This guide is intended to provide information on most aspects of the Mechanical Engineering programs at AUB.

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<th>Revision Date</th>
<th>Reason for Change</th>
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<td>June 30, 2002</td>
<td>First Release</td>
<td>A. Smaili</td>
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<td>2</td>
<td>June 15, 2003</td>
<td>Updated Probation rules</td>
<td>N. Ghaddar</td>
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<td>3</td>
<td>June 15, 2004</td>
<td>Updated Mission statement</td>
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<td>4</td>
<td>July 15, 2005</td>
<td>Updated format and added section on Summer Training</td>
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<td>May 15, 2007</td>
<td>Revised Curriculum</td>
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<td>6</td>
<td>July 1, 2008</td>
<td>General updated</td>
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<td>July 22, 2009</td>
<td>Corrections and updated Curriculum Section, added section on chemical engineering</td>
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<td>8</td>
<td>Nov. 25, 2010</td>
<td>Updated the Curriculum sections for the mechanical and chemical engineering programs, and changes to General Education section</td>
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<td>9</td>
<td>June 20, 2011</td>
<td>Updated MECH curriculums and removed CHEN program into separate manual</td>
<td>M. Darwish</td>
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<td>10</td>
<td>June 30, 2012</td>
<td>Add Plan A and B for undergraduate curriculum</td>
<td>K. Ghali</td>
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Information in this guide is subject to change without notice. Students are responsible for checking their AUB email for announcements, information, and updates.

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1. Introduction

The American University of Beirut, Bachelor of Engineering (BE) Program in Mechanical Engineering has been accredited by the Engineering Accreditation Commission of ABET, Inc., the recognized accreditor of college and university programs in applied science, computing, engineering, and technology. ABET accreditation demonstrates a program’s commitment to providing its students with a quality education.
2. Mechanical Engineering

2.1 Introduction

Overview

AUB provides a world-class education for its students. The success of this venture is based on the synergy between students, faculty, and the administration of the university; between a faculty committed to excellence in teaching and research, an administration dedicated to a rich and diverse learning environment, and students eager to make the most of this opportunity to grow into accomplished engineers and leaders in their society.

Engineering is a key profession in today’s technological and energy focused world, and design is an essential ingredient of the profession. Applications within Mechanical Engineering are diverse; consequently, the field encompasses many specialties. This is reflected in the broad scope of the ME undergraduate program and its emphasis on fundamentals. This is considered as essential for both continuing education and progressive growth as a professional in the field of our graduates.

This manual has been prepared to be a quick, basic reference for both faculty and students in the Mechanical Engineering Department. It is not intended to be a complete document of all University policies and requirements. For detailed information about regulations and procedures students are referred to the AUB Student Handbook, the FEA Academic Manual, and the University Catalogue. It is the student’s responsibily to be aware of all curriculum requirements and University requirements.
Mission

The Mechanical Engineering Department at AUB has written a mission to which its activities are directed and for which the curriculum has been developed. The Mechanical Engineering faculty has agreed that: The Undergraduate Program in Mechanical Engineering seeks to empower students to pursue successful careers, and to create a learning environment in which they can develop their creative and critical thinking, their ability to grow into life-long learners in light of the ever-increasing challenges of modern technology, and their commitment to the ethical and professional responsibilities required in their calling at the global level while focusing on the needs of Lebanon and the region.


Department Responsibility

In support of this mission the department is committed to do all it can to under-gird the main purpose and to emphasize the essential responsibility to its stake-holders. The specific responsibilities of the department in service of the mission are to:

1. Provide quality undergraduate education within the context of a curriculum that will maintain accreditation by the Engineering Accreditation Commission of ABET, Inc.[Accreditation Board for Engineering and Technology ].

2. Provide quality education and research programs at the graduate level compatible with professional norms.

3. Maintain a faculty whose expertise encompass the facets of mechanical engineering and whose competence, dynamism, and practices of effective educational techniques motivate students to achieve what they are capable of.

4. Maintain an environment conducive to learning scholarly activities by acquiring and maintaining modern instructional tools and
providing modern laboratory and computer facilities consistent with both instructional and research objectives.

5. Actively seek financial support from outside the University to sponsor undergraduate and graduate research activities.

6. Actively sponsor student organizations, support extra-curricular activities, and encourage student participation in various institutional and community activities which are congruent with institutional objectives.

7. Provide information on the various aspects of the Mechanical Engineering Department to all groups interested in the affairs of the University.

8. Foster an environment of highly ethical practices. [See the ASME Code of Ethics in Appendix VII]

Program Educational Objectives

While having the aptitude to contribute to the society, students who attain a BE [Bachelor of Engineering] degree possess a tool chest of technical and non-technical skills and knowledge that positions them either for successful professional practice as entry-level engineers in existing firms or to be graduate students in any mechanical engineering program in the world. This does not preclude other activities, such as volunteerism, self-employment, or academic study in another discipline. The ME undergraduate program educational objectives as revised on May, 2010 are:

Our graduates will be able to advance successfully in their careers as reflected in continued employment, job satisfaction, leadership responsibilities, and professional recognition.

Our graduates will be able to succeed in graduate studies as
reflected in admission to highly ranked programs, timely completion of degree requirements, and recognition by competitive fellowships and other awards.

Program Learning Outcomes [ABET 2000 Criteria]

The following program educational outcomes have been adopted from ABET EC-2000. Each student receiving a BE degree will demonstrate:

a. An ability to apply knowledge of mathematics, science, and engineering

b. An ability to design and conduct experiments, as well as to analyze and interpret data

c. 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

d. An ability to function in multidisciplinary teams

e. An ability to identify, formulate, and solve engineering problems

f. An understanding of professional and ethical responsibility

g. An ability to communicate effectively

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

i. A recognition of the need for, and an ability to engage in lifelong learning

j. Knowledge of contemporary issues

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
ME Faculty and Staff

Full Time Faculty

**Kamel Ghali**, Professor and Chairperson, PhD from Kansas State University. His fields of interest are heat and mass transfer, applied energy, and thermal comfort. He joined the department in September 2009. [ka04@aub.edu.lb]

**Nesreen Ghaddar**, Qatar Chair in Energy Studies Professor, and Associate Provost, PhD from MIT. Her fields of interest are computational fluid dynamics, heat transfer and energy conversion. She joined the department in 1991. [farah@aub.edu.lb]

**Fadl Moukalled**, Professor and Associate Dean, Fellow of the Center of Advanced Mathematical Studies [CAMS], PhD from Louisiana State University. His field of interest is computational fluid dynamics. He joined the department in 1987. [memouk@aub.edu.lb]

**Marwan Darwish**, Professor, PhD from Brunell University. His fields of interest are engineering materials and computational method applied to engineering problems. He joined the department in 1992. [darwish@aub.edu.lb]

**Ramsey Hamade**, Professor, PhD from Virginia Polytechnic Institute. His fields of interest are design, materials, and manufacturing. He joined the department in 2000. [rh13@aub.edu.lb]

**Alan Shihadeh**, Professor, ScD from MIT. His fields of interest are power engineering and combustion. He joined the department in 2000. [as20@aub.edu.lb]

**Issam Lakakis**, Associate Professor, PhD from MIT. His fields of interest are computational physics and micro-electromechanical systems. He joined the department in September, 2004. [il01@aub.edu.lb]
Albert Kuran, Associate Professor, MS from Yale. He joined the department in 1956. [akuran@aub.edu.lb]

Ghanem Oweis, Associate Professor, PhD from University of Michigan, Ann Arbor. His field is experimental fluid dynamics. He joined the department in February 2006. [goweis@aub.edu.lb]

Daniel Asmar, Associate Professor, PhD from University of Waterloo. His fields of interest are robotics, computer vision, and mechatronics. He joined the department in September 2007. [da20@aub.edu.lb]

Mutasem Shehadeh, Assistant Professor, PhD from Washington State University. His fields of interest are multiscale modeling of materials, shock induced deformation, and micromechanics and crystal plasticity. He joined the department in September 2008. [ms144@aub.edu.lb]

Matthias Liermann, Assistant Professor, PhD from RWTH Aachen University, Germany. His fields of interest are automatic control, mechanical design and hydraulics. He joined the department in September 2009. [ml14@aub.edu.lb]

Elie Shammas, Assistant Professor, PhD from Carnegie Mellon University. His fields of interest are robotics and automatic control. [es34@aub.edu.lb]

Samir Mustapha, Assistant Professor, PhD from University of Sydney. His fields of interest are Finite element modeling, Linear and non-linear analysis, dynamic vibration, elastic wave propagation, mechanics of materials.

George Ayoub, Assistant Professor, PhD from University of Lillel, France. His fields of interest are: Mechanics and Material Science. [ga80@aub.edu.lb]
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**Pierre Azoury**, Professor, PhD from the University of London, Britain. [pa01@aub.edu.lb]

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**Wajih Najm**, Lecturer, ME from AUB. [wn00@aub.edu.lb]

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**Lina Kassis**, Instructor, ME from AUB. [lk35@aub.edu.lb]

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Lab Technical Manager

Ghassan Deeb [gd00@aub.edu.lb]

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[dr04@aub.edu.lb]

Roger Said, Assistant Supervisor [rs37@aub.edu.lb]

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Ramzi Safi, Senior Technician [rs48@aub.edu.lb]

George Jurdi, Senior Shop Master [gj05@aub.edu.lb]

Joseph Zoulikian, Materials and Manufacturing Lab Master [jz04@aub.edu.lb]

Joseph Khoury, Senior Technician [jk31@aub.edu.lb]
Advising

Advising in the ME department is the responsibility of the faculty advisor assigned to the student. The advisor is responsible for monitoring the progress of each ME student from the first year in the ME program until graduation. The faculty advisor provides advice about course selection and the opportunity to discuss career plans, to understand what and why mechanical engineers do what they do, and to provide a supportive personal relationship. Table 1 lists advisors for the 2011-12 academic year. If questions arise that cannot be answered by the advisor, the student should check with the main ME department office. Students must meet with their advisors by appointment at least once per semester for pre-registration advising. To assure that this occurs, advisors are sent the personal identification numbers [PIN] of their advisees. A student will not be able to register unless he/she meets with the advisor and obtains a PIN. In some cases, your advisor may not be able to answer specific academic questions or approve academic actions that are not described in the catalogue [course equivalence, exceeding permitted load, request for make up final, etc.] In these cases, the student has to petition the Academic Committee of the Faculty using the form available at the Record’s Office of the Faculty. The form is also enclosed at the end of this guide and online. After filling out the form, the student must secure the signature and the comments of his/her advisor. The answer to the petition will at most take 10 working days.

Registration And Validation Of Credits

Students register each academic semester via the web-based Banner System. Access to courses controlled by the FEA and other departments is automatically restricted to students who need these courses by virtue of their programs of enrollment. The faculty academic advisor is responsible for checking the student progress through the curriculum. At the beginning of each academic semester the program of each student is reviewed by the student’s faculty advisor to assure compliance with the continuation policy and to
assure that prerequisites are satisfied. Ultimately, each student is responsible for understanding the curriculum and planning his/her progress through it.

2.2 Undergraduate Mechanical Engineering Program
The undergraduate mechanical engineering program leads to the degree Bachelor of Engineering: Major, Mechanical Engineering. The mechanical engineering program extends over a four-year period offered exclusively on a daytime on-campus basis. The program is offered in 11 terms, eight terms are 16-week fall and spring semesters given over four years and three terms are eight-week summer terms taken during the first three years of the program. In the summer term of the third year, students are required to participate in a practical training course with a local, regional, or international organization. The entire program duration is equivalent to five academic years without the summer terms, but is completed in four calendar years. The undergraduate program also provides students with the option to pursue minors in the following:

- Biomedical Engineering offered by ECE Department
- Chemical Engineering offered by ME Department
- Engineering Management offered by EM Program
- Information Technology offered by ECE Department

Students may pursue other minors offered by the Faculty of Arts and Sciences and the Suliman Olayan School of Business.

The first two years in the ME curriculum are designed to emphasize the fundamentals in mechanical engineering upon which relevant applications in thermal and mechanical systems are based. The program requires that each student acquire a practical training experience with a local, regional, or international company during the summer after the third year. The third and fourth years are organized so that a student’s program of study includes a set of technical elective courses that provide the opportunity for the student to strengthen his/her skills in a specific area of interest. The final year project (FYP) provides the platform upon which students put to work the skills learned in their courses to create a meaningful design
The curriculum is designed to comply with requirements of the Accrediting Board for Engineering and Technology [ABET], the Lebanese Order of Engineers, the State of New York, and the AUB Board of Trustees. It includes courses in basic sciences and mathematics, engineering sciences, engineering design, English composition, the humanities, and the social sciences. Laboratory hands-on experiences and an emphasis on design are important ingredients integrated throughout the engineering curriculum.

The undergraduate curriculum for the degree of Bachelor of Engineering - Major, Mechanical Engineering consists of 143 semester-hours of course work. The curriculum shown in Table 2 serves as an aid for planning schedules. Table 3 shows the courses that satisfy the various requirements of the curriculum. The curriculum requires twelve [12] semester hours of humanity courses from art, music, literature, foreign language, philosophy, theatre, or history. The curriculum requires six [6] semester hours of social science courses, which are to be taken from economics, geography, history, political science, psychology, or sociology[see Appendix I]. Social science courses focus on individual relationships in and to society. Speech, technical writing, and religious dogma courses do not qualify for either the humanities or social science course requirement.

The suggested course loads and timing allow degree completion in eight [8] fall and spring semesters and three summers. However, it is recognized that many students will choose not to follow this schedule precisely. Consequently, students should routinely examine their progress and map out a plan for their degree completion. In doing this, they should be aware of course prerequisites and when courses are typically offered. Course descriptions for mechanical engineering courses are given in Appendix II.
<table>
<thead>
<tr>
<th>Term</th>
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<tr>
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<td>MATH 201</td>
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<td>EECE 230</td>
<td>Introduction to Programming</td>
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<td>CIVE 210</td>
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<td>Electricity and Magnetism</td>
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<td>EECE 210</td>
<td>Electric Circuits</td>
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<td>Introduction to Mechanical Engineering</td>
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<td>MATH 202</td>
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<td>Introduction to Environmental Chemistry</td>
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<td>MECH 310</td>
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<td>Term V</td>
<td>MATH</td>
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<td>Elementary Linear Algebra with Applications</td>
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<td>MECH</td>
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<td>Technical Elective IV</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>Technical Elective V</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Humanities Elective</td>
<td></td>
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</tr>
</tbody>
</table>
Table 3: Distribution of Credits in ME Curriculum

<table>
<thead>
<tr>
<th>Course Category</th>
<th>Courses/Topics</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>English Communication [6 cr.]</td>
<td>ENGL 206</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>English Elective</td>
<td>3</td>
</tr>
<tr>
<td>Arabic [3 cr.]</td>
<td>Elective as determined by the Arabic Placement Test</td>
<td>3</td>
</tr>
<tr>
<td>Humanities [12 CREDITS]</td>
<td>Three Humanities Electives</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Ethics Course</td>
<td>3</td>
</tr>
<tr>
<td>Social Sciences PSPA, SBS, OR ECON [6 cr.]</td>
<td>Two Social Science Electives</td>
<td>6</td>
</tr>
<tr>
<td>MATH and Sciences [27 cr. lectures and 3 cr. labs]</td>
<td>MATH 201, MATH 202, MATH 212, MATH 218, MATH 251, STAT 230, PHYS 211, PHYS 211L, CHEM 202, CHEM 203, Biology Elective; Any Biology course above 201 level except 209</td>
<td>30</td>
</tr>
<tr>
<td>General Engineering [16 cr.]</td>
<td>CIVE 210 [3], EECE 210 [3], EECE 230 [3], EECE 312 [1], ENGM 400 [3]</td>
<td>16</td>
</tr>
<tr>
<td>Mechanical Engineering Major [70 cr.]</td>
<td>ME core courses: MECH 200 [3], MECH 220 [1], MECH 230 [3], MECH 310[3], MECH 314 [3], MECH 320 [3], MECH 332 [3], MECH 412 [3], MECH 414 [3], MECH 340 [3], MECH 341 [1], MECH 410 [1], MECH 420 [3], MECH 421 [3], MECH 430 [3], MECH 432 [2], MECH 435 [2], MECH 435L [1], MECH 510 [3], MECH 520 [3]</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>5 Technical Elective Courses</td>
<td>15</td>
</tr>
</tbody>
</table>

### Practical Training/Summer Internship

All third year engineering students are required to fulfill a summer internship period of eight to twelve weeks. This is a graduation requirement so that each student gains practical training experience during the summer prior to graduation, with either a company or another academic institution. Host companies/institutions for interns are identified through the following avenues:

1. **IAESTE** [International Association for Exchange Student in Technology and Engineering] offers opportunities abroad to FEA students. Offers are usually made known to the various departments in February for the summer training period. All placements are made outside Lebanon.

2. **FEA Career Office** acts as a link between companies/academic institutions and the summer interns. The FEA career counselor seeks offers from companies and academic institutions requesting their acceptance of third year engineering students as interns.

3. Companies/institutions contact the FEA directly and
request interns. This process is generally forwarded to and directed by the FEA Career Development Center [CDC] as well.

4. Students’ own contact.

The chronology of events leading to summer training is as follows:

1. At the beginning of the academic year, all 3rd year engineering students are required to complete an internship application and submit it to the FEA CDC. This application is made available on line.
2. The link to the online career centre is [http://webfea.fea.aub.edu.lb/career/](http://webfea.fea.aub.edu.lb/career/)
3. The FEA CDC Office seeks offers from companies and institutions. Students interested in specific companies can request that the FEA CDC contacts those companies on their behalf.
4. Offers are sent to the FEA CDC Office
5. Students are matched and placed in companies/institutions according to major and desired field of training. The FEA CDC Officer matches students with available positions based on the student’s overall rank and interest in the field.
6. Changes are not possible once the student confirms his/her willingness to intern at a specific company/institution.
7. Offers from companies suggested by students need to be approved by the ME Department and by the FEA CDC. Offers for future training sessions are solicited from companies in which past internships have been successful and rewarding.

For more information regarding training experience contact Ms. Nadia Moufarrej/FEA Career counselor at ext. 3453 or the Dean’s Office at ext. 3400, or visit the ME website at [http://webfea.fea.aub.edu.lb/med/resources/summer_training.aspx](http://webfea.fea.aub.edu.lb/med/resources/summer_training.aspx)

Summer training guidelines are given in Appendix IV.
Final Year Project
Students normally in groups of three are supervised while working on a project worth five credits, which extends over a full academic year. The project is an attempt to provide students with a transitional experience from the academic world to the professional world. It is designed to serve as a platform in which mechanical engineering students in teams engage in a comprehensive, integrative, meaningful design experience requiring the solution of open-ended problems that draw from knowledge acquired in the lead-up courses in order to better prepare them to enter the real world of engineering practice. The project experience forms a bridge between being a mechanical engineering student to becoming a technologically astute engineer practicing in a world characterized by stiff competition, global market economy, rapid technological advancement, and customer driven engineering. Information on the types of projects offered can be found on the ME website. The guidelines for the FYP selection, expectations, deliverables, and assessment are compiled in a document and are posted on the ME website: http://webfea.fea.aub.edu.lb/fea/med/resources/fyp.aspx

Writing Center At AUB
Everyone at all levels of study can improve his/her ability to write. Learning to express yourself clearly in writing is an important skill for an engineer. If you get stuck writing an essay or report or do not know how to start, the AUB Writing Center can help. Schedule an appointment with a tutor or drop by the center in West Hall. The AUB Writing Center was established in November 2004 and is open to all undergraduate and graduate students. The Writing Center is directed by Professor Amy Zenger. [az07@aub.edu.lb – Fisk/204A]. The mission of the Writing Center is to enhance the quality of writing in the AUB community by providing a personal forum for students to engage in discussion about their texts. The tutors in the Center respect each student’s level of achievement and provide support and skills for analytical thinking, among many other textual-based processes.
2.3 Mechanical Engineering Optional Tracks

The core courses of the Mechanical Engineering Program are offered in the following tracks:

i  Thermal and Fluid Engineering
ii  Design, Materials and Manufacturing
iii  Mechatronics

The student may select any track and must complete at least four technical electives in the selected track. Normally, only one technical elective is allowed from outside the mechanical engineering department.

[Track I] Thermal And Fluid Engineering
Core Courses
MECH 310 Thermodynamics I [3 cr.]
MECH 314 Introduction to Fluids Engineering [3 cr.]
MECH 414 Thermodynamics II [3 cr.]
MECH 410L Thermal/Fluid Systems Lab [1 cr.]
MECH 412 Heat Transfer [3 cr.]
MECH 510 Design of Thermal Systems [3 cr.]
MECH 501 Final Year Project I and [1 cr.]
MECH 502 Final Year Project II [4 cr.]

Technical Elective Courses
At least 3 technical electives are required
MECH 511 Intermediate Fluid Mechanics [3 cr.]
MECH 512 Internal Combustion Engines [3 cr.]
MECH 513 Air Conditioning [3 cr.]
MECH 514 Gas Turbines [3 cr.]
MECH 515 Steam Turbines [3 cr.]
MECH 516 Aerodynamics [3 cr.]
MECH 603 Solar Energy [3 cr.]
MECH 604 Refrigeration [3 cr.]
MECH 606 Aerosol Dynamics [3 cr.]
MECH 607 Microflows Fundamentals &Applications [3 cr.]
  Application
[Track II] Design, Materials, And Manufacturing

Core Courses
- CIVE 210 Statics [3 cr.]
- MECH 200 Introduction to Mechanical Engineering [3 cr.]
- MECH 220 Engineering Graphics [1 cr.]
- MECH 320 Mechanics of Materials [3 cr.]
- MECH 332 Mechanics of Machines [3 cr.]
- MECH 340 Engineering Materials [3 cr.]
- MECH 341L Materials Lab [1 cr.]
- MECH 420 Mechanical Design I [3 cr.]
- MECH 421 Manufacturing Processes I [3 cr.]
- MECH 520 Mechanical Design II [3 cr.]
- MECH 501 Final Year Project I and [1 cr.]
- MECH 502 Final Year Project II [4 cr.]

Technical Elective Courses
At least 3 technical electives are required
- MECH 521 Manufacturing Processes II [3 cr.]
- MECH 522 Mechanical CAD/CAE/CAM [3 cr.]
- MECH 540 Selection of Properties of Materials [3 cr.]
- MECH 550 Computer Applications in [3 cr.]
  Mechanical Engineering
- MECH 619 Quality Control in Manufacturing [3 cr.]
- MECH 622 Modeling of Machining Processes [3 cr.]
  and Machines
- MECH 624 Mechanics of Composite Materials [3 cr.]
- MECH 625 Fatigue of Materials [3 cr.]
- MECH 626 Metals and their Properties [3 cr.]
- MECH 627 Polymers and their Properties [3 cr.]
- MECH 628 Design of Mechanisms [3 cr.]
- MECH 633 Biomechanics [3 cr.]
- MECH 634 Biomaterials and Medical Devices [3 cr.]
[Track III] Mechatronics

Core Courses in Mechatronics
MECH 230 Dynamics \([3 \text{ cr.}]\)  
EECE 210 Electric Circuits \([3 \text{ cr.}]\)  
EECE 312 Electronics (For ME Students) \([3 \text{ cr.}]\)  
EECE 312L Circuits and Electronics lab \([1 \text{ cr.}]\)  
MECH 430 Process Instrumentation and Measurements \([3 \text{ cr.}]\)  
MECH 435 Control Systems \([2 \text{ cr.}]\)  
MECH 435L Control Systems Lab \([1 \text{ cr.}]\)  
MECH 501 Final Year Project I and \([1 \text{ cr.}]\)  
MECH 502 Final Year Project II \([4 \text{ cr.}]\)  

Technical Elective Courses
At least 3 technical electives are required  
MECH 530 Mechatronics System Design \([3 \text{ cr.}]\)  
MECH 531 Mechanical Vibrations \([3 \text{ cr.}]\)  
MECH 628 Design of Mechanisms \([3 \text{ cr.}]\)  
MECH 631 Micro-Electro Mechanical Systems \([3 \text{ cr.}]\)  
[MEMS]  
MECH 634 Biomaterials and Medical Devices \([3 \text{ cr.}]\)  
MECH 641 Robotics \([3 \text{ cr.}]\)  
MECH 642 Computer Vision \([3 \text{ cr.}]\)  
MECH 643 Mechatronics and Intelligent Machines Eng. II \([3 \text{ cr.}]\)  
MECH 644 Modal Analysis \([3 \text{ cr.}]\)  
MECH 645 Noise and Vibration Control \([3 \text{ cr.}]\)
Academic Regulations

Petitions
There is a process whereby a student can petition for deviation from certain requirements. The student must submit a petition signed by the academic advisor to the FEA Records Office. The petition is then studied by the FEA Academic and Curriculum Committee. For more information on dealing with special or unique cases; the student and advisor should refer to details in the University Catalogue, the University Policy Manual, the Student Handbook and the Faculty Handbook, the Student Code of Conduct on the AUB website: http://pnp.aub.edu.lb/general/conductcode/index.html, and the University Faculty Advising Handbook.

Attendance

Classes And Laboratories
Students are expected to attend all classes, laboratories, and required fieldwork. All missed laboratory or fieldwork must be made up. A student is responsible for the work that is done, and for any announcements that are made during his/her absence.

Students who, during a semester, 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] will be dropped from the course. A faculty member who drops a student from the course for this reason must have stated in the syllabus that attendance will be taken.

Students who withdraw or are forced to drop a course will receive a grade of “W.”

A student cannot withdraw or be withdrawn, from a course after the announced deadline unless approved by the FEA Academic and 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 FEA Academic and Curriculum Committee.
Examinations And Quizzes
Students who miss an announced examination or quiz must present an excuse considered valid by the instructor of the course. The course instructor should then require the student to take a make-up examination.
Medical reports and/or qualified professional opinions issued by an AUB employee, AUH doctor, or by the University Health Services will be accepted. Should there be a question about the validity of any excuse presented by the student, the matter should be referred by the faculty member to the FEA Academic and Curriculum Committee.

Cheating
Plagiarism, cheating, or other forms of academic dishonesty are prohibited. Students guilty of academic misconduct, either directly or indirectly through participation or assistance, are immediately reported to the instructor of the class. In addition to other possible disciplinary sanctions, which may be imposed through regular institutional procedures as a result of academic misconduct, the instructor has the authority to assign an “F” or a zero for the exercise or examination, or to assign an “F” in the course.

On-Line Plagiarism Tutorial And Test
The Board of Deans has determined that all AUB students must complete an on-line plagiarism tutorial and test. Students can take the test as many times as necessary. The homepage of the Plagiarism Tutorial and Test is available at: http://staff.aub.edu.lb/~eplagio/TutorialTest/home_Tutorial_Test.htm
The Tutorial and Test is divided into four sections:
- Overview: when and how to give credit; recommendations; decision flowchart.
- Examples: word-for-word and paraphrasing plagiarism: 5 examples each.
- Practice with Feedback: identifying plagiarism: 10 items.
- Test
When students pass the test a “Notification of Test Completion” [see
sample at [http://staff.aub.edu.lb/~eplagio/TutoriaTest/notification.htm](http://staff.aub.edu.lb/~eplagio/TutoriaTest/notification.htm) appears and they click “submit” to have it sent to the Office of the Registrar. The Office of the Registrar will have in its database the information about the students who have passed the test, and the date when they did so. The system will also generate e-mails to the passing students giving them unique validation codes [to be used as a proof they passed the test-if needed].

**Examinations**

Final examinations are to be held at the end of each semester and are to be administered according to the schedule predetermined by the Office of the Registrar.

**Course Load**

To be considered full-time, a student must be registered for a minimum load of 12 credits per semester. [See the required number of credits for summer full-time status under summer term for FEA.] A full-time student who wishes or is forced to reduce his/her load to less than 12 credits must first apply to the FEA Academic and Curriculum Committee for permission to do so.

Students can normally register for up to 17 credits per semester and nine credits during the summer term. Students who wish to register for more than 17 credits must petition the FEA Academic and Curriculum Committee for permission to do so.

- Students in the following categories must petition the appropriate faculty committee but will normally be granted permission to register for more than 17 credits:
  - Freshman students intending to go into medicine or engineering, and who have an average of at least 80 in the first semester, may take an additional course during the second semester.
  - Junior and senior students who have completed their English communication skills requirements at the level required by the department of their major may register for a maximum of 18 credits per semester.
  - If the program requires that a student registers for more than 17 credits in a particular semester.
Change Of Major
All changes of major are subject to the approval of the department to which the change is requested. The receiving department determines the new study plan for a student accepted into the new major.

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.
Dean’s Honor List
To be placed on the Dean’s Honor List at the end of the semester, a student must:

- be carrying at least 12 credits,
- not be on probation,
- have passed all courses and attained an overall average of 85 or be ranked in the top 10 percent of the class and have an overall average of 80,
- 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.

Dismissal And Re-Admission
A student is 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 2nd 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. A student can be dropped for this reason even if he/she is in the final year at AUB.
- 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.
Incompletes
A student who receives an incomplete grade for a course must petition the FEA Academic and 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 from the beginning of the next regular semester. In exceptional circumstances, the FEA Academic and Curriculum Committee may decide to give the student additional time to complete a course. Incomplete coursework 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. Normally a student with incomplete grades on good academic standing will not be permitted to register for more than 16 credits during a regular semester.

Probation

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, and 12 in each subsequent fall or spring semester. Courses/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 [for approved reasons], courses/credits taken during that semester are counted towards the semester average of the next regular semester. Credit 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. During a regular semester, a student 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 who is on academic probation and has incomplete grades 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.

**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 [see 4.15 Graduation Requirements].

**Repeating Courses**
A student may repeat any course for which he/she received a grade of less than 70. A student who fails a required course must repeat the course at the earliest opportunity. No course may be taken more than three times. When a course is repeated, the highest grade will be considered in the calculation of the cumulative average. All course grades will remain a part of a student’s permanent record.

**Withdrawal From Courses [Also See Attendance]**
A student can withdraw from only one required course per semester. Students who wish to withdraw from more than one required course in any given semester must petition the appropriate Faculty committee for permission to do so. A student may withdraw from elective courses, down to a minimum of 12 credits, not later than 10 weeks [five weeks in the summer term] from the beginning of the semester. A student will receive a grade of “W” for the course.
Change Of Grade

1. Once grades are posted on the AUB Student Information System [AUBSIS], a change of grade is not allowed unless a demonstrable mistake was made in the correction of the final examination or in the calculation of the grade. In particular, if a change of grade would result in a change of the academic status of the student, the supporting evidence for the changes of grade must be presented to the chairperson of the department and the Dean.

2. A student may petition the Dean’s Office to request that a course teacher review the correction of the student’s final examination paper, in a case in which the student has reason to believe that some oversight may have been made in the correction, or that a mistake may have been made in calculating the course grade. Such petitions must be submitted within one week from the date of the posting of course grades. The Dean’s Office will transmit the petition to the teacher concerned.

3. To change a course grade, the teacher must complete a Change of Grade Form available in the Records Office and submit it to the chairperson of the department, with the supporting evidence, if required in accordance with paragraph 1 above. If the chairperson of the department approves the change of grade, s/he will sign the form and transmit it to the Dean for final approval.

Graduation

Students can graduate at the end of any academic semester. Satisfactory completion of the full curriculum is assured by a two-step process. The chairperson of the department in co-ordination with the faculty advisor of the fourth year students submit to the Office of the Registrar at the American University of Beirut a list with the names of students who will be completing the degree requirements at the end of a given term. At the end of the term, the Registrar’s Office will render a student eligible to receive the degree if that student has met all program requirements, which are:
1. Passed all the required courses and the approved experience;

2. Attained a minimum cumulative course average of 70 excluding freshman level courses and courses taken prior to admission to the FEA;

3. Attained a cumulative average of 70 or more in major courses. Major courses are specified as all engineering courses of 400 and above level, including courses approved as technical electives.

4. Met the residence requirements.

**Graduate Studies**
Students who plan to pursue graduate studies at AUB should have attained an average of at least 80 or an equivalent grade.

**Professional Societies And Awards**

**Professional Societies And Clubs**

All mechanical engineering students have immediate access to student chapters of ASME [American Society of Mechanical Engineers], ASHRAE [American Society of Heating, Refrigeration and Ventilating Engineers] and SME [Society of Manufacturing Engineers]. These societies offer leadership opportunities as well as frequent outside speaker programs and field trips. In addition the Department encourages students to cooperate in engineering oriented extra-curricular activities. Students have recently formed a Robotics club and a Karting club.
Awards

Dean’s Award for Creative Achievement
The Dean’s Award for Creative Achievement, was 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.

- Nature of Award: The award consists of a certificate in testimony of creative achievement as well as the inscription of the recipient’s name on a special board placed in FEA. A student who receives the award three times will be presented with a $500 prize.
- 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 and Computer Engineering, and Mechanical Engineering.
- 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 given to each member of the group.
- Procedure For Nomination And Selection: Faculty members shall submit to the chairperson of the department concerned, just after the final examinations of the spring semester, the names of candidates for the award with justification and supporting material. Selection of the candidate from each program shall be made by the respective department and communicated to the dean for voting by the faculty at the time of voting of degrees at the end of the academic year.

Distinguished Graduate Award
The Distinguished Graduate Award, first announced in June 1998, is given to the graduating senior student who demonstrates high academic achievement, outstanding character, and contribution to the department.

- Number of Awards: One award may be presented yearly, depending on eligibility, to a student in each of the following

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

- Academic Performance: The candidate for the award should have been placed on the Dean’s Honor List for Terms VII, VIII, X and XI and should have been nominated for graduation with distinction or high distinction.

- Character: The nomination letter for the student should include a section addressing the student’s character and should include examples that demonstrate it vis-à-vis his/her classmates and teachers. Emphasis should be given to evidence of exemplary, ethical, and responsible conduct inside and outside the classroom setting.

- Contribution to the Department: The nomination brief should address and evaluate the contributions that the student made to the learning environment in his/her classes and to the department as a whole. This section should include supporting examples.

- Voting: The successful candidate for the award should acquire the vote of at least two thirds of the voting faculty members of the department. Award: The award will consist of an engraved plaque and a certificate signed by the chairperson of the department and the dean of the school.

**Penrose Award**

In 1955 Mrs. Stephen Penrose initiated the Penrose Award in honor of her late husband, President Penrose.

- 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.

- Nature of the Award: The award consists of engraving the recipient’s name on a plaque that is kept on display in Jafet Library.
Nomination and Selection Procedures:

1. 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 terms VIII, X, XI, and XIII for Architecture students and have not repeated any of the above-mentioned terms.

2. 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, or a list of all nominated if less than three, for presentation to the faculty for final vote.

3. A faculty meeting will be called and the list mentioned in ‘2’ will be distributed. Final voting and selection, by the “voting faculty” will be made at this meeting.

4. 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. The above mentioned actions of the faculty will be final and will not be subject to any subsequent considerations.
Frequently Asked Questions [FAQ]

Q1: If I missed my registration time slot or the entire registration period what should I do?
A1: Speak with the FEA Student Services Officer, Alia Kazma Serhal. Her office is located in Bechtel room 302.

Q2: Who is my advisor?
A2: You can find the name of your advisor by logging onto SIS.

Q3: My advisor is not present; to whom should I go for advice?
A3: 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.

Q4: Can I change my advisor?
A4: (If you are in ECE you may change your advisor with the permission of your current advisor and the new advisor. You must complete the appropriate form in the ECE office.)

Q5: How can I get my alternate PIN?
A5: Your advisor has your alternate PIN number.

Q6: My advisor does not have my alternate PIN, who can give me this information?
A6: Speak with the FEA Student Services Officer, Alia Kazma Serhal. Her office is located in Bechtel room 302.

Q7: How do I use the alternate pin?
A7: After you log on to SIS you will be asked to give your PIN.

Q8: How do I find out the English level I am placed in?
A8: 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.

**Q9: I took ENGL 204 do I need to take ENGL 206?**
A9: 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 must be taken.

**Q10: I was placed in English 204 do I take it or 206 instead?**
A10: If you are in engineering or the architecture program you must take ENGL 206. If you are a graphic design major you should take ENGL 204.

**Q11: 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?**
A11: This information is available in the Department of Arabic and Near Eastern Languages located in College Hall on the 4th floor. Check the website of the Arabic Department: [http://staff.aub.edu.lb/~webarab/apt.htm](http://staff.aub.edu.lb/~webarab/apt.htm)

**Q12: What Arabic course should I take?**
A12: 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.

**Q13: Should I follow the required course list exactly? Which courses have prerequisites? Which courses can I delay taking?**
A13: 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.

**Q14: What are the humanities courses or the social sciences course I am permitted to take?**
A14: First check the FEA section of the most recent catalogue for a complete list of the acceptable electives. [http://www.aub.edu.lb](http://www.aub.edu.lb) if you still have questions see your advisor.
Q15: May I take my humanity electives in business or engineering management?
A15: Business and engineering management courses are not considered humanity courses.

Q16: How do I register for a minor in engineering management?
A16: 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.

Q17: How do I apply for a minor in bio-medical engineering?
A17: Check the AUB Undergraduate Catalogue for the requirements then complete the form on the ECE home page.

Q18: Can I take a graduate course as an elective?
A18: 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.

Q19: What are the ethics courses?
A19: Check the FEA section of the most current catalogue.

Q20: Where can I find the list of science electives?
A20: Check the departmental section for your major in the most recent catalogue for a complete list of the approved science electives.

Q21: What should I do when I can not register in my core course?
A21: Contact your department.

Q22: I am a fourth year student, I cannot register in a course that is required what should I do? I need the course.
A22: Contact the Student Services Officer for difficulties registering in courses outside the FEA.

Q23: If while trying to register for a course I get a prerequisite or a test score error, what should I do?
A23: 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.

Q24: Should I go to the Registrar to have restrictions removed?
A24: No, you should go to the department offering the course.

Q25: Why are there restrictions on courses for majors?
A25: Registration restrictions are put on some courses to give priority to students who need the course to complete the requirements in their major.

Q26: If the capacity in an FEA class needs to be increased in order for me to register, what should I do?
A26: 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.

Q27: Why must I ask permission from a chair or coordinator to open capacity if there is space?
A27: Some courses have restrictions placed on them to ensure that students who require the course for their major will be able to register.

Q28: If the capacity of a course outside the FEA must be increased in order for me to register, what should I do?
A28: You should see the Student Services Officer who will assist you by contacting the appropriate department.

Q29: Can capacity in lab class be opened if I bring my own laptop?
A29: No, the space in a lab class is strictly limited.

Q30: Can I switch sections if the section is open?
A30: Yes, you may switch sections but it can be done only during the drop and add period.

Q31: Why can’t my department open capacity in other Faculties?
A31: 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.

Q32: Do I have to wait until drop and add day to change my registration?
A32: 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.

Q33: What is the course load that I am required or permitted to take during the summer?
A33: 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.

Q34: How do I request an overload?
A34: 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.

Q35: What is the minimum grade that I need to clear probation?
A35: The minimum grade required to remove probation is dependent 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)

**Q36: How and when can I transfer out of, or into a department?**
A36: 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).

**Q37: What is the minimum grade average needed to transfer?**
A37: 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.

**Q38: 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?**
A38: 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.

**Q39: Can I use the courses that I took courses abroad as an exchange student as part of my graduation requirements?**
A39: Yes, if the courses are pre-approved through a petition to the FEA Academic Committee.

**Q40: What must I do concerning my summer training internship?**
A40: Check with the FEA Career Development Center and remember you must register for the Approved Experience course in your major.

**Q41: What is my class rank?**
A41: The FEA does not provide any ranking beyond the honor list.

**Q42: What forms do I need to complete before, during and after my internship?**
A42: All engineering programs require:
Proposal of Approved Experience form
Notice of Arrival form
Q43: How many students can be in an FYP group?  
A43: Check with your department.

Q44: I am a fourth year student what courses do I need to graduate?  
A44: Check with your advisor. There is a degree evaluation on SIS and on the WEB

Q45: What do I do to get a clearance for graduation?  
A45: Go to the Registrar on line and click on Forms.

Q46: What forms should I complete before my graduation?  
A46: You must complete the following forms: 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.

Q47: How can I know that I have taken all my required courses and that I am eligible for graduation?  
A47: Check with your advisor. There is a degree evaluation on SIS and on the WEB

Q48: What is my GPA? How do I translate this to the 4.0 scale?  
A48: Your GPA is on your transcript. You can get a conversion table at the Registrar’s Office.

Q49: How can I know my graduation GPA?  
A49: You must wait until all your final grades are posted on the web. Your final average will be included on your transcript.

Q50: When I apply to graduate school, what courses are used to calculate my GPA?
A50: 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.
Appendix I Distribution Of Requirements In Humanities/Social Sciences

All ME students take a minimum of 27 credits of general education requirements in Humanities and Social Sciences distributed as follows:

- 6 credits in English Communication Skills through English 206
- 3 credits in Arabic Communication Skills (except those formally exempted)
- 12 credits in Humanities.
- 6 credits in Social Science.

In addition ME students take the equivalent of 9 credits of:

- Natural Sciences courses (6 credits)
- Quantitative Thoughts courses (3 credits)

The list of courses satisfying these requirements are listed in the document [http://www.aub.edu.lb/registrar/Documents/pdfdoc/general-education-courses.pdf]
Appendix II - Mechanical Engineering Course Descriptions

AII.1 Undergraduate Courses

MECH 200 Mechanical Engineering Tools [3 cr.]
The course seeks to introduce students to the mechanical engineering discipline, build the student’s interpersonal and communication skills, and give them insight about engineering concepts and creative design principles and an overview of mechanical engineering as a profession, and ethics in engineering. Teamwork experience is highly stressed. Prerequisites: MECH 220

MECH 220 Engineering Graphics [1 cr.]
The course aims at preparing the future engineer to be able to understand and create technical drawings. The course seeks to develop the student effective utilization of computer-aided drafting (CAD) skills in order to create engineering drawings. Orthogonal projection, exploded and auxiliary views, sectioning and sectional views, dimensioning and tolerance schemes, standard drawing formats, and detailing. Introduction to the use of CAD packages (AutoCAD).

MECH 230 Dynamics [3 cr.]
A basic course in engineering mechanics covering dynamics of particles and planar rigid bodies. This course introduces Newton’s law of motion, the principle of work and energy, and the principle of impulse and momentum. Diagrammatic representation of the basic laws are applied on motion of particles, systems of particles, and rigid bodies. Prerequisite: CIVE 210 and MATH 201.

MECH 310 Thermodynamics I [3 cr.]
This course seeks to provide a methodology by which student’s view objects in the physical universe as “systems” and apply to them the basic laws of conservation of mass, energy and the entropy balance. The course covers the thermodynamic state and properties of a pure substance, energy and mass conservation, entropy and the second law. Applications are to closed setups and flow devices. Simple vapor and gas cycles applications.
MECH 314/CHEN 311 Introduction to Fluids Engineering [3 cr.]
An introductory course on fluid behavior emphasizing conservation of mass, momentum, and energy and dimensional analysis, study of fluid motion in terms of the velocity field, fluid acceleration, the pressure field, and the viscous effects; applications of Bernoulli’s equation, Navier-Stokes, and modeling; flow in ducts, potential flows, and boundary layer flows. Prerequisite: MECH 310.

MECH 320 Mechanics of Materials [3 cr.]
A course that addresses the mechanical behavior of materials under different loadings such as; axial, bending, transverse shear, torsion, and combined loadings. Stress and strain transformation is discussed. Deflection of beams and buckling in columns are covered. Prerequisite: CIVE 210.

MECH 332 Mechanics of Machines [3 cr.]
A course that deals with the mechanization of motion, kinematics analysis of linkage mechanisms, synthesis of cam-follower mechanisms, gear terminology and types of gears, analysis and synthesis of gear trains, force analysis, and introduction to linkage synthesis; computer aided project. Prerequisite: MECH 230. Annually.

MECH 340 Engineering Materials [3 cr.]
The course introduces fundamental concepts in materials science as applied to engineering materials: crystalline structures, imperfections, dislocations, and strengthening mechanisms, diffusion, phase diagrams and transformations, ferrous and non-ferrous metal alloys, ceramics, and polymers, structure-property relationships, Material selection case studies.

MECH 341 Materials Lab [1 cr.]
The course seeks to accompany and compliment MECH 340: Engineering Materials. The laboratory sessions are designed to impart a qualitative & quantitative understanding of the mechanical properties of engineering materials. The laboratory sessions will also examine topics related to the microstructure of materials. Co-requisite: MECH 340 Engineering Materials.
MECH 410L Thermal/Fluid Systems Laboratory [1 cr.]
A series of experiments in basic thermodynamic cycles, psychrometry, combustion and elementary fluid mechanics. Special emphasis on the use of the computer as a laboratory tool for data acquisition, reduction, analysis, and report preparation. Prerequisite: MECH 310 Thermodynamics I.

MECH 412 Heat Transfer [3 cr.]

MECH 414 Thermodynamics II [3 cr.]
A course investigating the availability and work potential of systems; irreversibility; second law efficiency; availability; gas mixtures; air conditioning; chemical reactions; high speed flow; nozzles and diffusers; environmental, economic, and social implications. Prerequisites: MECH 310.

MECH 420 Mechanical Design I [3 cr.]
This is an introductory course in machine design in which one learns how to determine the structural integrity of common machine components and to apply this knowledge within the context of machine design problems. Mechanical elements such as shafts, bearings, springs, welding joints and fasteners are studied with emphasis on their behavior under both static and fatigue loading. Prerequisites: MECH 320 and MECH 340.
MECH 421 Manufacturing Processes I [2.1, 3 cr.]  
A course covering traditional material removal processes (machining and abrasion), CNC machining, as well as non-traditional material removal processes (EDM, ECM, thermal cutting, etc.); the science behind these technologies; assembly processes such as welding, brazing, soldering, and fastening are also covered. The course emphasizes process capabilities and limitations, relative cost, and guidelines for process selection; and design for manufacturing guidelines. This course contains hands-on exercises in a machine shop environment. Prerequisite: MECH 320 and MECH 340.

MECH 430 Process Instrumentation & Measurements [2.1; 3 cr.]  
A course on general concepts of measurement systems; classification of sensors and sensor types; interfacing concepts; data acquisition, manipulation, transmission, and recording; introduction to LABVIEW; applications; team project on design, and implementation of a measuring device. Prerequisites: PHYS 211 and EECE 312. Co-requisite: MECH 200.

MECH 432 Dynamic Systems Analysis [2 cr.]  
A course introducing dynamic modeling and analysis of mechanical electrical, thermal and fluid systems. The course integrates software to test and analyze the modeled systems. Pre-requisites: EECE 210, and CIVE 210.

MECH 435 Control Systems [2 cr.]  
A lecture course which teaches the fundamentals about analysis of dynamic systems and design appropriate feedback control. The course includes a project and is taught in conjunction with a lab course MECH 435L. Prerequisites: EECE 210, MECH 430, and MECH 432.

MECH 435L Control Systems Laboratory [1 cr.]  
This course involves a series of hands-on experiments on modeling and design of control systems using Matlab, Simulink and Labview. The course also includes a team project. Co-requisite: MECH 435.
MECH 499 Undergraduate Research [3 cr.]
This course provides undergraduate students with advanced standing the opportunity to participate in faculty supervised research. Before registering, students must submit a proposal for approval by the supervising faculty member and the department; the proposal must describe the nature of the research, specific goals, and deliverables at the end of the semester. The course may be counted once, as a technical elective. Prerequisites: Completion of 65 required credits in the major, and a cumulative average of 80 or above.

MECH 500 Approved Experience [0 cr.]
An eight week professional training course in mechanical engineering.

MECH 501 Final Year Project I [1 cr.]
A supervised project in groups of normally three students aimed at providing practical experience in some design aspects of mechanical engineering. Students are expected to complete a literature survey, to critically analyze the design, and to acquire the necessary material needed for their intended end product. Prerequisite: MECH 420 and MECH 500, and MATH 251.

MECH 502 Final Year Project II [4 cr.]
A course in which the student integrates his/her acquired knowledge to deliver the product researched and planned in MECH 501. Prerequisite: MECH 501.

MECH 503 Special Topics in Mechanical Engineering [3 cr.]
MECH 510 Design of Thermal Systems [2.1; 3 cr.]
The course seeks to develop in students the ability to integrate rate mechanisms (h.k., heat transfer and fluid dynamics) into thermodynamic system modeling and analyses and provide design opportunities through open-ended problems with explicit considerations of engineering economics, optimization, environmental impact, ethical concerns, manufacturability and sustainability. Teamwork experience and communication skills are highly stressed. The students will gain some hands-on experience with the tools of investigation used for thermal and fluid systems and learn how to approach and solve problems typically encountered in engineering experimental work. Co-requisites: MECH 410L, Pre-requisites: MECH 412, and MATH 251.

MECH 511 Intermediate Fluid Mechanics [3 cr.]
A course that deals with potential flow and boundary layer analysis, lift and drag, flow separation, the use of computational techniques to solve boundary layer problems, viscous internal channel flow and lubrication theory, one-dimensional compressible flow in nozzles and ducts, normal shock waves and channel flow with friction or heat transfer, fluid machinery including pumps and hydraulic turbines. Prerequisites: MECH 314 and MECH 412.

MECH 512 Internal Combustion Engines [2.1; 3 cr.]
A course that examines the fundamentals of internal combustion engine design and operation, with emphasis on fluid/thermal processes. Topics include analysis of the respiration, combustion, and pollutant formation processes, heat transfer and friction phenomena, engine types and performance parameters, thermo-chemistry of fuel-air mixtures, the use of engine cycle models for performance predictions, and social implications of motorization. Pre- or co-requisites: CHEM 202, MECH 414, and MECH 430.

MECH 513 Air Conditioning [3 cr.]
A course on human thermal comfort and indoor air quality; solar radiation; heating and cooling load calculations in buildings; air
conditioning systems; air and water distribution systems; computer-based calculations. Prerequisite: MECH 412.

**MECH 514 Gas Turbines [3 cr.]**
A course that introduces the thermodynamic and aerodynamic theory forming the basis of gas turbine design: shaft power cycles, gas turbine cycles for aircraft propulsion, turbofan and turbojet engines, design and analysis of centrifugal and axial flow compressors and turbines. Prerequisites: MECH 314 and MECH 414.

**MECH 515 Steam Turbines [3 cr.]**
A course that deals with impulse and reaction steam turbines, steam turbine cycles, flow of steam in nozzles, design aspects of turbines stage losses and efficiency, velocity diagrams, and impulse and reaction blading velocities, nucleation, condensation, and two-phase phenomena in flowing steam, boiler room and its various equipment, the complete steam power plants, governors, electric generator, and power transmission lines. Pre- or co-requisites: MECH 314 and MECH 414.

**MECH 516 Aerodynamics [3 cr.]**
A course on theoretical and empirical methods for calculating the loads on airfoils and finite wings by application of classical potential theory, thin airfoil approximations, lifting line theory, and panel methods, wings and airplanes, application of linearized supersonic flow to supersonic airfoils, performance and constraint analysis, longitudinal stability and control. Pre- or co-requisites: MECH 314 and MECH 414.

**MECH 517 Hydraulic Turbines for Power Generation[3 cr.]**
This course presents the principles and development of hydraulic turbines with emphasis on the techniques for formulating and solving problems. The importance of the incoming flow direction will be stressed. The Pelton, or tangential flow, turbine will be studied in detail. The course will provide a brief introduction to cavitation. Prerequisites: MECH 310 and MECH 410.
MECH 518 Environmental Challenges in Managing Ozone Depleting Substances [3 cr.]
Introduction to environmental issues related to engineering. Review of selected multilateral agreements and, in particular, review of the Montreal Protocol with emphasis on compliance strategies and discussion of the current status of ozone depleting substances [ODS]. Available technologies that work best now and a look to future technologies and alternatives. Applications are related to fire fighting, aerosols, solvents, foams and pesticides. Management of ODS programs, good practices and safety issues. Prerequisite: MECH 310 or equivalent.

MECH 519 Compressible Flow [3 cr.]
The objective of the course is to impart an understanding of the fundamental principles of steady and unsteady one-dimensional gas flow. The course covers the behavior of homenergic and homentropic flow, develops an understanding of normal shock waves and homenergic flow in nozzles, shows how to analyze frictional homenergic flow in a constant-area duct and frictionless diabatic flow in a constant-area duct, discusses the fundamental behavior of one-dimensional unsteady flow of a perfect gas, and shows how to draw skeleton wave diagrams of wave processes. Prerequisite: MECH 310, MECH 314

MECH 520 Mechanical Design II [3 cr.]
This is an advanced course in mechanical design. Students taking this course are expected to have a firm grasp in the fundamentals of failure theories. This course proposes the methods for designing and selecting components such as gears, belts, clutches, brakes, flywheels, and journal bearings. A design project using a finite element package is emphasized. Prerequisites: MECH 332 and MECH 420.
MECH 521 Manufacturing Processes II [2.1; 3 cr.]
A course on heat treatments, deformation, phase-change, and particulate consolidation processing of metals; fabrication processing of non-metallic engineering materials such as ceramics, polymers, and composites; emphasis on process capabilities and limitations, relative cost, and guidelines for process selection; the behavior of materials under processing conditions; design for manufacturing guidelines. This course emphasizes hands-on training exercises. Prerequisite: MECH 340.

MECH 522 Mechanical CAD/CAE/CAM [3 cr.]
The course gives students exposure to the realm of computer-aided design (CAD), computer-aided engineering (CAE), and computer-aided manufacturing (CAM). The course teaches the students to harness the power of these powerful tools in the solution of various problems of mechanical engineering. The course utilizes several commercially available software packages but the emphasis is placed on Pro/Engineer. Prerequisites: MECH 320, MECH 420 and MECH 432

MECH 530/ EECE 560 Mechatronics System Design [2.1; 3 cr.]
A course that discusses mechatronics, data, numbering systems, architecture of the 8-bit Motorola MC68HC11 microcontroller, assembly language programming, A/D and D/A conversion, parallel I/O, programmable timer operation, interfacing sensors and actuators, applications, a team project on design and implementation of a mechatronic system. Prerequisites: EECE 312, MECH 430 or EECE 461

MECH 531 Mechanical Vibrations [3 cr.]
A course on free and forced response of non-damped and damped system; damping vibration absorption; response of discrete multi-degree of freedom systems; modal analysis; vibration measurement, case studies, vibration analysis with Matlab and Simulink. Prerequisite: MECH 230.
MECH 532 Dynamics and Applications [3 cr.]
This course examines the dynamics of particles and rigid bodies moving in three dimensions. Topics include Lagrange’s equations of motion for particles, rotations of rigid bodies, Euler angles and parameters, kinematics of rigid bodies, and the Newton-Euler equations of motion for rigid bodies. The course material will be illustrated with real-world examples such as gyroscopes, spinning tops, vehicles, and satellites. Applications of the material range from vehicle navigation to celestial mechanics, numerical simulations, and animations. Pre-requisites: MECH 230.

MECH 533 Electric Machines and Drives [3 cr.]
This course covers the fundamentals of electromagnetic circuits, three-phase circuits, transformers: single-phase ideal and real transformers, construction and operation; fundamentals of AC machines, operation of synchronous generators; induction motors: construction and principle of operation, power, torque, and efficiency expressions; AC drives: starting and speed control strategies, plugging and regenerative breaking; DC motors types and control strategies, stepper motors: types, operational characteristics, drivers configurations. 
Prerequisites: EECE 210 and MECH 310.

MECH 535 Fluid Power Systems [3 cr.]
This is a senior level undergraduate course which covers the fundamentals of fluid power transmission and drive technology. Students learn about the main hydraulic and pneumatic components and their static and dynamic performance characteristics. Students learn how to read circuit diagrams and understand the principles of circuit operations. Through the use of simulation software students will learn to design and analyze complex fluid power systems. Prerequisite: MECH 314 and MECH 435.

MECH 540 Selection and Properties of Materials [3 cr.]
A course that reviews the mechanical behavior of materials. Topics covered include structure-property relationships in materials, continuum mechanics and tensor notation, theorems of elastic, plastic,

**MECH 550 Computer Applications in Mechanical Eng’g [3 cr.]**
A course dealing with the application of numerical techniques to the solution of a variety of mechanical engineering problems involving systems of linear or non-linear algebraic equations, systems of ordinary differential equations of the initial and boundary value types, systems of ordinary differential equations, and partial differential equations of the parabolic, elliptic, and hyperbolic types. Engineering applications are introduced through a number of case study problems. Prerequisite: MATH 202 and MATH 251

**MECH 555/EECE 463 Artificial Intelligence for Control Systems [3cr.]**
This is an introductory course in the evolving field of artificial intelligence (AI) for control systems. It aims at giving students a solid foundation in AI by covering basic techniques such as A* searching, reasoning under uncertainty, probabilistic reasoning over time, multi objects tracking, path planning, scheduling, communicating, perceiving and learning as applied to control systems, robotics and manufacturing. The group project and individual lab assignments will provide students with hands on implementation experience of an intelligent control agent capable of basic learning. *Prerequisites: EECE 460 or MECH435*
AII.2 Graduate Courses

MECH 600 Applied Reservoir Engineering 1 [3 cr.]
This course introduces the concepts and principles needed to understand and to analyze hydrocarbon reservoir fluid systems; defines (with the help of geological and petrophysical principles) the size and contents of petroleum accumulations. Students will learn to organize programs for systematically collecting, recording, and analyzing data describing fundamental characteristics of individual well and reservoir performance (h.k. pressure, production, PVT data). The course covers topics on: fundamental concepts of fluid distribution, porosity distribution, trapping conditions; nature and type of primary drive mechanisms; production rates, ultimate recoveries, and reserves of reservoirs; supplementary recovery schemes to augment and improve primary recovery; economics analysis of developing and producing reservoirs and conducting supplementary recovery operations. Pre-requisite: MECH 314 or CIVE 340.

MECH 602 Energy Conservation and Utilization [3 cr.]
A course that deals with methods for reduction of losses and gains from a building envelope, energy conservation in cooling, heating, air-handling, and plumbing systems, energy management program. Prerequisites: MECH 310 and MECH 412.

MECH 603 Solar Energy [3 cr.]
A course discussing the fundamentals of solar radiation, collectors and concentrators, energy storage, estimation and conversion formulas for solar radiation. Prerequisite: MECH 412.

MECH 604 Refrigeration [3 cr.]
A course on fundamental concepts and principles, cold storage; functions and specifications of refrigeration equipment, applications. Prerequisite: MECH 412.
MECH 606 Aerosol Dynamics [3 cr.]
This course covers the physical and chemical principles that underlie the behavior of aerosols—collections of solid or liquid particles suspended in gases, such as clouds, smoke, and dust—and the instruments used to measure them. Topics include: aerosol particle characterization, transport properties and phenomena in quiescent, laminar, and turbulent flows, gas- and particle-particle interactions, and applications to human respiratory tract deposition and atmospheric pollution. Prerequisites: MECH 314, MECH412, MECH414, or approval of instructor.

MECH 607 Micro Flows Fundamentals and Applications [3 cr.]
A course on theory and applications of micro flows, the continuum hypothesis and the various flow regimes, shear and pressure driven micro flows, electrokinetically driven liquid micro flows, compressibility effects of micro flow of gases, particulate flows in bio-applications, modeling techniques, hybrid continuum-molecular methods, reduced order modeling of micro flows in multi-physics micro flow applications, case studies in BioMEMS. Prerequisites: MECH 310, MECH 314.

MECH 608 Applied Reservoir Engineering II [3 cr.]
This course introduces the advance concepts and principles needed to analyze hydrocarbon reservoir fluid systems, and defines the size and contents of petroleum accumulation. Students will learn to organize programs for collecting, recording, and analyze data describing the advanced characteristics of individual well and reservoir performance. This course of advanced reservoir engineering topics covers the concepts of fluid flow in porous medium, fluid distribution, fluid displacement, fractional flow equation and Buckley-Leverette equation, pressure draw-down and pressure buildup analysis, nature and type of primary, secondary and tertiary recovery, water influx and prediction of water-flood behavior, and reservoir model simulation and history matching. Prerequisite: MECH 600.
MECH 609 Experimental Methods in Fluid Dynamics [3 cr.]
This is a graduate level course to introduce students to experimental methods used to measure fluid flow quantities such as pressures, forces, and velocities. The course starts with an introduction to what and why we measure, and to uncertainty analysis and measurement error estimation. Some basic techniques for data reduction and data post-processing will be introduced. The available fluid measurement methods will be surveyed briefly, with selected applications. Emphasis will be on advanced optical diagnostic techniques, namely particle image velocimetry [PIV], and laser induced fluorescence [LIF]. The theoretical foundations of these techniques will be established, and the discussion will extend to practical considerations including software and hardware components. A few laboratory sessions will be incorporated into the course to supplement the lectures, and will make use of the instruments available in the ME department including the open circuit wind tunnel, and the PIV system. In addition to the lectures and lab sessions, emphasis will be also on the available literature. Prior knowledge of the basic principles of fluid mechanics and fluid systems is required. MATLAB will be needed for course work. Pre-requisite: MECH 314.

MECH 619 Quality Control in Manufacturing Systems [3 cr.]
The course covers the foundations of modern methods of quality control and improvement that may be applied to manufacturing industries. It aims is to introduce students to the tools and techniques of quality control used in industrial applications, and develop their ability to apply the tools and techniques to develop solutions to industrial problems. Emphasis is given to the application of quality management techniques to solve industrial case problems. The course emphasizes the philosophy and fundamentals of quality control, the statistics foundations of quality control, statistical process control, acceptance sampling, and product and process design. Prerequisites: STAT 230 and MECH 421.

MECH 622 Modeling of Machining Processes & Machines [3 cr.]
This course covers the principles and technology of metal machining; mechanics of orthogonal and 3D metal cutting; static deformations, force and self-excited vibration and chatter; and design principles of metal cutting CNC machines. Prerequisite: MECH 421.
MECH 624 Mechanics of Composite Materials [3 cr.]
A course on anisotropic elasticity and laminate theory, analysis of various members of composite materials, energy methods, failure theories, and micro-mechanics. Materials and fabrication processes are introduced. Prerequisites: MECH 320 or CIVE 310, and MECH 340 or equivalent.

MECH 625 Fatigue of Materials [3 cr.]
A course that deals with high cycle fatigue, low cycle fatigue, S-N curves, notched members, fatigue crack growth, cycling loading, Manson-Coffin curves, damage estimation, creep and damping. Prerequisite: MECH 320 or CIVE 310.

MECH 626 Metals and their Properties [3 cr.]
A course that investigates ferrous and non-ferrous alloys, industrial equilibrium diagrams, heat treatment of metals, surface properties of metals, plastic deformation of metals, elements of fracture mechanics, process-structure-properties relations. Prerequisite: MECH 340.

MECH 627 Polymers and their Properties [3 cr.]
A course on chemistry and nomenclature, polymerization and synthesis, characterization techniques, physical properties of polymers, viscoelasticity and mechanical properties, applications. Prerequisite: MECH 340.

MECH 628 Design of Mechanisms [3 cr.]
A course involving graphical and analytical synthesis of single- and multi-loop linkage mechanisms for motion, path, and function generation through 2-3-4- and 5 precision positions, optimum synthesis of linkage mechanisms, synthesis of cam-follower mechanisms, synthesis of gear trains. Prerequisite: MECH 332.
MECH 630 Finite Element Methods in Mechanical Engineering [3 cr.]
A course on the classification of machine components, displacement-based formulation, line elements and their applications in design of mechanical systems, isoparametric formulation, plane stress, plane strain, axi-symmetric, and solid elements and their applications, modeling considerations and error analysis, introduction to ALGOR general formulation and Galerkin approach, analysis of field problems. Prerequisites: MECH 420 and MATH 251.

MECH 631 Micro Electro Mechanical Systems [MEMS] [3 cr.]
A course that deals with materials for micro-sensors and micro-actuators, materials for micro-structures, micro fabrication techniques and processes for micromachining, computer-aided design and development of MEMS, commercial MEMS structures and systems, packaging for MEMS, future trends, and team project. Prerequisite: MECH 430.

MECH 633 Biomechanics [3 cr.]
A course on the study of the biomechanical principles underlying the kinetics and kinematics of normal and abnormal human motion. Emphasis is placed on the interaction between biomechanical and physiologic factors (bone, joint, connective tissue, and muscle physiology and structure) in skleto-motor function and the application of such in testing and practice in rehabilitation. The course is designed for senior level undergraduate/graduate engineering students with no previous anatomy/physiology. Prerequisite: MECH 320 or CIVE 310, or consent of instructor.

MECH 634 Biomaterial and Medical Devices [3 cr.]
Course that examines the structure-property relationships for biomaterials and the medical applications of biomaterials and devices. The first part of the course focuses on the main classes of biomaterials, metal, ceramic, polymeric, and composite implant materials, as well as their interactions with the human body (biocompatibility). The second part of the course examines the various applications of biomaterials and devices in different tissue and organ systems such as orthopedic, cardiovascular, derivation matology, and dental applications. Experts from the medical
community will also be invited to discuss the various applications. Prerequisite: MECH 340 or approval of instructor.

**MECH 637 Micromechanics and Crystal Plasticity [3 cr.]**
This course covers the theoretical knowledge of the deformation process in single and polycrystalline solids with an emphasis on the role of dislocations and other types of defects on the overall mechanical properties of materials. Topics will include an introduction to crystallography, defects in crystals, fundamentals of dislocations, strengthening mechanisms, microstructures, and yielding. Prerequisites: MECH 340, MECH 320

**MECH 641/EECE 661 Robotics [3 cr.]**
A course discussing concepts and sub-systems; robot architecture; mechanics of robots: kinematics and kinetics; sensors and intelligence; actuators; trajectory planning or end effector motion; motion and force control of manipulators; robot languages. Prerequisite: MECH 435 or EECE 460.

**MECH 642/EECE 692 Computer Vision [3 cr.]**
An introductory course on the problems and solutions of modern computer vision. Topics covered include image acquisition, sampling and quantization; image segmentation; geometric framework for vision: single view and two-views; camera calibration; stereopsis; motion and optical flow; recognition; pose estimation in perspective images. Prerequisites: MATH 202 and EECE 230.

**MECH 643 Mechatronics & Intelligent Machines Eng’g II [3 cr.]**
A course on sensors, sensor noise and sensor fusion, actuators, system models and automated computer simulation, information, perception, and cognition, planning and control, architecture, design, and development, a team project is included. Prerequisites: MECH 340 and MECH 530.

**MECH 644 Modal Analysis [3 cr.]**
A course reviewing MDOF system vibrations, frequency response functions, damping, mobility measurement, curve fitting and modal parameter extraction, derivation of mathematical models, laboratory experiments, and projects are included. Prerequisite: MECH 531.
MECH 645 Noise and Vibration Control [3 cr.]
A course on fundamental concepts in noise and vibration, passive and active damping strategies, damping materials, control methods, applications. Prerequisite: MECH 230, MATH 212, and MECH 531.

MECH 646/EECE 697 Wheeled Mobile Robotics [3cr.]
A course that provides an in-depth coverage of wheeled mobile robots. The material covers (i) Nonholonomy and integrability of kinematic constraints, (ii) Modeling: kinematics, dynamics and state-space representation and (iii) Nonlinear control strategies (open-loop and closed –loop). Five case studies are covered all-over the course: car-like, cart-like, omni- directional wheeled, mobile wheeled pendulums and bike-like robots. Prerequisite: Senior or graduate standing.

MECH 647/EECE 699 Hydraulic Servo Systems [3 cr.]
A graduate lecture course which teaches the fundamentals of modeling and control of hydraulic servo-systems. It provides theoretical background and practical techniques for the modeling, identification and control of hydraulic servo-systems. Classical and advanced control algorithms are discussed. The use of Matlab/Simulink and DYMOLA will be an integral part in this course. Prerequisites: MECH 314 and MECH 435 or EECE 460.

MECH 648/EECE 669 Nonlinear Systems: Analysis, Stability, and Control [3 cr.]
This course presents a comprehensive exposition of the theory of nonlinear dynamical systems and its control with particular emphasis on techniques applicable to mechanical systems. The course will be punctuated by a rich set of mechanical systems examples, ranging from violin strings vibration to jet engines, from heart beats to vehicle control, and from population growth to nonlinear flight control. Prerequisite: MECH 435 or EECE 460.
MECH 650/EECE 698 Autonomous Mobile Robotics [3 cr.]
This course is designed to provide engineering graduate and 4th year students with the opportunity to learn about autonomous mobile robotics. Topics include sensor modeling, vehicle state estimation, map-based localization, linear and nonlinear control, and simultaneous localization and mapping. Prerequisites: EECE 230, EECE 312, and MECH 435 or EECE 230 and EECE 460.

MECH 654/EECE 660 System Analysis and Design [3cr.]
A course that outlines state-space models of discrete and continuous, linear and nonlinear systems; controllability; observability; minimality; Eigenvector and transforms analysis of linear time invariant multi-input multi-output systems; pole shifting; computer control; design of controllers and observers. Prerequisite: Senior or graduate standing.

MECH 655/EECE 662 Optimal Control [3cr.]
A course on optimization theory and performance measures, calculus of variations, the maximum principle, dynamic programming, numerical techniques, LQR control systems. Prerequisite: Senior or graduate standing.

MECH 656/EECE 663 System Identification [3cr.]
This course introduces the fundamentals of system identification as the basic mathematical tools to fit models into empirical input-output data. While rooted in control theory, applications extend to general time-series modeling and forecasting, such as stock prices, biological data and others. Topics covered include nonparametric identification methods: time and frequency response analysis; parametric identification methods: prediction error methods, least squares, linear unbiased estimation and maximum likelihood; Convergence, consistency and asymptotic distribution of estimates; properties and practical modeling issues: bias distribution, experiment design and model validation. Prerequisite: Senior or graduate standing.
MECH 660 Advanced Fluid Mechanics [3 cr.]
A course that examines fundamental concepts and principles in addition to basic relations for continuous fluids; Vorticity dynamics, Kelvin Helmholtz theorems; Navier-Stokes equations; and turbulence and oscillating flows. Prerequisite: MECH 314.

MECH 663 Computational Fluid Dynamics [3 cr.]
A course that deals with discretization process in fluid dynamics, numerical approaches and applications, interactive and direct matrix methods, numerical implementation of turbulence models. Prerequisites: MECH 314 and MECH 412.

MECH 665 Unsteady Gas Flow [3 cr.]
A course examining equations of unsteady continuous adiabatic multidimensional flows, unsteady continuous one-dimensional flow of a perfect gas with and without discontinuities, applications, pressure exchangers. Prerequisite: MECH 414.

MECH 670 Laboratory for Renewable Energy in Buildings [2 cr.]
A laboratory course that will investigate means of reducing building energy consumption first through green building design, giving consideration to building orientation, thermal massing, wind- and buoyancy-driven flows, “urban heat island” effects, and second, by retrofitting existing buildings with energy saving materials and devices such as window films, solar water heaters, and green roofs. This course is offered because in Lebanon and the region, electricity consumption for building services accounts for a major portion of national energy use and greenhouse gas emissions. Students will measure and compare effects of various designs and retrofit interventions on the thermal performance, lighting and glare, and natural ventilation of model-scale buildings, and characterize performance of devices used in green building design. Lab assignments may vary by semester but will normally include mathematical modeling and experimental measurement components organized around aspects of building physics. Prerequisite: MECH 430.
A course that covers the principles and utilization of solar (Thermal and photovoltaic), wind, and geothermal energy, as well as energy from biomass. Issues relevant to energy efficiency and energy storage are discussed (heat and power store and bio-tanks). The course distinguishes between energy sources for large-scale, industrial/commercial settings and those intended for smaller structures. The potential of using renewable energy technologies as a complement to and, to the extent and non-renewable energy technologies in hybrid systems are analyzed. Design aspects of active, passive, wind, bio-energy, and photovoltaic energy conversion systems for buildings; and strategies for enhancing the future use of renewable energy resources are presented. The course will include several demonstrations of concept experiments. Prerequisite: MECH 310. Students cannot receive credit for both MECH 671 and EECE 675.

MECH 672 Modeling Energy Systems [3 cr.]
A course that covers indoor space thermal models. The course also deals with the analysis and modeling of building energy systems involving applications of thermodynamics, economics, heat transfer, fluid flow and optimization. The use of modern computational tools to model thermal performance characteristics of components of HVAC systems including chillers, recovery systems, boilers, condensers, cooling towers, fans, duct systems, piping systems and pumps. The course will use modern simulation tools extensively. Prerequisite: MECH 310.

MECH 673 Energy Efficient Buildings with Good Indoor Air Quality [3 cr.]
The course covers energy consumption standards and codes in buildings; energy conservation measures in built in environment to enhance the building’s energy efficiency while maintaining space thermal comfort and indoor air quality requirement; fundamental ventilation, indoor-air-quality, infiltration natural and mechanical ventilation, importance and impact of indoor air quality on human health and energy performance of the building air conditioning system; and ASHRAE requirement for ventilation. Particular focus
will be given to green energy alternative measures. An overview of the different heating, ventilation and air conditioning system designs is covered. Performance and energy consumption of the conventional air conditioning system (constant and variable air volume) as well as the hybrid integrated air conditioning systems will be discussed and compared. The course will include several demonstrations of concept experiments. Prerequisite: MECH 310.

**MECH 674 Energy Economics and Policy [3 cr.]**
A course that aims at developing an understanding of practical analytical skills of energy economics and planning approaches taking into account the cost of impact on the environment. This course will cover fundamental concepts of economic issues and theories related to energy, such as economics of natural and energy resources, aggregate supply and demand analysis, and the interrelationship between energy, economics and the environment as well as some important issues in energy policy. The course will also demonstrate the use of economic tools for decision making in energy and environment planning and policy. It will explore the terminology, conventions, procedures and planning policy applications. It will also cover a number of contemporary energy and environmental policy issues, including energy security, global warming, regulations of energy industries, energy research and development, and energy technology commercialization. Prerequisite: ENGM 400. Students cannot receive credit for both MECH 674 and ECON 333.

**MECH 675 Building Energy Management Systems [3 cr.]**
A course that provides an opportunity for students to explore topics in energy management systems and management strategies for new and existing buildings; energy use in buildings; energy systems analysis and methods for evaluating the energy system efficiency; energy audit programs and practices for buildings and facilities; initiating energy management programs; guidelines for methods of reducing energy usage in each area in buildings; conservation of the energy in the planning, design, installation, utilization, maintenance; control and automation of the mechanical systems in existing and new buildings; air conditioning and ventilation systems in the buildings; assessment and optimization of energy control strategies; prediction methods of economic and environmental impact of implemented control
strategies and indoor settings. Prerequisite: MECH 310 and MECH 412.

MECH 676 Passive Building Design [3 cr.]
A course that centers on issues surrounding the integration of sustainable and passive design principles into conceptual and practical building design. Topics will include: solar geometry, climate/regional limitations, natural lighting, passive design and sustainability initiatives, insulating and energy storing material, and bioclimatic design and concepts. Case studies will be used extensively as a vehicle to discuss the success/failure of ideas and their physical applications. The course will focus on the use of energy auditing/modeling methods as means to both design and evaluate the relative “greenness” of buildings, as well as to understand the global implications of sustainable buildings. The course will include several demonstrations of concept experiments. Prerequisite: MECH 671.

MECH 677 Heat Pumps [3 cr.]
A course that focuses on heat pumps in low energy and passive buildings as well as ground source heat pump fundamentals, loop systems, open systems, soil/rock classification and conductivity, grouting procedures, and performance of ground source heat pumps in housing units; water loop heat pumps, inside building, bore holes, design and optimization of heat pump plants, including heat sources for such plants, and cost effective design options will also be considered. The course includes study visits and seminars given by industry experts. Prerequisite: MECH 310.
MECH 678 Solar Electricity [3 cr.]
A course that focuses on the solar cell: photo generation of current, characteristic current-voltage (I-V) curve, equivalent circuit, effect of illumination intensity and temperature: the Photovoltaic (PV) generator: characteristic I-V curve of a PV generator, the PV module, connections of modules, support, safeguards, shadowing; the PV system: batteries, power conditioning. PV Systems: grid-connected and stand-alone systems, economics and sizing, reliability, applications; and manufacturing: preparation of crystalline silicon wafers, formation of contacts, coatings, construction of modules. The course will include several demonstrations of concept experiments. Prerequisite: EECE 210.

MECH 679 Energy Audit Lab [2 cr.]
A course designed to give the students “hands-on” experience with carrying out energy audit measurements and studies on buildings to identify possible savings through selected energy conservation measures. Students will carry out measurements to investigate ventilation, air conditioning equipment, lighting and other office and lab equipment. Students will then be introduced to visual DOE or E-Quest to perform energy simulation of buildings. Such tools will then be used to carry out a full building simulation taking into consideration occupancy data, equipment, lights, and building envelope. A base case of energy usage will thus be established and energy conservation is then applied to deduce possible savings and their economic value. Pre-or co-requisite: MECH 672.
Appendix III - Requirements And Procedures For MECH 500 Approved Experience

The information and guidelines described in this section pertain to the Summer Training Internship program [Approved Experience] which you must undergo and pass, normally in the summer preceding your last year, in partial fulfillment of the graduation requirements. You are required to abide strictly by the regulations and deadlines indicated in this document, in order to successfully pass the course. This document and relevant training forms are available on the website of the department under resources [www.aub.edu.lb/fea/me ].

AIII.1 General
To qualify for the degree of Bachelor of Engineering, you are expected to work eight full weeks at a recognized firm, in Lebanon or abroad, in a capacity which ensures that you apply your knowledge and acquire professional experience in the field of mechanical engineering.

AIII.2 Securing A Training Position
It is your responsibility to ensure that you have secured a training offer. The department and faculty will assist you to find an internship, mainly through the FEA Career Development Center, with which you should stay in close contact. The Center is well connected with employers and keeps track of job and training offers. It also handles the IAESTE training exchange program through which selected international offers are obtained and assigned to students on a competitive basis. You should report any problems related to finding an internship to your academic advisor as soon as it arises.

AIII.3 Registration
You must register and pay tuition for MECH 500 Approved Experience [no credit]. Your statement of fees must be withdrawn and tuition paid in accordance with the schedule announced for the summer term by the University Registrar.
AIII.4 After You Begin Your Internship
You should maintain a highly professional attitude and behavior at work. Punctuality and attendance at the required working hours are essential. Good relations with your supervisors, as well as with people working with you, should be one of your major concerns. Consideration for fellow workers, and for materials around you, is important in projecting a professional attitude. Always remember that you are representing AUB, FEA, and your department during the training and it is expected that you will carry your duties responsibly. Also, make sure to keep notes regularly on all information relating to your training, preferably using a daily log book, which you will use as a basis for writing the required reports, as described later. In the event that, for unfortunate reasons, any problem arises during the training, you will need to contact the department promptly and explain. If the type of work assigned to you does not meet the training objectives, you should report to the department for advice and resolution.

AIII.5 Training File And Deliverables
Each student is responsible for maintaining an individual training file at the department and completing it in order for the evaluation of your Approved Experience to be performed. Your file will be considered complete only after submission of the Final Training Report. Deliverables and timeline for submissions are outlined below:

1. Proposal of Approved Experience form, to be completed after you secure a summer training offer and before the end of the preceding spring term.

2. Notice of Arrival form, to be sent promptly during the first week of your training

3. Interim Training Report, to be sent at the end of the fourth week of training, and should include a progress account of your work. A minimum of a four-page double-spaced report is expected.

4. Letter from Employer, to be attached or included in the Final Training Report. It is the student’s responsibility to request this letter of evaluation from his/her employer at the end of the training.
5. Final Training Report, to be submitted to the department no later than the end of second week of classes of the fall term following the training.

You are requested to send the Notice of Arrival and Interim Training Report by hand, by regular mail or by e-mail to the department address. You are also requested to keep duplicates of all your training file documents and any relevant communication with the department.

**AIII.6 Presentation**

Soon after the training files are completed, sessions will be scheduled for students to present their work. The presentation should be concise [10 minutes maximum], and briefly describe the experience gained, using visual multi-media tools. An electronic copy of the presentation will be kept in the department for future reference.

**AIII.7 Evaluation**

Your Approved Experience will be evaluated with a Pass or Fail grade based on the following criteria:

1. Completion of the training file as described above.

2. Evaluation of the quality and relevance of the professional experience acquired.

3. Satisfactory Interim and Final Training Reports. You may be requested to revise or repeat your reports in cases where they do not meet department expectations. The Final Training Report content and format are described later.

4. An acceptable Letter from the Employer. The letter should reflect a performance and attitude deemed worthy by the employer.

5. Suitable presentation with proper verbal communication and organization.
Outstanding reports and presentations will be acknowledged and made available as exemplar sample models for future years.

**AIII.8 Final Training Report**

**General**
The Final Training Report should cover all your Approved Experience activities. It must clearly reflect the type of work and activities actually carried out by you, and must describe the technical experience gained. The report should be professional in style and content. You should do your best to organize the relevant material, to write concisely, and to support your statements. You are also urged to check layout consistency, grammar, and spelling. Each student must write a report independently, even if two or more students are assigned to the same job.

**Style And Format**
1. The report should be typed in double-space format, with proper set-backs and margins. All pages should be numbered. Only design and calculation sheets may be hand-written, with samples included in an appendix.

2. All sources of information should be referenced in the text of the report, with references listed in a dedicated section at the end.

3. Personalization and story telling should be avoided. Incidents or happenings in the firm should not be reported unless strictly relevant to the training experience.

4. Tables, figures, and pictures should be properly labeled.

**Content And Organization**
1. Cover page with course name and number, author, training term, and report date.

2. Summary sheet including relevant training information.
3. Letter from the employer, to be attached or included.

4. Table of contents.

5. List of tables, figures, and pictures.

6. Introduction section outlining the various projects and the position and type of work that you were entrusted to carry out.

7. Core content detailing the various stages of the training on a project basis. The report should describe all the technical and administrative activities performed. This section should not normally exceed 20 pages in length. Relevant tables and descriptive figures or pictures are encouraged, but should not be excessive. Samples of the plans or design and calculation sheets can only be included in an appendix section and must be properly referenced in the text. Materials photocopied or duplicated from the company’s previous proposals or reports should not be included.

8. Conclusion section discussing the benefits acquired from the training experience and the ways in which it enriched the knowledge of the trainee. Any deficiencies of the trainee in his/her education and suggestions for improvements of the training program should also be mentioned.

9. List of references.

10. Appendices listing all support material such as: a brief introduction about the hosting firm, its management and administrative structure; sample plans or drawings; technical documents and literature; design and calculation sheets; and other relevant material. This section should not normally exceed 20 pages in length.
AIII.9 Contact Address
All correspondence, forms, and reports should be addressed to:

Chairperson, Department of Mechanical Engineering
Faculty of Engineering and Architecture
American University of Beirut
P.O. Box 11-0236
Beirut, Republic of Lebanon
E-mail: mefea@aub.edu.lb
Appendix IV Team Projects

All team-based design projects should contain:

1. A list of the design constraints that need to be addressed by the students. The constraints included should be detailed and specific to the project at hand, not generic.
   For example:
   a. The elevator brake design must incorporate at least two safety redundancies in the event that the primary mechanism fails.
   b. The bill of materials required of the final design must cost less than $300 when purchased over-the-counter in Beirut at the time of the project’s completion.
   c. At least 50% of the mass of the vehicle must be derived from recycled materials.

2. The domains of expertise and responsibilities in the execution of the project must be defined for each team member. Design projects inevitably require expertise from more than one domain or discipline (e.g., mechanics, heat transfer, vibrations, biology, ergonomics, numerical methods, chemistry, marketing, etc). This is essentially different from having a group of students work on a multi-disciplinary project without specific assigned roles.
# Appendix VI Reference Phone Numbers

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone Numbers</th>
<th>Department/Office</th>
<th>Extension</th>
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<tbody>
<tr>
<td>Prof. Marwan Darwish</td>
<td>3595</td>
<td>ME Department</td>
<td>3590/1</td>
</tr>
<tr>
<td>Prof. Nesreen Ghaddar</td>
<td>3594/2513</td>
<td>FEA Dean’s Office</td>
<td>3400</td>
</tr>
<tr>
<td>Prof. Fadl Moukalled</td>
<td>3406</td>
<td>Mechanical Eng. Labs</td>
<td>3626</td>
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<tr>
<td>Prof. Kamel Boughali</td>
<td>3438</td>
<td>Engineering Shops</td>
<td>3650</td>
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<tr>
<td>Prof. Ramsey Hamade</td>
<td>3481</td>
<td>Engineering Library</td>
<td>2630/2633</td>
</tr>
<tr>
<td>Prof. Albert Kuran</td>
<td>3473</td>
<td>Registrar</td>
<td>2570</td>
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<tr>
<td>Prof. Alan Shihadeh</td>
<td>3465</td>
<td>Admissions</td>
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<tr>
<td>Prof. Daniel Asmar</td>
<td>3427</td>
<td>Protection</td>
<td>2400</td>
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<tr>
<td>Prof. Issam Lakkis</td>
<td>3636</td>
<td>Student Affairs</td>
<td>3170</td>
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<tr>
<td>Prof. Matthias Liermann</td>
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<td>Prof. Ghanem Oweis</td>
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<td>Prof. Mutassem Shehadeh</td>
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<td>Prof. Elie Shammas</td>
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<tr>
<td>Prof. Salem Seifeddine</td>
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Appendix VII ASME Code Of Ethics
The following is the American Society of Mechanical Engineers [ASME] Code of Ethics of Engineers:

AIV.1 The Fundamental Principles
Engineers uphold and advance the integrity, honor, and dignity of the engineering profession by:
I. Using their knowledge and skill for the enhancement of human welfare;
II. Being honest and impartial, and serving with fidelity the public, their employers and clients; and
III. Striving to increase the competence and prestige of the engineering profession.

AIV.2 The Fundamental Canons
I. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
II. Engineers shall perform services only in areas of their competence.
III. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.
IV. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
V. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
VI. Engineers shall associate only with reputable persons or organizations.
VII. Engineers shall issue public statements only in an objective and truthful manner.
VIII. Engineers shall consider environmental impact in the performance of their professional duties.
Appendix VIII Forms
PROPOSAL OF APPROVED EXPERIENCE

Form to be completed and submitted to the department after securing a training offer, and before the end of the Spring Term. The form is part of the training file.

1. Name of student: _________________________________________________________________

2. Department and Class: __________________________________________________________

3. Name and address of proposed firm: ______________________________________________

4. Name and address of contact person in firm who offered the training position:

5. Proposed period of training: From: _________________________ Till: _________________________

STUDENT’S SIGNATURE ___________________________ DATE ___________
NOTICE ON ARRIVAL

Form to be completed and sent by student to the department upon reporting to work, during the first week of training. The form is part of the student’s training file.

1. Name of student: ________________________________

2. Department and Class: ________________________________

3. Date of starting work: ________________________________

4. Proposed date of completing work: ________________________________

5. Name and address of firm: ________________________________

6. Name and address of responsible supervisor: ________________________________

7. Student’s business address: ________________________________

8. Student’s residence address: ________________________________

NOTE: Any changes in the above information should be promptly communicated to the department
AMERICAN UNIVERSITY OF BEIRUT
FACULTY OF ENGINEERING AND ARCHITECTURE
DEPARTMENT OF MECHANICAL ENGINEERING
MECH 500 - APPROVED EXPERIENCE

SUMMARY SHEET

Form to be completed and included in the Final Training Report.

STUDENT INFORMATION
Name: __________________________________________

Department: ______________________________________

Class: __________________________________________

Training Position: ________________________________

TRAINING FIRMS[S] INFORMATION
Name: __________________________________________

Specialty: ______________________________________

Location: _______________________________________

SUPERVISOR[S] INFORMATION
Name: __________________________________________

Position: _______________________________________

EXACT DURATION OF TRAINING
Arrival date: _____________________________________

Departure date: _________________________________

ADDITIONAL INFORMATION OR COMMENTS [OPTIONAL]
_____________________________________________________________________________________

_____________________________________________________________________________________

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STUDENT PETITION FORM

Petition No. and Date Received: ________________________________________________________

Name: ______________________________________________ ID No. ____________________________

Current Major: ________________________________________________________________

Class Status:  □ 1st Year  □ 2nd Year  □ 3rd Year  □ 4th Year  □ 5th Year  □ Graduate

GPA: Cumulative GPA  □  Last Semester GPA  □

Academic Status: □ Clear Status  □ Probation Status  □ Strict Probation Status

Subject of Petition: ______________________________________________________________

State Briefly the Main Request of Your Petition: ______________________________________

[Continue on back if necessary]

Advisor’s Recommendation: _______________________________________________________

____________________________________  _____________________________________________  ______________________
NAME [PRINT]  SIGNATURE  DATE

Committee’s Decision: ______________________________________________________________

Date: __________________________________________________________________________
# Request to Register 18 or 19 Credits

**AMERICAN UNIVERSITY OF BEIRUT**  
**FACULTY OF ENGINEERING AND ARCHITECTURE**  
**DEPARTMENT OF MECHANICAL ENGINEERING**  
**COURSE OVERLOAD FORM**

**REQUEST TO REGISTER 18 OR 19 CREDITS FOR THE**  
галс  
Spring term of academic year 200___ - 200___

## STUDENT INFORMATION

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<th>Name:</th>
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| ME  
| GD  
| CE  
| EE  |
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| Email:           |                  |
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<th>Cumulative Average: [100]</th>
<th>Last Semester Average: [100]</th>
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**Number of credits you intend to take during term specified at the top of this form:**

- 18
- 19

**Reason for Overload:**

- To repeat the course
- To improve my grades in the course
- To complete a minor in
- Other. Please explain.

-______________________________
-______________________________
-______________________________
-______________________________

**STUDENT’S SIGNATURE**

___________________________
_____________________________

**DATE**

___________________________
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**ADVISOR’S RECOMMENDATION**

<table>
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<tr>
<th>Advisor’s Name:</th>
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- The student is allowed to take 18 credits during the term indicated at the top of this form.
- The student is advised not to register for more than 17 credits during the term indicated at the top of this form.

**ADVISOR’S SIGNATURE**

___________________________
_____________________________

**DATE**

___________________________
_____________________________

**CHAIRPERSON’S APPROVAL**

<table>
<thead>
<tr>
<th>Chairperson’s Signature</th>
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<th>Chairperson’s Signature</th>
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