Sociology SOAN 203 Introduction to Anthropology SOAN 204 Introduction to Communication Process SOAN 212 Social Anthropology SOAN 214 Arab Culture and Society SOAN 220 City and Society SOAN 229 Communication Theory SOAN 232 Conflict Analysis & Resolution
All 200 level courses are allowed, up to SOAN 242 except SOAN 215, SOAN 217, and SOAN 225	
Psychology	PSYC 202 General Psychology PSYC 211 Introduction to Social Psychology PSYC 221 Psychology of Learning PSYC 225 Psychology of Personality PSYC 223 Cognitive Psychology
All 200 level courses are allowed, up to PSYC 251	

Appendix F: Frequently Asked Questions (FAQ)

Advising

- Who is my advisor?

You can find the name of your advisor by logging onto SIS.

- My advisor is not present; to whom should I go for advice?

First read through the FAQ list to see if you can find an answer to your question. If you do not find an answer to your question go to the chairperson of your department. S/he will answer your question or tell you who to see.

An advisor's office hours sometimes do not coincide with a student's registration time. All faculty members have their office hours posted outside their door.

- Can I change my advisor?

No

Registration, Course Capacities, Placement, Restrictions, Electives

- If I missed my registration time slot or the entire registration period what should I do?

Speak with the FEA Student Services Officer, Alia Kazma Serha. Her office is located in the main FEA office.

- How can I get my alternate PIN?

Your advisor has your alternate PIN number.

- My advisor does not have my alternate PIN, who can give me this information?

Speak with the FEA Student Services Officer, Alia Kazma Serha. Her office is located in the main FEA office.

- How do I use the alternate pin?

After you log on to SIS you will be asked to give your PIN.

- How do I find out the English level I am placed in?

If you are a new student check with the Admissions Office to find which English class you must take. If you are a continuing student the English department should be able to answer your question.

- I took ENGL 204 do I need to take ENGL 206?

If you took ENGL 204 before joining the FEA you do not need to take ENGL 206.

If ENGL 204 was counted toward your freshman requirements a substitute English course should be taken.

- I was placed in English 204 do I take it or 206 instead?

If you are in engineering or the architecture program you should take ENGL 206. If you are a graphic design major you should take ENGL 204.

- How do I find out when an Arabic placement test will be given, and where can I find the results after I take the test?

This information is available in the Department of Arabic and Near Eastern Languages located in College Hall on the 4th floor. Check the website: <http://staff.aub.edu.lb/~webarab/apt.htm>

- What Arabic course should I take?

The course that you are placed in is dependent upon the results of your Arabic placement test. Those students who are exempt from taking Arabic must take an elective course in the humanities.

- Should I follow the required course list exactly? Which courses have prerequisites? Which courses can I delay taking?

You do not have to strictly follow the course list; however there are sequences of courses with prerequisites in all the programs. Check the AUB undergraduate catalogue or the course syllabus for the specific prerequisites. If there are no prerequisites for a course you may postpone taking it; it is advisable to check with your advisor.

- What are the humanities courses or the social sciences course I am permitted to take?

First check the FEA section of the most recent catalogue for a complete list of the acceptable electives. <http://www.aub.edu.lb>. If you still have questions, see your advisor.

- May I take my humanity electives in business or engineering management?

Business and engineering management courses are not considered humanity courses.

- Can I take a graduate course as an elective?

Undergraduate students may take graduate courses as electives if the class has not reached capacity. However, some programs limit the number of electives a student may take outside the department.

- What are the ethics courses?

Check the FEA section of the most current catalogue.

- Where can I find the list of science electives?

Check the departmental section for your major in the most recent catalogue for a complete list of the approved science electives.

- What should I do when I cannot register in my core course?

Contact your department.

- I am a fourth year student, I cannot register in a course that is required what should I do? I need the course.

Contact the Student Services Officer for difficulties registering in courses outside the FEA.

- If while trying to register for a course I get a prerequisite or a test score error, what should I do?

First go to the secretary of your department, and if s/he is not able to solve the problem go to the Student Services Officer. The Student Services Officer can help resolve problems with courses offered outside the FEA.

- Should I go to the Registrar to have restrictions removed?

No, you should go to the department offering the course.

- Why are there restrictions on courses for majors?

Registration restrictions are put on some courses to give priority to students who need the course to complete the requirements in their major.

- If the capacity in an FEA class needs to be increased in order for me to register, what should I do?

You should first talk to the department concerned; you will need the instructor's permission. If the problem persists you should contact the Student Services Officer.

- Why must I ask permission from a chair or coordinator to open capacity if there is space?

Some courses have restrictions placed on them to insure that students who require the course for their major will be able to register.

- If the capacity of a course outside the FEA must be increased in order for me to register, what should I do?

You should see the Student Services Officer who will assist you by contacting the appropriate department.

- Can capacity in lab class be opened if I bring my own laptop?

No, the space in a lab class is strictly limited.

- Can I switch sections if the section is open?

Yes, you may switch sections but it can be done only during the drop and add period.

- Why can't my department open capacity in other Faculties?

Each Faculty has control over the courses that they offer. It is difficult to predict the number of sections that will be required especially for first year courses. Opening a new section requires assigning instructors and rooms; this is done within the Faculty.

- Do I have to wait until drop and add day to change my registration?

To make changes in your registration you must wait until the drop and add period. The system is used for many functions (grades, fees etc.) and for logistical reasons caused by load on the system you must wait.

Minors

- How do I register for a minor in engineering management?

First check the EM minor program requirements in the catalogue. Then you must complete an Engineering Management Course Plan form which is available in the FEA Dean's Office. The form requires the signature of the program coordinator.

- How do I apply for a minor in information technology?

Students may apply by completing a minor application form available from the ECE Department.

- How do I apply for a minor in bio-medical engineering?

Check the AUB Undergraduate Catalogue for the requirements then complete the form on the ECE home page. Dr Nassir Sabah who is the coordinator of the program in the ECE department must grant permission.

Course Load and Overload

- What is the course load that I am required or permitted to take during the summer?

Nine credits is the standard course load during the summer term. If you are doing a summer internship and wish to register for an additional course you must submit a petition to the FEA Academic Committee. The course can only be taken if it is scheduled after or before regular work hours.

- How do I request an overload?

If the overload will involve 19 or less credits it can be approved at the departmental level. If the overload will result in more than 19 credits a petition must be filed with the FEA Academic Committee. The committee's approval will depend upon your GPA and if any of the courses are being repeated.

Normally first year students are not granted overload permission. Students may petition the FEA Academic Committee for overload permission. (The ECE will not approve an overload for a student in their first year.)

Probation

- What is the minimum grade that I need to clear probation?

The minimum grade required to remove probation is dependant upon your previous grades.

Probation is removed when a student attains a semester average of 69 or more in the third or fourth regular semester, or a semester average of 70 or more in any subsequent regular semester.

“Probation should be removed within two regular semesters, excluding summer, after the student is placed on probation, or when the student completes his/her graduation requirements.” (See: AUB Undergraduate Catalogue: Removal of Probation and Graduation Requirements)

Transfers

- How and when can I transfer out of, or into a department?

Usually you may transfer after completing two regular terms in a department. You must complete the change of major form on the FEA website (click on Student Resources and then Petitions and Forms).

- What is the minimum grade average needed to transfer?

All changes of major are subject to the approval of the department to which the change is requested. The average required depends on the department and the availability of space; check the catalogue for specific requirements.

- If I am going to transfer from one major to another within the FEA what courses should I take so as not to waste a whole semester? What courses are required?

Check the catalogue and see your advisor. The introduction to engineering courses (MECH 200, EECE 200, and CIVE 200) will be accepted by all the engineering departments for students who transfer.

- Can I use the courses I take abroad as an exchange student as part of my graduation requirements?

Yes, if the courses are pre-approved through a petition to the FEA Academic Committee.

Summer Training

- What must I do concerning my summer training internship?

Check with the FEA Career Center and remember you must register for the Approved Experience course in your major.

- What forms do I need to complete before, during and after my internship?

All engineering programs require: Proposal of Approved Experience form, Notice of Arrival form, Interim Training Report, Letter from Employer, Final Training Report.

For more information see your departmental undergraduate guide.

Final Year Project (FYP)

- How many students can be in an FYP group?

Check with your department.

Graduation and Clearance

- I am a fourth year student what courses do I need to graduate?

Check with your advisor. There is a degree evaluation on SIS and on the WEB

- What do I do to get a clearance for graduation?

Go to the Registrar on line and click on Forms.

- What forms should I complete before my graduation?

You must complete the Graduation Forms in the Registrar's Office, Departmental Exit Survey, Career Office Exit Survey, FEA Dean's Office updated records form, and you must have passed the online Plagiarism Test.

- How can I know that I have taken all my required courses and that I am eligible for graduation?

Check with your advisor. There is a degree evaluation on SIS and on the Department website.

GPA and Class Rank

- What is my GPA? How do I translate this to the 4.0 scale?

Your GPA is on your transcript. You can get a conversion table at the Registrar's Office.

- How can I know my graduation GPA?

You must wait until all your final grades are posted on the web. Your final average will be included on your transcript.

- When I apply to graduate school, what courses are used to calculate my GPA?

If you are applying to a graduate program at AUB the last two years of grades are considered. If you are applying elsewhere the entire transcript may be considered.

- What is my class rank?

The FEA does not provide any ranking beyond the honor list.

Notes

