



# **Faculty of Engineering and Architecture (FEA)**

# Faculty of Engineering and Architecture (FEA)

## Officers of the Faculty

Peter F. Dorman	President of the University
Ahmad Dallal	Provost, ex-officio
Ibrahim Hajj	Dean
Fadl Moukalled	Associate Dean
Moueen Salameh	Registrar, ex-officio
Salim Kanaan	Director of Admissions, ex-officio
Lokman Meho	University Librarian, ex-officio

## Faculty Administrative Support

Ghada Kamar Najm	Executive Officer
Alia Kazma Serhal	Student Services Officer
Lara Touma	Financial Officer

## Historical Background

As early as 1913 the University recognized the need for engineering education and training in the Middle 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. The years from 1951 to 1954 were a transitional period of continuous development toward the new curricula, established in 1954. 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. In 2006 the name of the degree was changed to Bachelor of Fine Arts in Graphic Design. In 2006 the name of the Electrical Engineering degree was changed to Electrical and Computer Engineering. In 2009 two new programs offering BS degrees were added to the FEA. A Construction Engineering Program in the CEE department and a Chemical Engineering Program currently housed in the Mechanical Engineering Department.

# Vision

The Faculty of Engineering and Architecture is a world-class professional school that attracts eminently qualified faculty of international caliber and outstanding students. The FEA contributes to the development of Lebanon and the region by providing undergraduate and graduate education of the highest quality, promoting strong research programs, and rendering expert services to the community.

# Mission

The Faculty of Engineering and Architecture (FEA) at the American University of Beirut is a leading professional school in the Middle East. The FEA offers educational programs of the highest standards, promotes research and creative scholarly activities of its faculty and students, and provides services to the community at large, while addressing the needs of Lebanon and the region. The FEA undergoes continuous improvement to maintain a challenging and intellectually stimulating environment, and prepares its students to be life-long learners, innovators, and professionals capable of being leaders in their chosen careers, committed to personal integrity and civic responsibility.

# Undergraduate Programs

The Faculty of Engineering and Architecture offers programs of study leading to the degrees of Bachelor of Architecture (BArch), Bachelor of Fine Arts in Graphic Design (BFA), and the degree of Bachelor of Engineering (BE), with majors in civil engineering, computer and communications engineering, electrical and computer engineering, mechanical engineering, and chemical engineering. The curriculum of the BArch degree extends over 14 terms (ten 16-week semesters and four eight-week summer terms), totaling 192 weeks. Although the program is completed in five calendar years, it is equivalent to a program of six academic years that does not include summers. The curriculum of the BE degree and that of the BFA degree is each divided into 11 terms (eight 16-week semesters and three eight-week summer terms), totaling 152 weeks. This duration is equivalent to five academic years, without summers, but the program is completed in four calendar years. There is a short break after each term and a one-month vacation between summer and fall terms. The Faculty also offers a Bachelor of Science (BS) degree in Construction Engineering and a Bachelor of Science (BS) degree in Chemical Engineering. The curriculum of both BS degree programs require the completion of 110 credit hours, after the freshman year, of course work over three years, including two summer terms.

The Faculty reserves the right to make changes in the curriculum, course content, and regulations as it deems appropriate, and without prior notice.

# Admission to First Year

Admission is by selection of the most promising, eligible applicants. All candidates for admission to the Faculty of Engineering and Architecture must have completed the pre-professional educational requirements of the candidate's country and the approved freshman program in the Faculty of Arts and Sciences of this University as described in this catalogue, or a program recognized as equivalent. The certificates, recognized for admission to the first year in the Faculty of Engineering and Architecture, are listed under Secondary Certificates in the section on Admissions in this catalogue. Holders of the technical baccalaureate (BT) are eligible for admission only to the same major as that of the BT.

More specifically, to be eligible for admission to the first year in the Faculty of Engineering and Architecture, a candidate must

- Demonstrate an acceptable level of proficiency in English, as specified under Admissions in this catalogue
- Sit for the required SAT I tests as specified in the relevant section, Admissions, in this catalogue
- Satisfy the Faculty of Engineering and Architecture requirements on character recommendation, as well as academic grounds

Students admitted to the first year are required to take all the major engineering, architecture, or graphic design courses specified in their respective programs.

## Admission of Transfer Students

Students attending recognized institutions of higher learning, including AUB, may apply for transfer to any of the engineering, architecture, or graphic design majors in the FEA. These students are eligible for consideration for admission to any of Terms I through VI (Term VIII for architecture) depending on availability of places and subject to the following conditions. Normally, students will not be admitted to the architecture or graphic design programs in the middle of the academic year. Students must

- Have completed the equivalent of the sophomore class at the college or university from which they are transferring
- Have attained a minimum cumulative average of 2.7 out of 4.0 (75 out of 100 for AUB students)
- Have taken at least 12 credits of math and basic science courses at the sophomore level or higher and attained a total average in these courses of at least 3.0 out of 4.0 (77 out of 100 for AUB students) This applies to engineering and architecture majors only
- Have satisfied the university English requirements for admission
- Students from outside AUB applying for transfer to the architecture or graphic design majors are required to submit portfolios of their work; students from within AUB applying for transfer to the architecture or graphic design majors are encouraged to submit portfolios of their work.

Applications of transfer students are evaluated and approved by the departments and the Admissions Committee of the Faculty. The term in which the student is placed, and the complete program of study in the major in which s/he is admitted, are determined by the department concerned depending on the number of credits completed at the institution from which the student is transferring.

## Special Students Not Working for a Degree

Refer to p. 38 in this catalogue.

Students may, upon approval of the Faculty concerned, complete the requirements for a second degree while registered in another Faculty at AUB. In such a case, a student will be granted two degrees at the same time of graduation. If tuition differs, students will pay the higher of the tuitions. Information about deadlines and applications are available on the following link: <http://www.aub.edu.lb/registrar/Documents/pdfdoc/dualdegree.pdf>

## Residence Requirements

Students of the Faculty of Engineering and Architecture must meet the following minimum residence requirements:

- **Engineering or Graphic Design Majors:** A student must register in residence at the Faculty of Engineering and Architecture for the last four regular semesters and should complete at least 50 credits during this period.
- **Architecture Major:** A student must register in residence at the Faculty of Engineering and Architecture for the last five regular semesters and should complete at least 65 credits during this period.

## General Education Program Requirements

Students in the CCE, ECE and ME departments are expected to satisfy the following distribution requirements of humanities/social sciences courses:

- Two English courses, one of them English 206 - (6 credits)
- One Arabic course as determined by the Arabic Placement Test - (3 credits).
- One course on ethics - (3 credits)
- Three humanities courses - (9 credits)
- Two social sciences courses - (6 credits)

FEA students must select humanities/social science elective courses from the approved GE program course list on the Registrar's homepage.

## Graduation Requirements

To be eligible for graduation with the bachelor's degree, a student must have

- passed all the required courses and the 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
- satisfied the faculty as to the adequacy of the student's professional development and conduct

## Academic Rules and Regulations

For information on Categories of Students, Correct Use of Language, Grading System, Graduation with Distinction and High Distinction, and Placement on the Dean's Honor List, see pp. 47-64 in this catalogue.

\* The following courses are equivalent and credits can be given to either of them: FAAH 221 and ARCH 121; FAAH 222 and ARCH 122; FAAH 223; FAAH 224 and ARCH 224.

## Class Status

The class status of students is as follows:

First Year	Terms I and II
Second Year	Terms III, IV, and V
Third Year	Terms VI, VII, and VIII
Fourth Year	Terms IX, X, and XI
Fifth Year (architecture)	Terms XII, XIII, and XIV

A student's status is changed to that of a higher year if his/her cumulative number of failed, withdrawn or unregistered credits from the regular credit hour requirements does not exceed seven.

## Change of Major within the Faculty

All changes of major are subject to approval by the department to which the change is requested. The receiving departments will determine the new study plans for students accepted to a new major.

## Minor in Applied Energy

The minor in applied energy is **open to all FEA students** who are interested in the energy domain and in renewable energy applications. Students seeking professional careers that will focus on energy, the environment, sustainable applications in buildings, and energy systems may find this minor attractive. The minor in applied energy is offered by the Faculty of Engineering and Architecture rather than by an individual department.

Students who have completed at least 60 credits at the sophomore level and higher, and who have a cumulative average of 70 or more, may apply by completing a minor application form available in the Dean's Office. The minor will be indicated on the transcript of the student who completes all the requirements described below. A minimum grade of 70 is required for a course to count toward the fulfillment of the minor.

## Applied Energy Minor Program Structure

The applied energy minor has two components. The first is a core of courses that provides a foundation for the understanding of energy science and technology. The second component is a customized series of electives and labs, selected by each student in close consultation with a special faculty advisor for the applied energy minor. A student wishing to complete the minor is required to complete a **minimum of 20 credits** from a list of core courses (9 credits) and elective courses (11 credits) to fulfill the minor requirements.

## Required Core Courses (9 credits)

The core courses include courses from three domains related to energy studies: one course in fundamental energy science, one course in energy technologies, and one course in energy management and economy as follows:

### Fundamental Energy Science Course

MECH 310 Thermodynamics I, or CIVE 340 Fluid Mechanics and Laboratory, or CHEM 217 Thermodynamics and Chemical Dynamics 3 cr.

### Energy Technologies Course

EECE 675 Renewable Energy Systems 3 cr.

### Energy Management and Economy Course

ECON 333 Energy Economics and Policy 3 cr.

### Elective Courses (Minimum of 11 credits)

Elective courses are selected from two lists. List A includes technical courses from chemical, mechanical, and electrical engineering majors at the undergraduate and master's levels. List B includes courses in management, sciences, and the social sciences. The student must take a minimum of **five credits** from list A and a minimum of **three credits** from List B.

#### List A: Energy in Engineering Context

CHEN 417	Kinetics and Reactor Design I	3 cr.
CHEN 411	Heat Transfer	3 cr.
CHEN 470	Chemical Process Design	3 cr.
CHEN 570	Process Synthesis and Optimization	3 cr.
CHEN 671	Chemical Product Design	3 cr.
CIVE 450	Water and Wastewater Treatment and Laboratory	3 cr.
CIVE 654	Solid Waste Management I	3 cr.
CIVE 656	Air Pollution and Control I	3 cr.
CIVE 658	Industrial/Hazardous Waste Management	3 cr.
CIVE 659	Environmental Impact Assessment	3 cr.
EECE 471	Fundamentals of Power Systems Analysis	3 cr.
EECE 471L	Power Systems Lab	1 cr.
EECE 670	Power Systems Planning	3 cr.
EECE 671	Environmental Aspects of Power Systems	3 cr.
EECE 672	Energy Planning and Policy	3 cr.
EECE 675	Renewable Energy Systems	3 cr.
EECE 678	Advanced Power System Analysis	3 cr.

MECH 510	Design of Thermal Systems	3 cr.
MECH 513	Air Conditioning	3 cr.
MECH 603	Solar Energy	3 cr.
MECH 670	Laboratory for Renewable Energy in Buildings	2 cr.
MECH 672	Energy Systems Modeling	3 cr.
MECH 673	Energy Efficient Building with Good Indoor Environment	3 cr.
MECH 675	Building Energy Management Systems	3 cr.
MECH 676	Passive Building Design	3 cr.
MECH 677	Heat Pumps	3 cr.
MECH 679	Energy Audit Lab	2 cr.

### List B: Energy Management and Economics

ARCH 065	Climate Responsive Design	3 cr.
ENMG 640	Sustainable Development Management	3 cr.
ENMG 698	Special Topics in Engineering Management Lean Construction Concepts	3 cr.
LDEM 203	The Environment and Sustainable Development	3 cr.
PSPA 317	(ENSC 657) Environmental Regulation and Legislation	3 cr.
PSPA 316	(ENSC 650) International Environmental Policy	3 cr.

Table 1 shows the number of credits that students will have to take outside their engineering major. Engineering students will have to take a **minimum of 9 credits outside their major**.

**Table 1: Minimum number of credits taken by engineering students outside their major.**

Major	CEE		CHEN		ECE & CCE		MECH	
Domain	Credits in Major	Credits Outside Major	Credits in Major	Credits Outside Major	Credits in Major	Credits Outside Major	Credits in Major	Credits Outside Major
Core								
MECH 310 or CIVE 340	3		3			3	3	
EECE 675		3		3	3			3
ECON 333		3		3		3		3
Electives								
List A								
CEE	5-9		5-9		5-9		5-9	
CHEN	5-9		5-9		5-9		5-9	
ECE	5-9		5-9		5-9		5-9	
MECH	5-9		5-9		5-9		5-9	
List B		3-6		3-6		3-6		3-6
Total Credits	20-21		20-21		20-21		20-21	

## Minor in Biomedical Engineering

The minor in Biomedical Engineering is open to all AUB students. Students who have completed at least 60 credits at the sophomore level and higher, and who have a cumulative average of 70 or more, may apply by completing a minor application form available in the ECE Department. The minor will be indicated on the transcript of the student who completes all the requirements described below, and who obtains an average in the minor courses of 70 or more.

The minor requirements are divided into a set of core courses and a set of elective courses.

### For engineering students, the requirements are as follows:

- EECE 401 [1 cr.]
- BIOL 201 [4 cr.]
- BIOL 202 or PHYL 246 [4 cr.]
- One core course [3 cr.] chosen from EECE 601, EECE 603, or MECH 633
- One elective course from list A below [3 cr.]
- One elective course from list A, B, or C below [3 cr.]

Minimum number of credits: 18

### For biology students, the requirements are as follows:

- EECE 401 [1 cr.]
- BIOL 201 [4 cr.]
- BIOL 202 [4 cr.]
- (EECE 210 [3 cr.] or equivalent, and EECE 601 [3 cr.])  
or (CIVE 210 [3 cr.] or equivalent, and MECH 634 [3 cr.])
- One elective course from list A or B below [3 cr.]

Minimum number of credits: 18

### For all other students, the requirements are as follows:

- EECE 401 [1 cr.]
- BIOL 201 [4 cr.]
- BIOL 202 or PHYL 246 [4 cr.]
- (EECE 210 [3 cr.] or equivalent, and EECE 601 [3 cr.])  
or (CIVE 210 [3 cr.] or equivalent, and MECH 634 [3 cr.])
- One elective course from list A, B, or C below [3 cr.]

Minimum number of credits: 18

### Elective Courses

**List A:** EECE 601, EECE 602, EECE 603 (unless the student takes EECE 694, in which case either EECE 694 or 603 counts toward the minor), EECE 604, EECE 605, MECH 633, MECH 634

**List B:** MECH 532, MECH 606, MECH 607, MECH 624, MECH 631, MECH 641/EECE 661, EECE 693, EECE 694 (unless the student takes EECE 603, in which case either 694 or 603 counts toward the minor)

**List C:** BIOL 202, BIOL 223, BIOL 225, BIOL 244, BIOL 263, BIOL 268, PHYL 202, PHYL 246

## Minor in Chemical Engineering

The minor in chemical engineering, currently offered in the Mechanical Engineering Department, is open to all engineering students in majors other than chemical engineering.

### Minor Program Requirements (20 credits)

Student taking the minor are required to complete 20 credits of course work: 14 credits of core courses, and six credits of elective courses from the list given below.

#### Required Core Courses (14 credits)

- MECH 310 Thermodynamics I 3 cr.
- CHEN 311/MECH 314 Fluid Flow Operations 3 cr.
- CHEN 410 Unit Operation Lab 2 cr.
- CHEN 411 Heat and Mass Transfer Operations 3 cr.
- CHEN 417 Kinetics and Reactor Design I 3 cr.

#### Elective Courses (6 credits) selected from the following courses

- CHEN 312 Separation Processes 3 cr.
- CHEN 314 Chemical Engineering Thermodynamics 3 cr.
- CHEN 451 Process Control 2 cr.
- CHEN 451L Process Control Lab 1 cr.
- CHEN 470 Chemical Process Design 3 cr.
- CHEN 480 Safety and Loss Prevention 3 cr.
- CHEN 517 Kinetics and Reactor Design II 3 cr.
- CHEN 531 Principles of Corrosion 3 cr.
- CHEN 570 Process Synthesis and Optimization 3 cr.

## Minor in Engineering Management

The Engineering Management Program offers a minor in engineering management that can be pursued by undergraduate engineering and architecture students, as well as by students from related majors, starting as early as the fall semester of their third year of enrollment. To satisfy the requirements of the minor, a student must earn 18 credits of course work from the engineering management course offerings.

- At least nine of the total requirement of 18 credits must be fulfilled from the six undergraduate courses offered by the program, which must include ENMG 400—Engineering Economy. (ENMG 400, ENMG 500, ENMG 501, ENMG 502, ENMG 503, ENMG 504)
- The other nine credits can be satisfied by taking courses either from the list of undergraduate courses, or from the elective graduate courses.

A minimum grade of 70 is required for a course to count toward the fulfillment of a minor in engineering management.