This guide is intended to provide information on most aspects of the Chemical Engineering programs at AUB
<table>
<thead>
<tr>
<th>Revision No.</th>
<th>Revision Date</th>
<th>Reason for Change</th>
<th>Changed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>August, 2012</td>
<td>Second Release</td>
<td>M. Ahmad</td>
</tr>
</tbody>
</table>

Information in this guide is subject to change without notice. Students are responsible for checking their AUB email for announcements, information, and updates.

Contact Information
Department of Mechanical Engineering
Chemical Engineering Program
American University of Beirut
P.O. Box 11–0236
Riad El Solh, Beirut 1107 2020, Lebanon
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http://www.aub.edu.lb/fea/chen/Pages/default.aspx
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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 recognised 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.

The Chemical Engineering BS and BE programs introduced in 2009 and is in the process of applying for accreditation; however, this is pending the Graduation of more students from both its BS and BE programs.
2. CHEMICAL ENGINEERING

2.1 INTRODUCTION

VISION
The vision for chemical engineering program at AUB is to achieve local, regional, and international recognition through excellence in teaching; research; and service of our faculty members, staff and students.

MISSION
The mission of chemical engineering program in FEA is to provide a stimulating and supportive environment for quality education; to prepare graduates for career opportunities in a rapidly changing world by fostering the development of professionalism, leadership qualities and ethical behavior, and to contribute to expanding the knowledge in chemical engineering and its related fields.

OBJECTIVES
- Our graduates will be able to advance successfully in their careers as reflected in continued employment, job satisfaction, leadership responsibilities, and professional recognition; and will maintain ties with the University.
- Our graduates will be able to build upon their undergraduate-level scientific knowledge and engineering skills through graduate study in the sciences and engineering.
- Our graduates will be professionals who recognize the broader aspects of engineering practice including economic, environmental, social, political, safety, and sustainability constraints.
CHEMICAL ENGINEERING FACULTY

Full Time Faculty

Mohammad Ahmad, Associate Professor and Coordinator, PhD from Queen’s University, Northern Ireland, UK. Research interests include environmental engineering, catalysis’s technology, solid and liquid waste treatment and biofuel production.
[m258@aub.edu.lb]

Mahmoud Al–Hindi, Assistant Professor, PhD from Imperial College, University of London, UK. Research interests include desalination, water reuse, membrane processes, heat exchanger network synthesis and operation, process integration and optimization.
[m211@aub.edu.lb]

Fouad Azizi, Assistant Professor, PhD from Dalhousie University, Canada, 2009. Research interests include reactor design, reaction engineering, process intensification, mixing, multiphase flows, mass transfer, computer modeling, population balance equations, interface science.
[fa48@aub.edu.lb]

Walid Saad, Assistant Professor, PhD from Princeton University. Research interests include drug delivery, nanoparticle–based formulations, and polymer self–assembly.
[ws20@aub.edu.lb]

Joseph Zeaiter, Assistant Professor, PhD from University of Sydney. Research interests include thrombolysis of plastic waste into fuel, process modeling, advanced process control and optimization.
[jz08@aub.edu.lb]

Part Time Faculty

Natalie Rouhana, Full–time Lecturer, PhD from the University of Tennessee, 1996.
[nr16@aub.edu.lb]

Talal Hassoun, Lecturer, PhD from Texas Tech. University, 2005.
[th22@aub.edu.lb]

Chemical Engineering Staff Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Ext.</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rita Khalil Azzi</td>
<td>Lab Engineer</td>
<td>3456</td>
<td><a href="mailto:rk95@aub.edu.lb">rk95@aub.edu.lb</a></td>
</tr>
<tr>
<td>Souad Shaaban</td>
<td>Administrative Assistant</td>
<td>3403</td>
<td><a href="mailto:chen@aub.edu.lb">chen@aub.edu.lb</a></td>
</tr>
</tbody>
</table>
**ADVISING**

Advising is the responsibility of the faculty advisor assigned to the student. The advisor is responsible for monitoring the progress of each student from the first year in the Chemical Engineering program until graduation. The faculty advisor provides advice about course selection and the opportunity to discuss career plans, to understand what and why chemical engineers do what they do, and to provide a supportive personal relationship. Table below lists advisors for the 2012–13 academic year [AY]. If questions arise that cannot be answered by the advisor, the student should check with the main CHEN 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 on-line the Academic Committee of the Faculty at this link: [http://webfea.fea.aub.edu.lb/onlineforms/stdforms/login.aspx](http://webfea.fea.aub.edu.lb/onlineforms/stdforms/login.aspx). After filling and submitting out the form, the student must expect an answer to the petition, at most, in 10 working days.

**Chemical Engineering Advisors**

<table>
<thead>
<tr>
<th>Class</th>
<th>Advisor</th>
<th>Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Prof. Saad</td>
<td>Ext. 3545; <a href="mailto:ws20@aub.edu.lb">ws20@aub.edu.lb</a></td>
</tr>
<tr>
<td>II</td>
<td>Prof. Zeaiter</td>
<td>Ext. 3548; <a href="mailto:jz08@aub.edu.lb">jz08@aub.edu.lb</a></td>
</tr>
<tr>
<td>III</td>
<td>Prof. Azizi</td>
<td>Ext. 3439; <a href="mailto:fa48@aub.edu.lb">fa48@aub.edu.lb</a></td>
</tr>
<tr>
<td>IV</td>
<td>Prof. Al–Hindi</td>
<td>Ext. 3433; <a href="mailto:ma211@aub.edu.lb">ma211@aub.edu.lb</a></td>
</tr>
</tbody>
</table>

**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 enrolment. 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.
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 center manager 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 Office as well.
4. International Research Centers.
5. 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 online.
2. The link to the online career center is http://webfea.fea.aub.edu.lb/career/
3. The FEA Career Development Office seeks offers from companies and institutions. Students interested in specific companies can request that the FEA Career Development (CDC) Office contact those companies on their behalf.
4. Offers are sent to the FEA CDC.
5. Students are matched and placed in companies/institutions according to major and desired field of training. The FEA CDC 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 CHEN Program 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 center manager at ext. 3453 or the Dean’s Office at ext. 3400, or visit the FEA Career Development Center website at http://webfea.fea.aub.edu.lb/career/
The summer training guidelines are given in the course description for CHEN 400 and CHEN 500 at our website: http://www.aub.edu.lb/FEA/CHEN/UNDERGRADUATE/Pages/course_description.aspx.

FINAL YEAR PROJECT
Students, normally in groups of three, are supervised while working on a project. 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 chemical 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 chemical 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.

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 respect each student’s level of achievement and provide support and skills for analytical thinking, among many other textual–based processes.

2.2 UNDERGRADUATE CHEMICAL ENGINEERING PROGRAMS (BS and BE)
The undergraduate curriculum for the degree of Bachelor of Science (BS), Major: Chemical Engineering is a four–year program. It consists of 140 semester credit hours of course work of which 30 credits are completed in the freshman year while the student is enrolled in the
Faculty of Arts and Sciences and 110 credits are completed in three years while the student is enrolled at the Faculty of Engineering and Architecture.

The undergraduate curriculum for the degree of Bachelor of Engineering (BE), Major: Chemical Engineering is a five-year program. It consists of 173 semester credit hours of course work of which 30 credits are completed in the freshman year while the student is enrolled in the Faculty of Arts and Sciences and 143 credits are completed in four years while the student is enrolled at the Faculty of Engineering and Architecture.

Students who are admitted at the sophomore level will be required to complete either 110 credits in three years to earn the BS degree or 143 credits in four years to earn the BE degree, the two programs are outlined here:

**CHEMICAL ENGINEERING CURRICULUM**

**Term I [Fall]** (BE/BS DEGREE), Total credits = 16

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Cr.</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 201</td>
<td>Calculus and Analytic Geometry III</td>
<td>3</td>
<td>MATH 102</td>
</tr>
<tr>
<td>EECE 230</td>
<td>Computers and Programming</td>
<td>3</td>
<td>NA</td>
</tr>
<tr>
<td>CIVE 210</td>
<td>Statics</td>
<td>3</td>
<td>Pre-or-Co/ MATH 201</td>
</tr>
<tr>
<td>MECH 220</td>
<td>Engineering Graphics</td>
<td>1</td>
<td>NA</td>
</tr>
<tr>
<td>ENGL 206*</td>
<td>English Technical Writing</td>
<td>3</td>
<td>ENGL 203</td>
</tr>
<tr>
<td>Humanities</td>
<td>Elective</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

*EEE=570+ / TOFEL=657+ / CBT=283+ / IBT=99+

**Term II [Spring]** (BE/BS DEGREE), Total credits = 15

<table>
<thead>
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<th>Course</th>
<th>Title</th>
<th>Cr.</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEN 200</td>
<td>Introduction to Chemical Eng’g.</td>
<td>3</td>
<td>NA</td>
</tr>
<tr>
<td>MATH 202</td>
<td>Differential Equations</td>
<td>3</td>
<td>MATH 201</td>
</tr>
<tr>
<td>EECE 210</td>
<td>Electric Circuits</td>
<td>3</td>
<td>NA</td>
</tr>
<tr>
<td>MECH 310</td>
<td>Thermodynamics I</td>
<td>3</td>
<td>NA</td>
</tr>
<tr>
<td>ENGL</td>
<td>Elective</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Term III [Summer]** (BE/BS DEGREE), Total credits = 9

<table>
<thead>
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<th>Cr.</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 230*</td>
<td>Introduction to Probability and Random Variables</td>
<td>3</td>
<td>MATH 201</td>
</tr>
<tr>
<td>CHEM 204</td>
<td>Physical Chemistry for Chemical Engineers</td>
<td>4</td>
<td>CHEM 102, CHEM 102L</td>
</tr>
<tr>
<td>CHEM 207**</td>
<td>Survey of Organic Chemistry and petrochemicals</td>
<td>2</td>
<td>CHEM 102, CHEM102L or equivalent</td>
</tr>
</tbody>
</table>

* Students can get credit for only 1 of STAT201, STAT 210, STAT 230, STAT233, EDUC 227, or ECON213. Each semester
** Students cannot receive credits for both CHEM 208 and CHEM 207, CHEM 211 and CHEM 207
Term IV [Fall] (BE/BS DEGREE), Total credits = 18

<table>
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<tr>
<th>Course</th>
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<th>Cr.</th>
<th>Prerequisite(s)</th>
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<tbody>
<tr>
<td>Arabic</td>
<td>Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Humanities</td>
<td>Elective: Ethics course</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MATH 218*</td>
<td>Elementary Linear Algebra with Applications</td>
<td>3</td>
<td>NA</td>
</tr>
<tr>
<td>CHEN 351</td>
<td>Process Instrumentation and Measurements</td>
<td>3</td>
<td>EECE 210, MATH 202</td>
</tr>
<tr>
<td>CHEN 311</td>
<td>Introduction to Fluids Engineering</td>
<td>3</td>
<td>MECH 310</td>
</tr>
<tr>
<td>CHEN 314</td>
<td>Chemical Engineering Thermodynamics</td>
<td>3</td>
<td>MECH 310, MATH 202, CHEN 200</td>
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</tbody>
</table>

*Students cannot receive credits for both MATH 219 & MATH 218

Term V [Spring] (BE/BS DEGREE), Total credits = 17

<table>
<thead>
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<th>Title</th>
<th>Cr.</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 219</td>
<td>Analytical And Instrumental Chemistry For Chemical Engineers</td>
<td>3</td>
<td>CHEM 102, CHEM 102L</td>
</tr>
<tr>
<td>CHEN 310</td>
<td>Transport Phenomena Lab</td>
<td>2</td>
<td>MECH 310, CHEN 311</td>
</tr>
<tr>
<td>CHEN 312</td>
<td>Separation Processes</td>
<td>3</td>
<td>MECH 310, MATH 202, CHEN 200</td>
</tr>
<tr>
<td>MECH 340</td>
<td>Engineering Materials</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MATH 251</td>
<td>Numerical Computing</td>
<td>3</td>
<td>CMPS 200 / EECE 230, MATH 201</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>Elective</td>
<td>3</td>
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Term VI [Summer] (BS DEGREE)

<table>
<thead>
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<th>Course</th>
<th>Title</th>
<th>Cr.</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEN 400</td>
<td>Approved Experience for (BS)</td>
<td>0</td>
<td>NA</td>
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Term VII [Fall] (BE/BS DEGREE), Total credits = 18

<table>
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<th>Title</th>
<th>Cr.</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 212*</td>
<td>Elementary Macroeconomics Theory</td>
<td>3</td>
<td>NA</td>
</tr>
<tr>
<td>CHEN 411</td>
<td>Heat and Mass Transfer Operations</td>
<td>3</td>
<td>MECH 310, CHEN 311</td>
</tr>
<tr>
<td>CHEN 417</td>
<td>Reaction Engineering and Reactor Design I</td>
<td>3</td>
<td>CHEN 314, MATH 251, CHEM 204</td>
</tr>
<tr>
<td>CHEN 470</td>
<td>Chemical Process Design</td>
<td>3</td>
<td>MATH 251, CHEN 312, CHEN 314</td>
</tr>
<tr>
<td>CHEN 480</td>
<td>Safety and Loss Prevention</td>
<td>3</td>
<td>CHEN 200</td>
</tr>
<tr>
<td>Humanities Elective for BS and BE</td>
<td></td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

* Students cannot receive credit for both ECON 203 and ECON 212

Term VIII [Spring] (BS DEGREE), Total credits = 17

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Cr.</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEN 401</td>
<td>Final Year Project (for BS)</td>
<td>3</td>
<td>NA</td>
</tr>
</tbody>
</table>
Terms VIII to XI for BE in Chemical Engineering

**Term VIII [Spring] (BE DEGREE), Total credits = 17**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Cr.</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEN 410</td>
<td>Unit Operation Lab</td>
<td>2</td>
<td>CHEN 310, CHEN 312, CHEN 411</td>
</tr>
<tr>
<td>CHEN 451</td>
<td>Process Control</td>
<td>2</td>
<td>CHEN 312, CHEN 351, CHEN 470</td>
</tr>
<tr>
<td>CHEN 451L</td>
<td>Process Control Lab</td>
<td>1</td>
<td>CO/CHEN 451</td>
</tr>
<tr>
<td>CHEN 410</td>
<td>Unit Operation Lab</td>
<td>2</td>
<td>CHEN 310, CHEN 312, CHEN 411</td>
</tr>
</tbody>
</table>

| Technical Elective I | 3 |
| Technical Elective II | 3 |
| Technical Elective III | 3 |
| Humanities Elective | 3 |

**Term IX [Summer] (BE DEGREE), Total credits = 1**

<table>
<thead>
<tr>
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<th>Title</th>
<th>Cr.</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEN 500</td>
<td>Approved Experience (for BE)</td>
<td>1</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Term X [Fall] (BE DEGREE), Total credits = 17**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Cr.</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEN 531</td>
<td>Principles of Corrosion</td>
<td>3</td>
<td>MECH 340, CHEN 314</td>
</tr>
<tr>
<td>CHEN 511</td>
<td>Transport Phenomena</td>
<td>3</td>
<td>CHEN 411</td>
</tr>
<tr>
<td>CHEN 501</td>
<td>Final Year Project I</td>
<td>2</td>
<td>NA</td>
</tr>
<tr>
<td>CHEN 571</td>
<td>Chemical Product Design</td>
<td>3</td>
<td>CHEN 411, CHEN 470</td>
</tr>
<tr>
<td>BIOL 210*</td>
<td>Biology Elective</td>
<td>3</td>
<td>NA</td>
</tr>
<tr>
<td>ENMG 500</td>
<td>Engineering Management</td>
<td>3</td>
<td>NA</td>
</tr>
</tbody>
</table>

* Students can't receive credit for all three of the following: BIOL 201, BIO 202, BIOL 210. Each semester

**Term XI [Spring] (BE DEGREE), Total credits = 15**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Cr.</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEN 515</td>
<td>Mechanical Unit Operations</td>
<td>3</td>
<td>MECH 310, CHEN 311, CHEN 312</td>
</tr>
<tr>
<td>CHEN 570</td>
<td>Process Synthesis and Optimization</td>
<td>3</td>
<td>CHEN 411, CHEN 470</td>
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<td>CHEN 502</td>
<td>Final Year Project II</td>
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<td>Science Elective</td>
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### Distribution of Credits in CHEN BS Curriculum

<table>
<thead>
<tr>
<th>Course Category</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>English Communication [6 cr.]</td>
<td>ENGL 206</td>
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<td>English Elective</td>
<td>3</td>
</tr>
<tr>
<td>Arabic [3 cr.]</td>
<td>Elective</td>
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<tr>
<td>Humanities [12 cr.]</td>
<td>Three Humanities Electives</td>
<td>9</td>
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<tr>
<td></td>
<td>ENGM 504 Engineering Ethics or an Ethics</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Course</td>
<td></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 [21 cr. lectures and 3 cr. labs]</td>
<td>MATH 201, MATH 202, MATH 218, STAT 230, CHEM 204, CHEM 207, CHEM 219</td>
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<tr>
<td>General Engineering [16 cr.]</td>
<td>CIVE 210, EECE 210, EECE 230, MECH 220, MECH 310, MECH 340</td>
<td>16</td>
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<tr>
<td>Chemical Engineering Major [43 cr.]</td>
<td>Core Courses: CHEN 200, CHEN 310, CHEN 311, CHEN 312, CHEN 314, CHEN 351, CHEN 400, CHEN 401, CHEN 410, CHEN 411, CHEN 417, CHEN 451, CHEN 451L, CHEN 470, CHEN 480</td>
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<td>Technical Electives: CHEN 413, CHEN 490, CHEN 511, CHEN 515, CHEN 531, CHEN 541, CHEN 570, CHEN 612, CHEN 613, CHEN 614, CHEN 617, CHEN 618, CHEN 651, CHEN 672, CHEN 673</td>
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### Distribution of Credits in CHEN BE Curriculum

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<td>ENGL 206</td>
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<td>English Elective</td>
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<td>Course</td>
<td></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 218, STAT 230, CHEM 204, CHEM 207, CHEM 219, MATH 251, BIOL 210, Science Elective</td>
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<tr>
<td>General Engineering [22 cr.]</td>
<td>CIVE 210, EECE 210, EECE 230, MECH 220, MECH 310, MECH 340, ENMG 500</td>
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<tr>
<td>Chemical Engineering Major [64 cr.]</td>
<td>Core Courses: CHEN 200, CHEN 310, CHEN 311, CHEN 312, CHEN 314, CHEN 351, CHEN 410, CHEN 411, CHEN 417, CHEN 451, CHEN 451L, CHEN 470, CHEN 480, CHEN 500, CHEN 501, CHEN 502, CHEN 511, CHEN 515, CHEN 531, CHEN 570, CHEN 571</td>
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<td></td>
<td>Technical Electives: CHEN 413, CHEN 490, CHEN 541, CHEN 580, CHEN 612, CHEN 613, CHEN 614, CHEN 617, CHEN 618, CHEN 651, CHEN 672</td>
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</tbody>
</table>
2.3 MINOR IN CHEMICAL ENGINEERING
The minor in chemical engineering is open to engineering students in majors other than chemical engineering.

Minor Program Requirements (21 credits)
The student taking the minor is required to complete 21 credits from the list given below. The student has to complete 15 credits of core courses and 6 credits of elective courses.

Required Core Courses (15 credits)
1. MECH 310  Thermodynamics I  [3 cr.]
2. CHEN 311/MECH 314 Introduction to fluids Engineering  [3 cr.]
3. CHEN 312  Separation Processes  [3 cr.]
4. CHEN 411  Heat and Mass Transfer Operations  [3 cr.]
5. CHEN 417  Reactor Engineering and Reactor Design  [3 cr.]

Elective Courses (6 credits) selected from the following courses
- CHEN 314 Chemical Engineering Thermodynamics II  [3 cr.]
- CHEN 451 Process Control  [2 cr.]
- CHEN 451L Process Control Lab  [1 cr.]
- CHEN 470 Chemical Process Design  [3 cr.]
- CHEN 480 Safety and Loss Prevention  [3 cr.]
- CHEN 490 Fundamentals of Petroleum Engineering  [3 cr.]
- CHEN 531 Principles of Corrosion  [3 cr.]
- CHEN 570 Process Synthesis and Optimisation  [3 cr.]
- CHEN 612 Desalination  [3 cr.]
- CHEN 671 Chemical Product Design  [3 cr.]
- CHEN 672 Polymer Science  [3 cr.]
- CHEN 673 Engineering of Drug Delivery Systems  [3 cr.]

2.4 COURSE PREREQUISITE FOR: (Table P. 18)
CHEN 200: CHEN 312, CHEN 314, CHEN 480
CHEN 310: CHEN 410
CHEN 311: CHEN 411, CHEN 515, CHEN 310
CHEN 312: CHEN 410, CHEN 451, CHEN 470, CHEN 515, CHEN 541, CHEN 613, CHEN 674
CHEN 314: CHEN 690, CHEN 417, CHEN 470, CHEN 531, CHEN 618
CHEN 351: CHEN 451
CHEN 411: CHEN 511, CHEN 570, CHEN 517, CHEN 612, CHEN 613, CHEN 674, CHEN 410
CHEN 417: CHEN 517, CHEN 541, CHEN 617
CHEN 451: CHEN 651, CHEN 674, C/O CHEN 451L
CHEN 470: CHEN 451, CHEN 570, CHEN 571
CHEN 501: CHEN 502
CHEN 515: CHEN 670
CHEN 570: CHEN 670, CHEN 674
CHEN 490: CHEN 690, CHEN 691
MECH 310: CHEN 310, CHEN 311, CHEN 312, CHEN 314, CHEN 411, CHEN 515, CHEN 612, CHEN 673
MECH 340: CHEN 531, CHEN 670, CHEN 672
EECE 210: CHEN 351
MATH 202: CHEN 312, CHEN 314, CHEN 351
MATH 251: CHEN 417, CHEN 470
CHEM 204: CHEN 417, CHEN 541, CHEN 673

Courses not Prerequisite for other courses in CHEN:
EECE 230, MECH 220, MATH 201, MATH 218, STAT 230, CHEM 207, CHEM 219, ECON 212, BIOL 210, ENMG 500
3. ACADEMIC REGULATIONS

3.1 PETITIONS
There is a process whereby a student can petition for deviation from certain requirements. The student must submit a petition *on-line*. 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.

3.2 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, AUBMC 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.

3.3 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.

3.4 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/Tutorial-Test/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/Tutorial-Test/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].

3.5 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.

3.6 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.

3.7 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.

3.8 ADMISSION of TRANSFER STUDENTS
Students attending recognised 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.

3.9 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.

3.10 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 recognised 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.

3.11 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.

3.12 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 3.16 Graduation Requirements].

3.13 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.

3.14 WITHDRAWAL FROM COURSES [ALSO SEE 3.2 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.

3.15 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.

3.16 GRADUATION REQUIREMENTS
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.

3.17 GRADUATE STUDIES
Students who plan to pursue graduate studies at AUB should have attained an average of at least 80 or an equivalent grade.
4. PROFESSIONAL SOCIETIES AND AWARDS

4.1 PROFESSIONAL SOCIETIES AND CLUBS
All chemical engineering students have immediate access to student chapter of CHESS [Chemical Engineering Student Society]. This society offers 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.

4.2 AWARDS
Dean’s Award for Creative Achievement
The Dean’s Award for Creative Achievement, 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, Chemical 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.
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.

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.
APPENDIX I – DISTRIBUTION OF REQUIREMENTS in HUMANITIES/SOCIAL SCIENCES

All students in the Chemical Engineering Program students satisfy the general education requirements as indicated previously in page 15. To see the list of courses satisfying the general education requirements, you are invited to visit Registrar’s Office website: [http://www.aub.edu.lb/registrar/Documents/pdfdoc/general-education-courses.pdf]

APPENDIX II – CHEMICAL ENGINEERING COURSE DESCRIPTIONS

AII.1 CHEMICAL ENGINEERING REQUIRED COURSES

CHEN 200 Introduction to Chemical Engineering [3 cr.]
This course is an introduction to the most important processes employed by the chemical industries, such as plastics, pharmaceutical, chemical, petrochemical and biochemical. Major emphasis is on formulating and solving material and energy balances for simple and complex systems. Equilibrium concepts for chemical process systems are developed and applied. Computer software is utilised extensively. The course activities include guest speakers and plant trips.

CHEN 310 Transport Phenomena Lab [2 cr.]
This lab includes experimentation in thermodynamics and heat, mass, and momentum transport on a bench scale; and measurement error estimation and analysis. Prerequisite: MECH 310 and CHEN 311.

CHEN 311 Introduction to Fluids Engineering [3 cr.]
An introductory course on fluid behavior emphasising conservation of mass, momentum, 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.

CHEN 312 Separation Processes [3 cr.]
This course includes the design of industrial separation equipment using both analytical and graphical methods; equilibrium based design techniques for single and multiple stages in distillation, absorption/stripping, and liquid–liquid extraction are employed; and an introduction to gas–solid and solid–liquid systems is presented as well. Mass transfer considerations are included in efficiency calculations and design procedures for packed absorption towers,
membrane separations, and adsorption. Ion exchange and chromatography are discussed. The role of solution thermodynamics and the methods of estimating or calculating thermodynamic properties are also studied. Degrees of freedom analyses are threaded throughout the course as well as the appropriate use of software. Prerequisites: MECH 310, MATH 202 and CHEN 200.

CHEN 314 Chemical Engineering Thermodynamics [3 cr.]
This course covers the applications of thermodynamics to pure and mixed fluids; and to phase equilibria and chemical reaction equilibria. Prerequisite: MECH 310, MATH 202 and CHEN 200.

CHEN 351 Process Instrumentation and Measurements [2.1; 3 cr.]
This course covers the general concepts of management systems; classification of sensors and sensor types; interfacing concepts; data acquisition, manipulation, transmission, and recording; introduction to LABView and applications. A team design project related to instrumentation will be included. Prerequisites: EECE 210 and MATH 202.

CHEN 400 Approved Experience [0 cr.]
This is an eight–week professional training course in chemical engineering for students enrolled in the BS program.

CHEN 401 Final Year Project (for students in the BS Program) [3 cr.]
The Final Year Project provides collaborative design experiences with a problem of industrial or societal significance. Projects can originate with an industrial sponsor, from an engineering project on campus, or from other industrial or academic sources. In all cases, a project is a capstone experience that draws extensively from the students' engineering and scientific background and requires independent judgments and actions. The projects generally involve a number of unit operations, a detailed economic analysis, simulation, use of industrial economic and process software packages, and experimentation and/or prototype construction. Prerequisite: Approval of instructor.

CHEN 410 Unit Operations Lab [2 cr.]
This laboratory introduces students to basic concepts, experimental techniques and calculation procedures in unit operations. Experiments include fluid dynamics, heat exchange (pilot–scale units designed to study air–solid, steam–water, water–water heat transfer), cooling towers, gas absorption, solvent extraction, ultrafiltration of hemoglobin solutions in water, chemical reactions (to study stoichiometry and kinetics of batch reactions in the liquid phase), drying of solid materials, and distillation. Some reaction kinetics experiments and flow pattern in industrial process equipment are also included. Prerequisite: CHEN 310, CHEN 312, and CHEN 411.
CHEN 411 Heat and Mass Transfer Operations [3 cr.]
The course covers heat conduction, convection, and radiation; general differential equations for energy transfer; conductive and convective heat transfer; radiation heat transfer; process heat exchangers molecular, convective and interface mass transfer; the differential equation for mass transfer; steady state molecular diffusion and film theory; convective mass transfer correlations; and mass transfer equipment. Prerequisite: MECH 310 and CHEN 311.

CHEN 417 Reaction Engineering and Reactor Design [3 cr.]
This course introduces the subject of chemical reaction engineering and reactor design. Classical reaction kinetics concerning rates, mechanisms, temperature effects, and multiple reactions are studied. The concepts of batch, continuous stirred-tank, and plug flow reactors are introduced for the ideal case. Non-isothermal reactors and non-ideal flow are considered in the design of chemical reactors systems. Heterogeneous reactors and catalysis are also discussed. Prerequisites: CHEN 314, MATH 251, and CHEM 204.

CHEN 451 Process Control [2 cr.]
This course covers the development of deterministic and non-deterministic models for physical systems, engineering applications, and simulation tools for case studies and projects. Prerequisites: CHEN 312, CHEN 351, and CHEN 470.

CHEN 451L Process Control Lab [1 cr.]
Laboratory Experiments demonstrating the principles covered in the process dynamic and control course CHEN 451. These include temperature, temperature flow, and concentration measuring devices, and process control simulation for typical chemical plants. Prerequisite: CHEN 312. Co-requisite: CHEN 451.

CHEN 470 Chemical Process Design [3 cr.]
This course is an integration of material from other chemical engineering courses with applications to the design of plants and processes representative of the chemical and related process industries; basic concepts and methodology for making rational decisions; and the implementation of real engineering projects and comparing alternatives. Prerequisite: MATH 251, CHEN 312, and CHEN 314.

CHEN 480 Safety and Loss Prevention [3 cr.]
Topics covered in this class include: history of health and safety; causes and effects of loss; policy development; loss control and health basics; emergency preparedness and standards; hazard identification; safe process design; inspection and investigation processes; measurement, evaluation and audits of OH & S program
element; legislation, HAZOP & HAZAN. Prerequisite: CHEN 200.

**CHEN 500 Approved Experience**  
[1 cr.]  
This is an eight week training course in chemical engineering for students enrolled in the BE program.

**CHEN 501 Final Year Project I**  
[2 cr.]  
The Final Year Project provides collaborative design experiences with a problem of industrial or societal significance. Projects can originate with an industrial sponsor or from other industrial or academic sources. Prerequisite: approval of instructor.

**CHEN 502 Final Year Project II**  
[3 cr.]  
This course will be a continuation of CHEN 501 where the student will employ his/her acquired knowledge to investigate the design of overall processes, detailed design of individual unit operations, economic analysis and to use industrial economic and process software packages, experimentation and/or prototype construction integrating safety and environmental issues to produce the final optimized design and/or product. Prerequisite: approval of instructor. Prerequisite: CHEN 501.

**CHEN 511 Transport Phenomena**  
[3 cr.]  
This course covers the applications of the principles of momentum, heat and mass transfer to steady state and transient problems; molecular concepts; transport in turbulent flow; boundary layer theory; and numerical applications. Prerequisite: CHEN 411.

**CHEN 515 Mechanical Unit Operations**  
[3 cr.]  
This course introduces students to the principles and practices involved in contacting, conveying, separating, and storing single and multiphase systems. It includes the flow of incompressible fluids in conduits and past immersed bodies; as well as the transportation, metering, and mixing of fluids. Unit operations involved in the contacting and physical separation of phases, such as fluidization, sedimentation and centrifugation, evaporation and membrane separation, are also studied. Prerequisite. MECH 310, CHEN 311, and CHEN 312.

**CHEN 531 Principles of Corrosion**  
[3 cr.]  
This course includes the application of electrochemical principles, corrosion reactions, passivation, cathodic and anodic protection, stress corrosion, and high-temperature oxidation. Prerequisite: MECH 340 and CHEN 314.

**CHEN 570 Process Synthesis and Optimization**  
[3 cr.]  
An introduction to the design and synthesis for the large scale production and processing of materials such as water, chemicals,
petroleum products, food, drugs and wastes. The course introduces principles of optimization: continuous, linear and non-linear, and mixed-integer linear and non-linear problems. Applications to heat exchanger network synthesis, energy systems design, distillation and separation systems selection and optimization and design under uncertainty. Prerequisite: CHEN 411 and CHEN 470.

**CHEN 571 Chemical Product Design** [3 cr.]
This course covers the application of the design process to products based on chemical technology. It covers the entire design process from initial identification of product needs, to the generation and selection of product ideas, and culminates in the manufacture of a new product. Prerequisite: CHEN 411 and CHEN 470.

**AII.2 CHEMICAL ENGINEERING TECHNICAL ELECTIVES**

**CHEN 413 Water and Waste Treatment** [3 cr.]
A course that examines the quality and treatment methods of water and wastewater; testing for physical, chemical, and biological parameters. Prerequisite: Approval of instructor.

**CHEN 490 Fundamentals of Petroleum Engineering** [3 cr.]
This course introduces the integrated view of Petroleum Engineering, and presents the nature of petroleum: chemical composition, properties of liquid petroleum and natural gas; defines the concept of exploration methods (geological and geophysical); drilling and well completion operations; reservoir fluids, rock properties, coring and core analysis; well logging, and formation damage.

**CHEN 541 Biochemical and Bioprocess Engineering** [3 cr.]
This course will be taught in two stages. In the first stage, elementary biochemistry of living organisms, with emphasis on the biochemical pathways that bring about growth and cellular energy production, is presented, along with enzyme kinetics and microbial growth models. In the second stage, bioreactors used to bring about the biomass growth either for metabolite production or for degradation are studied. Mass balances and design equations incorporating cellular kinetics and concepts are presented for batch and continuous stirred tank reactors. Vapor phase, fixed-bed reactor designs such as biofilters are presented as applications in air pollution control. Prerequisites: CHEN 312 and CHEN 417, and CHEM 204.

**CHEN 612 Desalination** [3 cr.]
This course will survey the commonly used thermal and membrane based desalination technologies. Fundamental thermodynamic and transport processes which govern desalination will be developed. Environmental, sustainability and economic factors which may
influence the performance, affordability and more wide-spread use of desalination systems for fresh water production and reuse will be highlighted. Renewable energy technologies coupled with desalination processes will be reviewed. A team based student project will be assigned to design a reverse osmosis membrane desalination plant (brackish water, seawater, or treated sewage effluent) using conventional or alternative energy sources. Prerequisite: MECH 310, and CHEN 411 or MECH 412.

CHEN 613 Membrane Separation Processes [3 cr.]
The course will provide a general introduction to membrane science and technology: transport mechanisms, membrane preparation and boundary layer effects. The course will also cover the various types of membranes used in industry: microfiltration, ultrafiltration, reverse osmosis, electro-dialysis and pervaporation. Prerequisite: CHEN 312, and CHEN 411.

CHEN 614 Environmental Engineering Separation Processes [3 cr.]
This course includes a discussion of the unit operations associated with environmental engineering separation processes of solid–liquid, liquid–liquid, and gas–liquid systems; general use, principles of operation and design procedures for specific types of equipment. Prerequisite: approval of instructor.

CHEN 617 Chemical Reactor Analysis and Design [3 cr.]
This course covers design for optimum selectivity; stability and transient behavior of the mixed flow reactor; non ideal flow and balance models; fixed and fluidized bed reactors; and multiphase flow reactors. Prerequisite: CHEN 417.

CHEN 618 Colloid and Interface Science [3 cr.]
This is a first course in colloid and interface science. The repulsive and attractive forces at interfaces are described along with the dynamics of the interfaces. Topics include the stability of macroemulsions, the formulation and properties of microemulsions, and surface metal–support interactions of catalysts. Prerequisite: CHEN 314.

CHEN 651 Advanced Process Control [3 cr.]
This course covers the mathematical modeling and computer simulation of process dynamics and control. Prerequisite: CHEN 451 and 451L.

CHEN 672 Polymer Science [3 cr.]
This course is a broad technical overview of the nature of synthetic macromolecules, including the formation of polymers and their structure, structure–property relationships, polymer characterization and processing, and applications of polymers. The course tends to
focus on thermoplastic polymers and elastomers. **Prerequisite: MECH 340.**

**CHEN 673 Engineering of Drug Delivery Systems**  
[3 cr.]  
This course focuses on recent advances in the development of novel drug delivery systems. The fundamentals of drug delivery are discussed. Various strategies to tune and control the release of active agents for optimized therapeutic outcomes are explored. The course covers polymers and techniques used to produce drug nanoparticles, with specific examples of nanoparticle–based drug delivery systems. **Prerequisite: MECH 310, CHEN 411 and CHEM 204.**

**CHEN 691 Reservoir Characterization: Carbonate Rocks**  
[3 cr.]  
This course is an introduction to the common, modern approached for the characterization of carbonate reservoirs. State of the art petrographic tools will be introduced. The major depositional environments of carbonate rocks and carbonate platform types as well as the principal controls on carbonate sedimentation will be highlighted. Diagenesis (modification of reservoir properties through time) will be discussed through related processes and products, including the process of dolomitization. An in depth coverage of secondary porosity evolution in carbonate reservoirs will be provided (including elements of appropriate rock–typing). A team based project to solve a case study in reservoir characterization and a field–trip to provide a practical view of carbonate reservoir rocks will be included. **Prerequisite: CHEN 490.**

**AII.3 CONTACT ADDRESS**  
All correspondence, forms, and reports should be addressed to:

Coordinator, Chemical Engineering Program  
Faculty of Engineering and Architecture  
American University of Beirut  
P.O. Box 11–0236  
Riad El–Solh 1107 2020, Beirut  
Lebanon  
E–mail: chen@aub.edu.lb
APPENDIX III– 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:
   • The elevator brake design must incorporate at least two safety redundancies in the event that the primary mechanism fails.
   • 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.
   • 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 IV– REFERENCE PHONE NUMBERS

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone</th>
<th>Department/Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Kamel Ghali</td>
<td>3438</td>
<td>CHEN LABS</td>
</tr>
<tr>
<td>Dr. Nesreen Ghaddar</td>
<td>2513</td>
<td>FEA Dean’s Office</td>
</tr>
<tr>
<td>Dr. Mohammad Ahmad</td>
<td>3419</td>
<td>ME LABS</td>
</tr>
<tr>
<td>Dr. Mahmoud Al–Hindi</td>
<td>3433</td>
<td>Engineering Shops</td>
</tr>
<tr>
<td>Dr. Fouad Azizi</td>
<td>3439</td>
<td>Engineering Library</td>
</tr>
<tr>
<td>Dr. Walid Saad</td>
<td>3545</td>
<td>Registrar</td>
</tr>
<tr>
<td>Dr. Joseph Zeaiter</td>
<td>3548</td>
<td>Admissions</td>
</tr>
<tr>
<td>CHEN Department</td>
<td>3403</td>
<td>Students Affairs</td>
</tr>
</tbody>
</table>
APPENDIX V – 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: How can I get my alternate PIN?
A4: Your advisor has your alternate PIN number.

Q5: My advisor does not have my alternate PIN, who can give me this information?
A5: Speak with the FEA Student Services Officer, Alia Kazma Serhal. Her office is located in Bechtel room 301.

Q6: How do I use the alternate pin?
A6: After you log on to SIS you will be asked to give your PIN.

Q7: How do I find out the English level I am placed in?
A7: 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.

Q8: I took ENGL 204 do I need to take ENGL 206?
A8: 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.

Q9: I was placed in English 204 do I take it or 206 instead?
A9: 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.

Q10: 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?
A10: 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

Q11: What Arabic course should I take?
A11: 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.

Q12: Should I follow the required course list exactly? Which courses have prerequisites? Which courses can I delay taking?
A12: 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.

Q13: What are the humanities courses or the social sciences course I am permitted to take?
A13: 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.

Q14: May I take my humanity electives in business or engineering management?
A14: Business and engineering management courses are not considered humanity courses.

Q15: How do I register for a minor in engineering management?
A15: 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.

Q16: How do I apply for a minor in bio–medical engineering?
A16: Check the AUB Undergraduate Catalogue for the requirements then complete the form on the ECE home page.

Q17: Can I take a graduate course as an elective?
A17: 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.

Q18: What are the ethics courses?
A18: Check the FEA section of the most current catalogue.

Q19: Where can I find the list of science electives?
A19: Check the departmental section for your major in the most recent catalogue for a complete list of the approved science electives.

Q20: What should I do when I can not register in my core course?
A20: Contact your department.

Q21: I am a fourth year student, I cannot register in a course that is required what should I do? I need the course.
A21: Contact the Student Services Officer for difficulties registering in courses outside the FEA.

Q22: If while trying to register for a course I get a prerequisite or a test score error, what should I do?
A22: 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.
Q23: Should I go to the Registrar to have restrictions removed?
A23: No, you should go to the department offering the course.

Q24: Why are there restrictions on courses for majors?
A24: Registration restrictions are put on some courses to give priority to students who need the course to complete the requirements in their major.

Q25: If the capacity in an FEA class needs to be increased in order for me to register, what should I do?
A25: 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.

Q26: Why must I ask permission from a chair or coordinator to open capacity if there is space?
A26: Some courses have restrictions placed on them to ensure that students who require the course for their major will be able to register.

Q27: If the capacity of a course outside the FEA must be increased in order for me to register, what should I do?
A27: You should see the Student Services Officer who will assist you by contacting the appropriate department.

Q28: Can capacity in lab class be opened if I bring my own laptop?
A28: No, the space in a lab class is strictly limited.

Q29: Can I switch sections if the section is open?
A29: Yes, you may switch sections but it can be done only during the drop and add period.

Q30: Why can’t my department open capacity in other Faculties?
A30: 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.

Q31: Do I have to wait until drop and add day to change my registration?
A31: 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.

Q32: What is the course load that I am required or permitted to take during the summer?
A32: 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.

Q33: How do I request an overload?
A33: 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.

Q34: What is the minimum grade that I need to clear probation?
A34: 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)

Q35: How and when can I transfer out of, or into a department?
A35: 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).

Q36: What is the minimum grade average needed to transfer?
A36: 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.

Q37: 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?
A37: 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.

Q38: Can I use the courses that I took abroad as an exchange student as part of my graduation requirements?
A38: Yes, if the courses are pre-approved through a petition to the FEA Academic Committee.

Q39: What must I do concerning my summer training internship?
A39: Check with the FEA Career Development Center and remember you must register for the Approved Experience course in your major.

Q40: What is my class rank?
A40: The FEA does not provide any ranking beyond the honor list.

Q41: What forms do I need to complete before, during and after my internship?
A41: All engineering programs require:
1– Proposal of Approved Experience form
2– Notice of Arrival form
3– Interim Training Report
Q42: How many students can be in an FYP group?
A42: Check with your department.

Q43: I am a fourth year student what courses do I need to graduate?
A43: Check with your advisor. There is a degree evaluation on SIS and on the WEB.

Q44: What do I do to get a clearance for graduation?
A44: Go to the Registrar on line and click on Forms.

Q45: What forms should I complete before my graduation?
A45: 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.

Q46: How can I know that I have taken all my required courses and that I am eligible for graduation?
A46: Check with your advisor. There is a degree evaluation on SIS and on the WEB.

Q47: What is my GPA? How do I translate this to the 4.0 scale?
A47: Your GPA is on your transcript. You can get a conversion table at the Registrar's Office.

Q48: How can I know my graduation GPA?
A48: You must wait until all your final grades are posted on the web. Your final average will be included on your transcript.

Q49: When I apply to graduate school, what courses are used to calculate my GPA?
A49: 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.