UNDERGRADUATE CATALOG

Faculty of Engineering - Rabigh

Academic Year
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/http://fer.rb.kau.edu.sa

Table of Contents

FACULTY ADMINISTRATION

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Deanof the faculty

Vice Dean forGraduate Studies &ScientificResearch

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Vice Dean

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Dr. Mohamed I. Bassyouni

Chemical& Materials Engineering Dept.

Dr. Raed A. Naebulharam

Industrial Engineering Dept.

Dr. Abdulaziz A. Banawi

Architectural Engineering Dept.

INTRODUCTION

About the Faculty

The Faculty of Engineering - Rabigh (FER) was established in 2009 by a Royal Decreeof the Custodian of the Two Holy Mosques, King Abdullah Bin Abdulaziz, and the President of the Council of Higher Education. The objective of establishing this branch is to have a direct impact on the development of industrial community in Rabigh district and its vicinities. For that purpose, Dr. Saud AbdulazizGutub was appointed as the first dean of this Facultyand he immediately began to enlist and recruit the services of several renowned faculty members who have wide and excellent experience in specialized engineering fields to establish the following departments:
1. Chemical and Materials Engineering
2. Civil Engineering
3. Electrical Engineering
4. Industrial Engineering
5. Mechanical Engineering

Since FER establishment, the faculty, staff, and administration members have implemented several initiatives to meet changes around the world and industrial needs. As a result, new study plans were designed based on well-known global academic standards to meet the Saudi market requirements. These plans have been approved in 2012 and started to be applied in the academic year 2012/2013 (1434/1435H). Moreover, the faculty policy has been directed to enhance the level of academic education to meet the international standards while developing innovative leaders through appointing newly graduated Saudi engineers and giving them the opportunity to complete their higher studies in highly regarded universities abroad. The faculty also playsan essential role in conducting scientific research and providing training programs with the aim of having a direct impact on the development of industrial community in Rabigh district and its vicinities. Finally, the FER established recently the Architectural Engineering Department, it sixth department approved by the Royal Decree, in order operate beginning of the next academic year.

FER Strategy

Vision

To be pioneers in the field of engineering science and its novel applications.

Mission

Prepare distinct and competent engineers as leaders in the field of engineering, scientific research, and technology transfer, and to be a role model in the development of local communities of our beloved country.

Goals
1. Develop and continuously update the curriculum based on well-known national and world academic standards to meet the market requirements.
2. Continuous update of administration and academic affairs according to the quality and accreditation standards.
3. Have efficient graduates provided with wide range of fundamentals for engineering knowledge and skills.
4. Conduct high-caliber applied research in engineering and applied science and related fields.
5. Utilize advanced and innovative teaching and learning methods and tools, including advanced information, computing and communication technologies, to facilitate successful learning along with well-equipped laboratory, and library facilities.
6. Foster a collegial, respectful and productive environment that attracts and retains the best faculty, staff and students, and creates a sense of spirit and loyalty.

7. Communicate effectivelywith the industrial sector to emphasis student's practical training programs and provide training programs, consultant and scientific research that contribute to community services and the development of the environment.

Industrial Advisory Boards

The Industrial Advisory Boards (IAB) are industry-based committees intended to help FER to ensure that the graduates comply with the needs of the employer stakeholders. The board members are leading non-academic professionals selected from a variety of backgrounds and industries that traditionally seek graduates of engineering programs.

Boards' members generally advise FER on the needs of the job market, and the qualities that they seek when they hire. One of the most important roles of the IAB is to help FER to review and develop valuable educational objectives for its programs.

Capstone Experience

Students in their last year of study are exposed to a significant 2-semester personal or group accomplishment capstone experience through the senior project course(s). This experience provides students with the opportunity to bring together knowledge and skills acquired during their studies. It also allows departments to assess the extent of achievement of their program outcomes. Students will go through requirements development, design, implementation, testing, and documentation activities. Students are required to submit a final report and give a presentation at the end.

Student Activity

FER offers a range of extra-curricular activities through its own student competitions, clubs and activity committees. Students can participate in their choice of activities related to engineering, Islamic awareness, culture, arts, sports, and social activity. FER encourages its students to participate in various student events and competitions inside and outside the university.

Alumni

FER, through its Faculty Training and Graduates Unit (FTGU), works to keep in touch with its former students in order to leverage their experiences and achievements to benefit the current students. Alumni can help the college to review and assess educational objectives for its programs offering valuable insights from their own experiences.

Faculty Development

KAU provides a wide range of opportunities for professional development to all its faculty members. The Center for Teaching and Learning Development (CTLD) at KAU hosts a series of skills development workshops and training courses offered by renowned speakers from inside and outside the university. In addition, faculty members are encouraged to attend conferences, seminars, workshops, and training courses for professional development.

Undergraduate Programs and Degrees

The FERcurrently offers five5-year bachelor-level programs leading to degrees as follows:

Program	Awarded Degree
Mechanical Engineering	Bachelor of Science in Mechanical Engineering
Electrical Engineering	Bachelor of Science in Electrical Engineering
Civil Engineering	Bachelor of Science in Civil Engineering
Chemical Engineering	Bachelor of Science in Chemical Engineering
Industrial Engineering	Bachelor of Science in Industrial Engineering

A sixth program is planned to be offered beginning of the next academic year to award a degree as a Bachelor of Science in Architectural Engineering.

Student Admissions

The students are admitted to the Faculty of Engineering –Rabigh(FER) after completing successfully all the requirements of the scientific track of the Rabigh Preparatory Year Program. The FER Council determines each year the maximum number of the students to be admitted. The faculty accepts the highest GPA students on the condition that:

- They obtain at least 75% in Mathematics, Physics, and the fourth level of the English Language courses (ELI 104) of the Preparation Year.

- They accumulate a GPA of 3out of 5 or higher.

The FER allows eligible students of the main campus Preparatory Year Program to be admitted,based on seats availability, after admitting the eligible students of Rabigh Preparatory Year Program.

Department Admission Requirements

After admission to the FER, the students study one common year completing some of university and faculty required courses. To be eligible for specialization and admission to one of the five engineering programs available within FER, the student must satisfy the following:

- Completing a total of 50 credit hours or more at the end of the semester during which he applies for specialization.
- Meeting the minimum GPA requirements determined annually by FER departments.

The distribution process to the various programs at FER is carried out according to the interest of students and the capacity of programs. When applicants exceed availability, priority is given to the students with higher GPA.

Students are allowed to change their specialization within FER no more than once during their whole study period. Such a change is allowed only for the students who have completed less than 50% of the credit hours of the current specialization by the end of the semester during which they apply for specialization change. Applicants for specialization change submit their request to Vice Dean Office and compete with the rest of the students eligible for specialization.

Program Educational Objectives and Student Outcomes

FER Bachelor's programs have educational objectives that have been reviewed with student, faculty, and industry representatives. Program educational objectives based on Accreditation Board for Engineering and Technology (ABET) are broad statements that describe what graduate are expected to attain within few years of graduation. They are based on the needs of the program's constituencies. The objectives of each program are listed under its host department's section.

ABET Student outcomes (SOs) are statements that describe what students are expected to know and be able to do by the time of graduation. These relate to skills, knowledge, and behaviors that students acquire as they progress through the program.

FER Bachelor's programs share the following ABET outcomes:

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 on 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 life-long learning;
j. A knowledge of contemporary issues; and
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The educational processes are planned and organized to ensure that the SOs are achieved. The SOs are aligned with the program educational objectives. The assessment and evaluation of SOs are done at the end of each semester (level). Each program conducts annual review of the evaluation of SOs for changes and subsequent program improvement.

ACADEMIC REGULATIONSAND POLICIES

Academics are largely governed by the regulations of undergraduate studies and exams in the Kingdom of Saudi Arabia issued by the Ministry of Education, and rules of King Abdulaziz University published by its Deanship of Admission and Registration. Both students and faculty are encouraged to check relevant academic rules and procedures on the Deanship of Admission and Registration webpage (http://admission.kau.edu.sa/Default.aspx?Site_ID=210&Lng=AR).

Academic Integrity

Scholastic Honesty Policy

FER is serious about creating an honest and ethical learning environment. FER will not tolerate dishonest actions such as cheating and plagiarism, or disruptive behavior that violates its rules and conduct expectations. Offenders will be subject to punishment in accordance with student disciplinary regulations as issued by the University Council. FER reserves the right to use various means to detect and document dishonest conduct.

Code of Student Conduct

FER expects all of its students to conduct themselves in a respectful, ethical, and professional manner. In addition to guidelines outlined in KAU document of Student Rights and Obligations, students are expected to adhere to the following:
- Respect and be courteous to faculty members, staff, and fellow students.
- Respect faculty property both physical and electronic.
- Respect faculty rules and regulations.
- Attend classes regularly and punctually.
- Complete all assignments on time and honestly.
- Actively participate in faculty activities.
- Lead by example and be a good representative of KAU students.

Student Appeals

Students can appeal any decisions according to standard university process published in Arabic within the KAUrelated manuals, available on KAU website under Deanship of Admissions and Registration.

Academic Advising

Academic advising is a key to success at any higher education institution. FER considers academic advisers a valuable resource to students as they help plan their undergraduate career and, ultimately, prepare them for graduation. Academic advising means guiding the students/advisee on different issues related to their academic progress and help them find solutions to different academic problems. Academic advising is related to assisting students with educational choices, degree requirements, academic policies/procedures, as well as broader concerns such as career and graduate school options in the future.

The process of advising FER students starts with an engineering day program specifically designed to inform the new students of the various programs at the faculty while shedding light on their future career opportunities. Lectures are presented by faculty members from each program. A system for advising is in place for the students of each program. Each student is assigned to an academic advisor, who assists him in getting familiar with the available services, understanding the University and Program policies, explaining the curriculum, and resolving problems or issues they might face. The academic advisor is also responsible for monitoring and guiding the student

progress throughout his academic education. The weekly schedule of faculty members includes time slots dedicated for student advising. The students can also communicate with faculty members through various other means such as KAU email, faculty KAU websites, and ODUS system. The level of interaction between faculty and students is also spiritually enhanced during the two daily prayers held during the working hours.

Roles and Responsibilities

An academic advisor is a selected faculty member of the department for the process of guiding the students/advisee on different issues related to their academic progress and problems. Following are the responsibilities defined for the academic advisor:

- Advise undergraduate students and address their academic concerns.
- Follow and report student progress via advising checklist sheet.
- Participate in orientation and advising services.
- Assist students in selecting suitable senior projects and supervisors.
- Check fulfillment of graduation requirements.

The advisee/student has the responsibility to:

- Recognize that advising is a shared responsibility and accept responsibility for all decisions.
- Share personal values, abilities and goals.
- Prepare for advising sessions and bring relevant materials.
- Meet with the advisor when asked for or when in need of assistance.
- Learneducational policies, procedures and requirements available on KAU the Deanship of Admission and Registration webpage.

Academic Calendar

The FER programs, similar to all other programs at KAU, follow the semester system. Two semesters are offered in each academic year. The duration of each semester in KSA is nominally 15 weeks excluding final examinations period. In addition, there is an optional eight-week summer semester. Each FER program is a five-year program which consists of a two-semester preparatory year, two semesters of university and faculty required courses, six semesters in the department program and one summer training session after completion of no less than 110 credit hours. Teaching during summer is in fact administrated whenever faculty is available; at least 5 students are enrolled in the course or with at least one graduating student regardless of the number of students enrolled.

Registration Procedure

At the beginning of each semester, the students register a number of credit hours according to their academic standing. The cumulative GPA of the student defines his maximum loads of registration.

GPA	Maximum Load (Credit Units)		
	Default Value	With Vice-Dean Approval	If Graduating Senior in Last Semester Before Graduation
GPA≥2.75	18	19	24
GPA<2.75	12	12	12

Students register their courses online through the ODUS Plus system. All restrictions are programmed. However, if the student needs to override any of these restrictions he needs the approval of his advisor and the department head's approval prior seeking the Vice-Dean's approval.

Among the latest additions to the rolled features of ODUS Plus modules is the "Academic Advisor Module" which provides the Academic Advisors the privilege of auditing student performance against his corresponding study plan in addition to having the options of registering, adding and dropping courses for their advisees during specific time of each semester. The following summarizes prerequisite handling during the different registration periods:

- **During the Preregistration Period** (three weeks during the preceding semester): students are required to meet with their advisors to discuss about the courses for the upcoming semester. The students then register in ODUS Plus which enforces the prerequisites automatically.

- **During the Department Add-Drop Period** (the first two weeks of the semester): The students may, through the department, register for a course for which the prerequisite handling has not yet been automated. Permission of the Academic Advisor and the Department Head are required and the registration requires privileges assigned only to the Faculty Vice-Dean.

- **During the Vice-Dean Office Add-Drop Period** (weeks 3 and 4 of the semester): The Students may, through the Vide-Dean Office, add and drop courses in exceptional circumstances. During this period, academic advisors review the class schedule of their advisees and will request changes if any discrepancies, errors, or prerequisites violations are found.

Examination and Grading System

The examination and grading system of all FER offered programs abide by the following regulations:
- Success in a course is usually based on the combination of a grade awarded for the course work, plus a grade for the final examination.
- Each course will have a total of 100 points, and these are distributed as follows: 60% for the course work (quizzes, assignments, exercises, homework, midterm exams, projects, case studies, practical, and 40% for the final examination.
- The passing grade in each course is 60% out of the total. If a student, for valid reason, is unable to complete the requirements of a registered course, he/she can ask for the grade of "Incomplete" (IC). The case should be presented to the Department Council for approval. Any student who is approved for receiving an IC must complete the requirements of the course during the following semester; otherwise, his/her grade automatically changes to "Fail" (F).

- Other grade types a student might get include:
    o IP Grade (In Progress): this grade is given to the student when registering a course that requires more than one semester. The student is given up to two extra semesters (excluding summer semester) to complete the course work. Failure to do so will automatically change the IP grade to F grade.
    o NP Grade (No Grade Pass): This grade is reserved for the students who pass the Summer Training. The credit hours are counted but have no contribution to the cumulative GPA.
    o NF Grade (No Grade Fail): This grade is reserved for the students who do not pass the Summer Training. The credit hours are not counted and have no contribution to the cumulative GPA. The student has to repeat the Summer Training.

o DN Grade (Denial): This grade is given to students who are absent more than 25% of the contact hours for a certain course. Students will be denied the right to take the final exam in that course and the DN grade will be accounted as 1.0 GPA point in the calculation of the cumulative GPA.

o W (Withdrawn): The students are given this grade for the courses that are withdrawn within the withdrawal period of each semester. The grade does not earn the students any credit units of the designated courses and does not contribute to the GPA calculation.

The program grading system follows the requirements at KAU which is based on a maximum of 5 as shown below.

Letter Grade	Numerical	Point
A+	95-100	5.0
A	90-less than 95	4.75
B+	85-less than 90	4.5
B	80-less than 85	4.0
C+	75-less than 80	3.5
C	70-less than 75	3.0
D+	65-less than 70	2.5
D	60-less than 65	2.0
F	Below 60	1.0

A student grade point average (GPA) is determined by dividing the cumulative point value of all courses attempted by the number of credit hours in the student's semester schedule. Although a student is allowed to repeat any course in which he earned an "F", the new grade does not cancel out the old one. Old grades are kept in the student's transcript and count towards his GPA. The Cumulative Grade Point Average value is translated into performance standing as shown below.

Grade Range	Standing
4.5 upwards	Excellent
3.75-4.50	Very Good
2.75-3.75	Good
Less than 2.75	Fail

Summer Training Performance Evaluation

Summer training is administered through the Training and Graduates Unit (FTGU) in coordination with external organizations in the country. Each student is assigned a faculty member to be his summer training supervisor and a representative from the training organization to supervise and mentor him at work. Summer training supervisors are assigned at least 3 students from the program. The student's performance is evaluated through the following:

- A field evaluation by the representative of the training organization which is submitted to FER at the end of the training period,
- Regular on-site visits by the summer training supervisor during the training period, and

- A written report and oral presentation conducted by the student before his summer training supervisor at the first two-weeks of the semester following the training period.

Withdrawal

The student has the right to withdraw from one or more courses or from the whole academic semester within the withdrawal period announced in the academic calendar for that semester. No withdrawal is allowed during the last five weeks before the final examination. The college Vice Dean must approve the withdrawal request after reviewing the authenticity of the student's reasons for withdrawal.

Attendance

Considering that regular course attendance is necessary for academic success, KAU requires that students should attend at least 75% of the lectures and practical. Students failing to meet this requirement in any of the courses will be prohibited from attending the final examination of that course and will have a DN (Denial) grade in that course. Furthermore, the student who is absent in the final examination of a course(s) will not be given a substitute examination, except for a valid reason accepted by the college council.

Scholastic Probation

All students at FER are required to maintain a GPA of at least 2.75 out of 5.0 which is the minimum GPA for graduation. Those who fail to maintain this GPA are placed on scholastic probation and are given three consecutive semesters in which they must attain it. If this condition is not met within this period, the student may then be dismissed from his studies at the FER. One last opportunity of a fourth semester to raise the average can be given, after review of the academic record by the academic supervisor and approval of Faculty and University Councils. Students who are completely absent for a semester will be disqualified from their program and will require the approval of the Faculty Council to resume their studies. Students failing in all of their registered courses in one semester are temporarily disqualified until they supply official proof from the instructors of these courses that they attended at least partially. Access to the ODUS Plus is denied for disqualified students. Student academic records and administrative aspects, including online registration, are integral parts of ODUS Plus. Students are expected to graduate after completing 10 semesters and will be disqualified from their programs if they do not fulfill the graduation requirements within a maximum period of 15 semesters. In exceptional cases, the University Council can give an exceptional opportunity to the students to fulfill the graduation requirements within maximum of 20 semesters.

Transfer Students and Transfer Courses

KAU has in place a process for the evaluation of transfer credits from other universities as well as transfer of credits between different KAU faculties. The Deanship of Admission and Registration arranges the transfer of course credits from other four- or five-year institutions. In many cases, this process requires additional evaluation by the academic advisor or referral to a faculty member who is more familiar with particular subject matter.

Transfer from Other Universities

A student may transfer from another university to the Faculty of Engineering - Rabigh at KAU if the following conditions are satisfied:
- The academic degree pursued by the student in the original university is substantially equivalent to the Bachelor of Science degree granted by KAU.
- The student should have a minimum GPA or 3.0 out of 5.0 or equivalent.

- The student should not have been dismissed for disciplinary reasons from the university he is transferring from.
- The student must complete at KAU at least 50% of the credit hours required by the KAU degree.
- Transfer students may transfer the courses taken in their previous university provided that they are deemed equivalent to the corresponding KAU courses. For such equivalence to be granted, three criteria must be satisfied:
  o The two courses are ascertained to be essentially of the same content by the concerned KAU department or program.
  o The number of credit units of the course at the previous university is at least the same for the KAU course.
  o The student must have passed the course with a grade C or better.
- Transferred courses are listed in the transcript but will not contribute to the student's cumulative GPA at KAU.
- The transfer is administered by the Deanship of Admission and Registration.

Transfer of Students within the FER

Students may apply, only once, to transfer to the program if they are studying in another program at the FER and have not completed 50% of the credit hours required in their current program. Transfer is competitive based on the available seats of the program and the students' GPA. The transfer is administered by the FER Vice-Dean Office. All courses previously taken by transferring students (whether required for the program or not) do remain on the students' records and are included in their cumulative GPAs.

Discontinuity Status

The following rules apply to students who discontinue their education progress:
1. The student is considered to be on discontinuing status if he withdraws from a semester or fails to register, with or without a valid reason.
2. It is permissible for a student to be on a discontinuing status for a maximum of two consecutive semesters, or a maximum of three non-consecutive semesters during his enrolment. The student's enrolment will be terminated if he exceeds these limits.
3. Any student who loses his status as a student at KAU due to the condition mentioned in point **1** above is entitled to appeal to be readmitted to the university based on the following conditions:
   - The student should satisfy all the admission conditions announced at re-admission.
   - The student should keep the same University Identification Number and the records he had prior to discontinuing his study.
   - The student's appeal should be approved by his Faculty Council, which has the right to require the student to retake any course that he has passed.

If the student's discontinuity exceeds four semesters, he can apply for admission as a fresh student without looking into his previous record, provided that his discontinuity was not because of misconduct.

Programs Graduation Requirements

In order to qualify for a Bachelor of Science degree in FER offered programs:
- A student must successfully complete 155 credit hours with an overall GPA of 2.75 out of 5 or higher while satisfying the curriculum requirements of his program of specialization.
- Each student is also required to complete one summer training of 10 weeks in industry under the supervision of a faculty member.

- The typical study period is five years (10 semesters) and the credit units are distributed as follows:
  - University Requirements   26
  - Faculty Requirements   44
  - Program Requirements   79
  - Free Courses (from outside Faculty)   6

University Requirements

#	Course Title	Code / No.	CU	Prerequisite
1	Islamic Culture (1)	ISLS 101	2	---
2	Islamic Culture (2)	ISLS 201	2	ISLS 101
3	Islamic Culture (3)	ISLS 301	2	ISLS 201
4	Islamic Culture (4) (Professional Ethics)	ISLS 401	2	ISLS 301
5	Linguistic Skills	ARAB 101	3	---
6	Arabic Writing	ARAB 201	3	ARAB 101
7	Communication Skills	COMM 101	3	---
8	Computer Skills	CPIT 100	3	---
9	English Language (1)	ELI 101	0	---
10	English Language (2)	ELI 102	2	---
11	English Language (3)	ELI 103	2	ELI 102
12	English Language (4)	ELI 104	2	---
	Total CU		26	

Faculty Requirements

#	Course Title	Code / No.	CU	Prerequisite
1	Engineering Drawing	MEN 100	3	---
2	Technical Writing in English	IEN 101	2	ELI 104
3	General Biology I	BIO 110	3	---
4	General Chemistry I	CHEM 110	3	---
5	Calculus I	MATH 110	3	---
6	General Physics I	PHYS 110	3	---
7	General Statistics I	STAT 110	3	---
8	Computer Programming	EEN 170	2	CPIT 100, MATH 110
9	Intro to Engineering Design I	IEN 201	2	COMM 101, IEN 101
10	Intro to Engineering Design II	IEN 202	2	IEN 201
11	Calculus II	MATH 202	3	MATH 110
12	General Physics II	PHYS 202	4	MATH 110, PHYS 110
13	Calculus III	MATH 203	3	MATH 110
14	Differential Equations	MATH204	3	MATH 202

15	Engineering Economy	IEN 255	3	MATH 110
16	General Chemistry Laboratory	CHEM 281	1	CHEM 110
17	General Physics Laboratory	PHYS 281	1	PHYS 110
	Total CU		**44**	

Preparatory Year Program Courses

1st Semester

Course Title	Code / No	CU	Pre-Req.
Computer Skills	CPIT 100	3	---
English Language (1)	ELI 101	0	---
English Language (2)	ELI 102	2	---
Calculus I	MATH 110	3	---
General Physics I	PHYS 110	3	---

2nd Semester

Course Title	Code / No	CU	Pre-Req.
Communication Skills	COMM 101	3	---
English Language (3)	ELI 103	2	ELI 102
English Language (4)	ELI 104	2	---
General Statistics I	STAT 110	3	---
General Chemistry I	CHEM 110	3	---
General Biology I	BIO 110	3	---

CHEMICAL AND MATERIALS ENGINEERING DEPARTMENT

About the Department

Chemical and Materials Engineering discipline deals with the application of basic and engineering sciences to study the processes in which raw materials undergo both chemical and physical changes to produce value added products. Chemical and materials engineers focus on the design, construction and economic operation of process plants and equipment in which these processes take place. Quality and characteristics of materials produced are also studied in this discipline.

The Kingdom of Saudi Arabia is enriched with huge resources of petroleum and minerals which require the skills of chemical and materials engineers to harness these resources and contribute to the rapid development and progress of the country. Rabigh is an attractive location for industrial facilities. According to Municipality of Rabigh, there are more than 125 industrial companies located and running in and round Rabigh till 2012. These companies are involved in core chemical processes such as petroleum refining, petrochemicals, cement production, polymer processing, metals forming and galvanization. A good amount of food production companies are under construction and they will start operation very soon. Moreover, Rabigh has developed special geological importance due to the vicinity of King Abdullah Economic city and Yanbu Industrial area. Realizing the needs of trained and skilled personnel in the area, King Abdulaziz University-Rabigh founded the Department of Chemical and Materials Engineering in 2010 and became operational in 2011.

The department is well equipped to provide effective training to graduate the engineers. It has a B.Sc. degree program of five years duration consisting of 155 credit units with specialized courses, suitable to the requirements of Kingdom. The department is in its development phase and making progress at a good pace. The Chemical and Materials Engineering Department maintains an active the American Institute of Chemical Engineers (AIChE) student chapter with students from all years and stages in the CHEN curriculum since May 2015. The American Institute of Chemical Engineers is a national professional organization for chemical engineers. Since 1908, it has been one of the greatest resources for both the Chemical major and the profession

Vision

The department will be recognized as one of the leading comprehensive Chemical and Materials Engineering programs in the Middle East.

Mission

The department provides industry and government agencies with engineers able to deal with high technology and meet the job market needs.

Program Educational Objectives

PEOs of Bachelor of Science in Chemical Engineering (BSCHE) program are listed below.
Within a few years of graduation, our graduates are expected to:

- Apply their skills to deal with the technological challenges in the field of Chemical Engineering.
- Pursue advanced studies, learn independently, grow intellectually, solve multidisciplinary engineering problems innovatively and start their own businesses.
- Meet the needs of the regional industries, participate in community activities, understand the role of safety and the impact of their actions on the society and the environment.

Program Graduation Requirements

In order to qualify for a B.Sc. degree in Chemical and Materials Engineering:

- A student must successfully complete 155 credit hours with an overall GPA of 2.75 out of 5 or better while satisfying the curriculum requirements of his program of specialization.
- Each student is also required to complete one summer training of 10 weeks in industry under the supervision of a faculty member.
- The typical study period is five years (10 semesters) and the credit units are distributed as follows:
  - University Requirements   26
  - Faculty Requirements   44
  - ProgramCompulsory Requirements   68
  - ProgramElective Requirements   11
  - Free Courses (from outside Faculty)   6

Program Courses

Compulsory Courses

#	Course Title	Code / No.	CU	Prerequisite
1	Electrical Circuits I	EEN 100	3	PHYS 202
2	Basic Workshop	MEN 130	1	---
3	Intro to Chemical Engineering	CHEN 201	3	CHEM 281
4	Chemical Eng Thermodynamics	CHEN 202	3	CHEM 240
5	Materials Science and Eng	CHEN 210	3	CHEM 110
6	Polymer Science and Eng	CHEN 211	2	CHEM 231
7	Engineering Mechanics	MEN 225	3	PHYS 281
8	Principles of Organic Chem I	CHEM 231	4	CHEM 110
9	Fluid and Particle Mechanics	CHEN 231	3	MATH 204, CHEN 201
10	PhysChem for Non Chem Majors	CHEM 240	4	CHEM 281
11	Thermodynamics of Materials	CHEN 301	3	CHEN 210
12	Electrochem and Corrosion Eng	CHEN 311	2	CHEM 240
13	Chemical Reaction Engineering	CHEN 321	3	MATH 204, CHEN 201
14	Mass Transfer	CHEN 331	3	CHEN 231
15	Heat Transfer	CHEN 332	3	CHEN 201
16	Separation Processes	CHEN 333	3	CHEN 201
17	Process Dynamic and Control I	CHEN 341	2	CHEN 321
18	Numerical Methods in ChemEng	CHEN 342	3	MATH 204
19	Summer Training	CHEN 390	2	Complete 110 CU
20	Unit Operations Lab	CHEN 431	2	CHEN 333
21	Process Dynamic and Control II	CHEN 441	2	CHEN 341
22	Modeling and Simulation	CHEN 442	3	CHEN 333

23	Plant Design	CHEN 451	3	CHEN 321, CHEN 333
24	Intro to Entrepreneurship	IEN 481	1	IEN 202
25	B.Sc. Senior Project (9th and 10th Semester)	CHEN 499	4	CHEN 333
	Total CU		68	

Elective Courses

#	Course Title	Code / No.	CU	Prerequisite
1	Materials Selection	CHEN 411	4	CHEN 210
2	Composite Materials	CHEN 412	3	CHEN 210
3	Mat Structure and Failure Anal	CHEN 413	3	CHEN 210
4	Mat and Nanomat Character	CHEN 414	4	CHEN 211
5	Biomaterials	CHEN 415	3	CHEN 210& CHEN 211
6	Extractive Metallurgy	CHEN 416	3	CHEN 210
7	Water and Wastewater Treatment	CHEN 452	4	CHEN 333
8	Water Desalination	CHEN 454	3	CHEN 332
9	Safety in Chem Process Indust	CHEN 466	3	CHEN 333
10	ChemEng Design for Environ	CHEN 471	4	CHEN 201
11	Industrial Pollution Control	CHEN 472	3	CHEN 442
12	Biochemical Engineering	CHEN 481	3	CHEN 321
13	Fundamentals of Biofuel	CHEN 421	3	CHEN 321
14	Energy Conservation	CHEN 432	3	CHEN332
15	Design of Altern Energy Sys	CHEN 455	4	CHEN 202
16	Petroleum Refinery Engineering	CHEN 461	4	CHEN 321 & CHEN 333
17	Natural Gas Engineering	CHEN 462	3	CHEN 321 & CHEN 333
18	Petrochemical Technology	CHEN 463	3	CHEN 333
19	Selected Topics in ChemEng	CHEN 497	3	---

Study Program

3rd Semester

Course Title	Code / No	CU	Pre-Req.
Linguistic skills	ARAB 101	3	---
Computer Programming	EEN 170	2	MATH 110 CPIT 100
Calculus II	MATH 202	3	MATH 110
General Physics II	PHYS 202	4	MATH 110 PHYS 110
General Physics Laboratory	PHYS 281	1	PHYS 110
Engineering Drawing	MEN 100	3	---

4th Semester

Course Title	Code / No	CU	Pre-Req.
Engineering Economy	IEN 255	3	MATH 110
General Chemistry Laboratory	CHEM 281	1	CHEM 110
Electrical Circuits (I)	EEN 100	3	PHYS 202
Islamic Culture (1)	ISLS 101	2	---
Calculus III	MATH 203	3	MATH 110
Technical Writing	IEN 101	2	ELI 104
Basic Workshop	MEN 130	1	---

5th Semester

Course Title	Code / No	CU	Pre-Req.
Intro to Chemical Eng.	CHEN 201	3	CHEM 281
Intro to Eng. Design I	IEN 201	2	COMM 101 IEN 101
Differential Eqs.	MATH 204	3	MATH 202
Islamic Culture II	ISLS 201	2	ISLS 101
Principles of Organic Chem I	CHEM 231	4	CHEM 110
PhysChem for Non Chem Majors	CHEM 240	4	CHEM 281

6th Semester

Course Title	Code / No	CU	Pre-Req.
Eng. Mechanics	MEN 225	3	PHYS 281
Chemical Eng Thermodynamics	CHEN 202	3	CHEM 240
Intro to Eng. Design II	IEN 202	2	IEN 201
Materials Sci. and Eng	CHEN 210	3	CHEM 110
Polymer Science and Eng	CHEN 211	2	CHEM 231
Fluid and Particle Mechanics	CHEN 231	3	MATH 204 CHEN 201

7th Semester

Course Title	Code / No	CU	Pre-Req.
Thermodynamics of Materials	CHEN 301	3	CHEN 210
Electrochem. and Corrosion Eng	CHEN 311	2	CHEM 240
Chemical Reaction Engineering	CHEN 321	3	MATH 204 CHEN 201
Mass Transfer	CHEN 331	3	CHEN 231
Free Course I	xxx	3	---

8th Semester

Course Title	Code / No	CU	Pre-Req.
Arabic Writing	ARAB 201	3	ARAB 101
Numerical Methods in ChemEng	CHEN 342	3	MATH 204
Islamic Culture III	ISLS 301	2	ISLS 201
Heat Transfer	CHEN 332	3	CHEN 201
Separation Processes	CHEN 333	3	CHEN 201
Process Dynamic and Control I	CHEN 341	2	CHEN 321

Summer Training

Course Title	Code / No	CU	Pre-Req.
Summer Training	CHEN 390	2	Complete 110 CU

9th Semester

Course Title	Code / No	CU	Pre-Req.
Islamic Culture IV	ISLS 401	2	ISLS 301
Unit Operations Lab	CHEN 431	2	CHEN 333
Process Dynamic and Control II	CHEN 441	2	CHEN 341
Elective I,	CHEN 4xx	3	CHEN xxx
Elective (2),	CHEN 4xx	4	CHEN xxx
B.Sc. Senior Project; (two semesters)	CHEN 499	4	CHEN 333

10th Semester

Course Title	Code / No	CU	Pre-Req.
Modeling and Simulation	CHEN 442	3	CHEN 333
Plant Design	CHEN 451	3	CHEN 321 CHEN 333
Intro to Entrepreneurship	IEN 481	1	IEN 202
Elective (3)	CHEN 4xx	4	CHEN xxx
Free Course II	xxx	3	---

Department Faculty

Mohamed Bassyouni
Associate Professor
Ph.D. in Chemical Eng.
Cairo, **Egypt&** TU- Clausthal,
Germany, 2008

Mohamed Helmy Abdel-Aziz
Associate Professor
Ph.D. in Chemical Eng.
Alexandria University**, Egypt**,
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I-MEP[2], Université de
Grenoble, **France**, 2012

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Ph.D. in Physical Chemistry.
Clausthal University of
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NUST, Islamabad**, Pakistan**,
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Syed WaheedulHasam
Lecturer
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UET Lahore, **Pakistan**, 2011

UmairJavaid
Lecturer
M.Sc. in Materials & Surface
Eng**.**
NUST, Islamabad**, Pakistan,**
2009

CIVIL ENGINEERING DEPARTMENT

About the Department

Civil Engineering is one of the first engineering sciences that accompanied the development of humankind, and that it plays a major and vital role in the evolution of life and progress. This is like a constantly evolving science with continuous growths. Recently, the Civil Engineering intertwined largely with the industrial development for the production of new construction materials to meet the growing requirements to the needs of the labor market. The Civil Engineering has many specialized fields as analysis, design, construction, operation and maintenance of constructed facilities. The country infrastructure includes buildings, roads, bridges, airports, rail and traffic management, water and sanitation. In addition to, methods of treating sewage and study of environmental pollution and ways to mitigate it, building dams, digging wells, canals, management of engineering projects and solid waste management.

The Civil Engineer is the specialist who qualifies for the analysis, design, construction, operation and maintenance as well as to address the engineering issues, trying to find appropriate solutions and economic development. That allows the student to study Civil Engineering prepares future engineers to deal direct and correct and in a manner commensurate with the reality and contribute to the transport conscious of civilization and international technology, which in turn helps the continuation of the comprehensive development drive witnessed by our beloved country.

Vision

Look forward to leading role to promote education and scientific research and community service in the field of civil engineering.

Mission

Preparation of qualified engineers in the field of civil engineering education and research to provide them with the foundations of knowledge, skills and technology localization in order to serve for community development and meet the needs of the labor market.

Program Educational Objectives

Within a few years of graduation, graduates of the Bachelor of Science in Civil Engineering (BSCE) program are expected to:

- Have successful careers in Civil Engineering and related fields by virtue of acquired skills (technical, communication, leadership qualities, teamwork, innovative and entrepreneurial etc.) and knowledge.
- Be engaged in advanced study, lifelong learning through self-study, participation in professional conferences, workshops, seminars etc.
- Have gained professional licensure, function ethically in their professional civil engineering roles and comprehend the effects of civil engineering projects on the society and environment.

Program Graduation Requirements

In order to qualify for a Bachelor of Science degree in Civil Engineering:

- A student must successfully complete 155 credit units with an overall GPA of 2.75 out of 5 or better while satisfying the curricular requirements of his program of specialization.
- Each student is also required to complete one summer training of 10 weeks in industry under the supervision of a faculty member.
- The typical study period is five years (10 semesters) and the credit units are distributed as follows:

o   University Requirements   26
o   Faculty Requirements   44
o   Program Compulsory Requirements   67
o   Program Elective Requirements   12
o   Free Courses (from outside Faculty) 6

Program Courses

Compulsory Courses

#	Course Title	Code / No.	CU	Prerequisite
1	Electrical Circuits I	EEN 100	3	PHYS 202
2	Basic Workshop	MEN 130	1	---
3	Statics	CEN 201	3	PHYS 281
4	Strength of Materials	CEN 202	3	CEN 201
5	Construction Management	CEN 221	3	IEN 255
6	Structural Analysis (1)	CEN 240	3	CEN 201
7	Hydraulics (1)	CEN 251	3	MATH 203
8	Environmental Eng. Principles	CEN 260	3	CHEM 281
9	Surveying	CEN 271	3	MATH 202
10	Geotechnical Engineering	CEN 333	3	CEN 202
11	Foundation Engineering	CEN 334	3	CEN333 + CEN 342
12	Structural Analysis (2)	CEN 340	3	CEN240
13	Materials of Construction	CEN 341	3	CEN202
14	Reinforced Concrete Design (1)	CEN 342	3	CEN 240
15	Hydraulics (2)	CEN 352	3	CEN 251
16	Hydrology	CEN 353	3	CEN 352
17	Environmental Pollution	CEN 361	2	CEN 260
18	Transportation Engineering	CEN 381	3	CEN 271
19	Summer Training	CEN 390	2	Complete 110 CU
20	Numerical Meth. for Civil Eng.	CEN 402	3	CEN 340
21	Reinforced Concrete Design (2)	CEN 442	3	CEN 342
22	Wastewater Engineering	CEN 462	3	CEN 353
23	Intro to Entrepreneurship	IEN 481	1	IEN 202
24	B.Sc. Senior Project	CEN 499	4	Complete 120 CU
Total CU			67	

Elective Courses

#	Course Title	Code / No.	CU	Prerequisite
1	Construction Engineering	CEN 422	3	CEN 221
2	Construction Contracting	CEN 424	3	CEN 221
3	Applications in Foundation Engineering	CEN 435	3	CEN 334
4	Soil Improvement	CEN 439	3	CEN 334
5	Design of Steel Structures	CEN 443	3	CEN 340
6	Advanced Reinforced Concrete Design	CEN 444	3	CEN 342
7	Maintenance & Rehabilitation of Structures	CEN 445	3	CEN 342
8	AdvancedConstruction Materials	CEN 446	3	CEN 341
9	Design of Hydraulic Structures	CEN 451	3	CEN 352
10	Water Supply Engineering	CEN 453	3	CEN 353
11	Water Resources Engineering	CEN 457	3	CEN 353
12	Wastewater Reclamation & Reuse	CEN 463	3	CEN 361
13	Solid Wastes Engineering	CEN 464	3	CEN 361
14	Environmental Impact Assessment	CEN 465	3	CEN 361
15	GPS and GIS Applications	CEN 471	3	CEN 271
16	Highway Design & Construction	CEN 482	3	CEN 381
17	Traffic Engineering	CEN 483	3	CEN 381
18	Flexible Pavement Maintenance	CEN 486	3	CEN 381
19	Special Topic in Civil Eng.	CEN 497	3	Chairman's Approval

Study Program

3rd Semester

Course Title	Code / No	CU	Pre-Req.
Engineering Drawing	MEN 100	3	---
Linguistic skills	ARAB 101	3	---
Computer Programming	EEN 170	2	MATH 110 CPIT 100
Calculus II	MATH 202	3	MATH 110
General Physics II	PHYS 202	4	MATH 110 PHYS 110
General Physics Laboratory	PHYS 281	1	PHYS 110

4th Semester

Course Title	Code / No	CU	Pre-Req.
Electrical Circuits (I)	EEN 100	3	PHYS 202
Technical Writing	IEN 101	2	ELI 104
Islamic Culture (1)	ISLS 101	2	---
Basic Workshop	MEN 130	1	---
Calculus III	MATH 203	3	MATH 110
Engineering Economy	IEN 255	3	MATH 110
General Chemistry Laboratory	CHEM 281	1	CHEM 110

5th Semester

Course Title	Code / No	CU	Pre-Req.
Arabic Writing	ARAB 201	3	ARAB 101
Statics	CEN 201	3	PHYS 281
Intro to Eng. Design I	IEN 201	2	COMM 101 IEN 101
Differential Eq.	MATH 204	3	MATH 202
Environmental Eng. Principles	CEN 260	3	CHEM 281
Surveying	CEN 271	3	MATH 202

6th Semester

Course Title	Code / No	CU	Pre-Req.
Islamic Culture (2)	ISLS 201	2	ISLS 101
Strength of Materials	CEN 202	3	CEN 201
Intro to Eng. Design II	IEN 202	2	IEN 201
Construction Management	CEN 221	3	IEN 255
Structural Analysis (1)	CEN 240	3	CEN 201
Hydraulics (1)	CEN 251	3	MATH 203

7th Semester

Course Title	Code / No	CU	Pre-Req.
Islamic Culture (3)	ISLS 301	2	ISLS 201
Geotechnical Engineering	CEN 333	3	CEN 202
Structural Analysis (2)	CEN 340	3	CEN 240
Materials of Construction	CEN 341	3	CEN 202
Reinforced Concrete Design (1)	CEN 342	3	CEN 240
Hydraulics (2)	CEN 352	3	CEN 251

8th Semester

Course Title	Code / No	CU	Pre-Req.
Foundation Engineering	CEN 334	3	CEN 333 + CEN 342
Hydrology	CEN 353	3	CEN 352
Environmental pollution	CEN 361	2	CEN 260
Transportation Engineering	CEN 381	3	CEN 271
Free Course (1)	xxx	3	---

Summer Training

Course Title	Code / No	CU	Pre-Req.
Summer Training	CEN 390	2	Complete 110 CU

9th Semester

Course Title	Code / No	CU	Pre-Req.
Numerical Meth. for Civil Eng.	CEN 402	3	CEN 340
Reinforced Concrete Design (2)	CEN 442	3	CEN 342
Elective Course (1);	CEN 4xx	3	CEN xxx
Free Course (2)	xxx	3	---
B.Sc. Senior Project; (two semesters)	CEN 499	4	Complete 120 CU

10th Semester

Course Title	Code / No	CU	Pre-Req.
Islamic Culture (4)	ISLS 401	2	ISLS 301
Wastewater Engineering	CEN 462	3	CEN 353
Intro to Entrepreneurship	IEN 481	1	IEN 202
Elective Course (2);	CEN 4xx	3	CEN xxx
Elective Course (3);	CEN 4xx	3	CEN xxx
Elective Course (4);	CEN 4xx	3	CEN xxx

Department Faculty

Mahmoud Abo El-Wafa Associate Professor
Ph.D. in Civil Eng., (Advanced Construction Materials).
Okayama University, **Japan** 2002

Mostafa Abdel-Bary
Professor
Ph.D. in Civil Eng.
Innsbruck University, **Austria**, 1998

Ibrahim Mosly
Assistant Professor
Ph.D. in Civil Eng., Project Management.
RMIT University, **Australia**, 2012

Mohamed O. M. Hussein
Assistant Professor
Ph.D. in Civil Eng., (Structural).
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Mohamed I. H. Ramadan
Assistant Professor
Ph.D. in Civil Eng., (Geotechnical).
Memorial University, **Canada**, 2011

Hassan Safi H. Ahmed
Assistant Professor
Ph.D. in Civil Eng. (Water Resources).
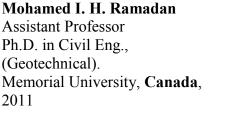Saitama University, **Japan**, 2009

Asifuzzaman
Lecturer
M.Sc. in Civil Eng., (Environmental Eng.).
Aligarh Muslim University, **India**, 2005

ELECTRICAL ENGINEERING DEPARTMENT

About the Department

The Electrical Engineering department (EE) is one of the six departments at FER. It was established in 2009 to meet the need in Rabigh and its vicinities for well-trained electrical engineers capable of designing, installing, maintaining, and managing electrical systems. The idea was to produce qualified engineers in the field of electrical engineering education and research by providing them with the foundations of knowledge, skills and technology localization in order to serve for community development and meet the needs of the labor market.

Vision

The department seeks to be recognized locally, regionally and internationally as an excellent center for teaching and research within the field of Electrical Engineering.

Mission

To provide high quality programs in education, scientific research and community services in the field of Electrical Engineering.

Program Educational Objectives

The Program Educational Objectives (PEOs) of the Bachelor of Science in Electrical Engineering (BSEE) program are listed below.
Within a few years of graduation, our graduates will:

- Have successful careers in the field of electrical engineering.
- Advance to the leadership positions by lifelong learning through higher education and/or professional development.
- Contribute to the society growth and profession development through responsible practice of engineering.

Program Graduation Requirements

In order to qualify for a Bachelor of Science degree in Electrical Engineering:

- A student must successfully complete 155 credit hours with an overall GPA of 2.75 out of 5 or better while satisfying the curricular requirements of his program of specialization.
- Each student is also required to complete one summer training of 10 weeks in industry under the supervision of a faculty member.
- The typical study period is five years (10 semesters) and the credit hours are distributed as follows:

  - University Requirements   26
  - Faculty Requirements   44
  - Program Compulsory Requirements   61
  - Program Electives Requirements   18
  - Free Courses (from outside Faculty)   6

Program Courses

Compulsory Courses

#	Course Title	Code / No.	CU	Prerequisite
1	Electrical Circuits I	EEN 100	3	PHYS 202
2	Basic Workshop	MEN 130	1	---
3	Electrical Circuits II	EEN 201	3	EEN 100
4	Electrical Measurements	EEN 202	3	EEN 201
5	Electronics I	EEN 210	2	EEN 100
6	Electronics Lab.	EEN 211	1	EEN 100
7	Digital Logic Design	EEN 212	2	EEN 210
8	Digital Logic Design Lab.	EEN 213	1	EEN 210
9	Electromagnetic Fields	EEN 220	3	EEN 201, MATH 203
10	Engineering Mechanics	MEN 225	3	PHYS 281
11	Engineering Numerical Methods	EEN 271	3	EEN 170, MATH 204
12	Signals and Systems	EEN 303	2	MATH 204
13	Automatic Control	EEN 304	3	EEN 201, MATH 204
14	Probability and Statistic	EEN 305	2	EEN 303
15	Materials Properties	CHEN 310	2	EEN 210, CHEM 281
16	Electronics II	EEN 314	3	EEN 210
17	Fundamentals of Power Systems	EEN 330	3	EEN 201
18	Power Systems Lab.	EEN 331	1	EEN 201
19	Electrical Machines I	EEN 340	2	EEN 220
20	Electrical Machines Lab.	EEN 341	1	EEN 220
21	Introduction to Communications	EEN 350	3	EEN 303
22	Communications Lab.	EEN 351	1	EEN 303
23	Thermo-Fluids	MEN 367	3	PHYS 281, MATH 202
24	Summer Training	EEN 390	2	Complete 110 CU
25	Embedded Systems	EEN 415	3	EEN 212
26	Intro. to Entrepreneurship	IEN 481	1	IEN 202
27	Senior Project I	EEN 498	1	EEN 390
28	Senior Project II	EEN 499	3	EEN 498
	Total CU		61	

Elective Courses

#	Course Title	Code / No.	CU	Prerequisite
1	High Voltage Engineering	EEN 432	3	EEN 330
2	Power Electronics	EEN 442	3	EEN 314
3	Electrical Machines II	EEN 443	3	EEN 340, EEN 341
4	Protection and Switchgear	EEN 433	3	---
5	Power Systems Analysis	EEN 434	3	---
6	Power Networks Planning	EEN 435	3	---
7	Power System Control	EEN 436	3	EEN 304, EEN 330
8	High Voltage Applications	EEN 437	3	EEN 432
9	Special Topics in Power System	EEN 438	3	Chairman's Approval
10	Electric Drive Systems	EEN 444	3	EEN 442, EEN 443
11	Special Electrical Machines	EEN 445	3	EEN 443
12	Programmable Logic Controllers	EEN 446	3	EEN 212, EEN 304
13	Industrial Power Electronics	EEN 447	3	EEN 442
14	Electrical Machines Analysis	EEN 448	3	EEN271, EEN 443
15	Special Topics in Machines	EEN 449	3	Chairman's Approval
16	Electromagnetic Waves	EEN 421	3	EEN 220, EEN 350
17	Digital Communications	EEN 452	3	EEN 212, EEN 350
18	Computer Networks	EEN 460	3	EEN 212, EEN 350
19	Antennas and waves Propagation	EEN 422	3	EEN 421
20	Mobile Communications	EEN 453	3	EEN 452
21	Satellite Communications	EEN 454	3	EEN 421, EEN 452
22	Optical Communications	EEN 455	3	EEN 421, EEN 452
23	Digital Signal Processing	EEN 456	3	EEN 452
24	Special Topics in Comm. Eng.	EEN 458	3	Chairman's Approval
25	Information Theory and Coding	EEN 457	3	EEN 452
26	Optical Networks	EEN 461	3	EEN 460
27	Data Comm. and Networks	EEN 462	3	EEN 460
28	Telecommunications Networks	EEN 463	3	EEN 452
29	Special Topics in Networks	EEN 464	3	Chairman's Approval

Study Program

3rd Semester

Course Title	Code / No	CU	Pre-Req.
Linguistic skills	ARAB 101	3	---
Computer Programming	EEN 170	2	MATH 110 CPIT 100
Calculus II	MATH 202	3	MATH 110
General Physics II	PHYS 202	4	MATH 110 PHYS 110
General Physics Laboratory	PHYS 281	1	PHYS 110
Engineering Drawing	MEN 100	3	---

4th Semester

Course Title	Code / No	CU	Pre-Req.
Engineering Economy	IEN 255	3	MATH 110
General Chemistry Laboratory	CHEM 281	1	CHEM 110
Electrical Circuits (I)	EEN 100	3	PHYS 202
Islamic Culture (1)	ISLS 101	2	---
Calculus III	MATH 203	3	MATH 110
Technical Writing	IEN 101	2	ELI 104
Basic Workshop	MEN 130	1	---

5th Semester

Course Title	Code / No	CU	Pre-Req.
Engineering Mechanics	MEN 225	3	PHYS 281
Intro to Eng. Design I	IEN 201	2	IEN 101 COMM 101
Differential Equations	MATH 204	3	MATH 202
Electronics I	EEN 210	2	EEN 100
Electronics Lab.	EEN 211	1	EEN 100
Electrical Circuits II	EEN 201	3	EEN 100
Arabic Writing	ARAB 201	3	ARAB 101

6th Semester

Course Title	Code / No	CU	Pre-Req.
Islamic Culture (2)	ISLS 201	2	ISLS 101
Intro to Eng. Design II	IEN 202	2	IEN 201
Electrical Measurements	EEN 202	3	EEN 201
Digital Logic Design	EEN 212	2	EEN 210
Digital Logic Design Lab	EEN 213	1	EEN 210
Electromagnetic Fields	EEN 220	3	EEN 201 MATH 203
Engineering Numerical Methods	EEN 271	3	EEN 170 MATH 204

7th Semester

Course Title	Code / No	CU	Pre-Req.
Islamic Culture (3)	ISLS 301	2	ISLS 201
Thermo-Fluids	MEN 367	3	PHYS 281 MATH 202
Electronics II	EEN 314	3	EEN 210
Signals and Systems	EEN 303	2	MATH 204
Electrical Machines I	EEN 340	2	EEN 220
Electrical Machines Lab.	EEN 341	1	EEN 220
Free Course I	xxx	3	---

8th Semester

Course Title	Code / No	CU	Pre-Req.
Automatic Control	EEN 304	3	EEN 201 MATH 204
Materials Properties	CHEN 310	2	EEN 210 CHEM 281
Probability & Statistic	EEN 305	2	EEN 303
Fundamentals of Power Systems	EEN 330	3	EEN 201
Power Systems Lab.	EEN 331	1	EEN 201
Intro. to Communications	EEN 350	3	EEN 303
Communications Lab.	EEN 351	1	EEN 303

Summer Training

Course Title	Code / No	CU	Pre-Req.
Summer Training	EEN 390	2	Complete 110 CU

9th Semester

Course Title	Code / No	CU	Pre-Req.
Embedded Systems	EEN 415	3	EEN 212
Islamic Culture (4)	ISLS 401	2	ISLS 301
Elective Course I	EEN 4xx	3	EEN xxx
Elective Course II	EEN 4xx	3	EEN xxx
Elective Course III	EEN 4xx	3	EEN xxx
Senior Project I	EEN 498	1	EEN 390

10th Semester

Course Title	Code / No	CU	Pre-Req.
Elective Course IV	EEN 4xx	3	EEN xxx
Elective Course V	EEN 4xx	3	EEN xxx
Elective Course VI	EEN 4xx	3	EEN xxx
Senior Project II	EEN 499	3	EEN 498
Intro to Entrepreneurship	IEN 481	1	IEN 202
Free Course II	xxx	3	---

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Associate Professor
Ph.D. in Electrical Eng.
New Jersey Institute of
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**Mohammed E. D.
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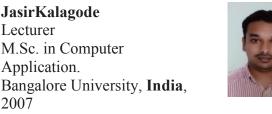Suez Canal University, **Egypt**,
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Hussain M. M. Bassi
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Aswan University, Aswan**,
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Nawaf R. Almuqati
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M.Sc. in Electrical and
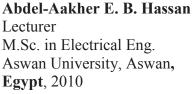Computer Eng.
Concordia University,
Canada, 2012

Mohammed M. Alhazmi
Lecturer
M.Sc. in Electrical Eng., Power
and Control.
California State University,
USA, 2015

INDUSTRIAL ENGINEERING DEPARTMENT

About the Department

The Kingdom of Saudi Arabia is undergoing rapid changes in various sectors of economy. In particular, manufacturing firms, engineering enterprises and organizations are becoming more complex. To be competitive in the global environment, the Kingdom of Saudi Arabia requires sufficient number of industrial engineers who are well trained to design, install, maintain and manage complex industrial operations and manufacturing systems. In line with this development, the Department of Industrial Engineering was established in the Faculty of Engineering, King Abdulaziz University, Rabigh Campus in 2009.

Currently, the department offers a Bachelor of Science in Industrial Engineering program. Industrial Engineering is a discipline known for its breadth of scope and applications. It is not only concerned with technology, but also with people and operational issues. It combines scientific and technical knowledge with human sciences to design, plan, and analyze systems that involve people, materials, money, energy, equipment, information and other related resources. The most distinct aspect of industrial engineering is the flexibility it offers. Because of its broad perspective, industrial engineering is applicable in a wide variety of industries, including: manufacturing, health care, banking, insurance, transportation, construction, utilities, and government agencies. However, to maintain the depth and the focus, the curriculum is designed to meet the specific and unique needs of employers in surrounding industrial areas. Hence, manufacturing systems and engineering related operations are the application domain of the curriculum. As such the curriculum emphasizes on the analysis and design of manufacturing systems. It prepares students to work in activities such as manufacturing process planning and control, automation, production methods and standards, computer-aided manufacturing, engineering economic analysis, facilities design and optimization of industrial operations. For industrial engineering graduates to function effectively within interdisciplinary environment, the curriculum gives more emphasize on broad engineering sciences courses.

Vision

Our vision is to become a center of excellence in Saudi Arabia of prominent research, education, and collaboration that produces, attracts and retains industry leaders, decision makers, and researchers in the field of Industrial Engineering.

Mission

Our Mission is to prepare distinguished and creative engineers through high quality applied education based on Islamic values and ethics to pioneer in research, consulting and knowledge transfer; all for ultimately serving and developing the society by making systems productive and efficient.

Program Educational Objectives

Within few years of graduation, graduates of the Bachelor of Science in Industrial Engineering (BSIE) program are expected to:

- Have positively impacted work environments at IE related challenging positions in the industry or have successfully established start-ups.
- Have developed their careers in industry and/or academia by virtue of acquired knowledge and adaptation to evolving professional environments.
- Be engaged in the service of local, regional, and/or professional communities through knowledge development and innovation while being ethical leaders

Program Graduation Requirements

In order to qualify for a Bachelor of Science degree in Industrial Engineering:

- A student must successfully complete 155 credit hours with an overall GPA of 2.75 out of 5 or better while satisfying the curricular requirements of his program of specialization.
- Each student is also required to complete one summer training of 10 weeks in industry under the supervision of a faculty member.
- The typical study period is five years (10 semesters) and the credit hours are distributed as follows;
  - o University Requirements   26
  - o Faculty Requirements   44
  - o Program Compulsory Requirements   67
  - o Program Elective Requirements   12
  - o Free Courses (from outside Faculty)   6

Program Courses

Compulsory Courses

#	Course Title	Code / No.	CU	Prerequisite
1	Electrical Circuits I	EEN 100	3	PHYS 202
2	Basic Workshop	MEN 130	1	---
3	Materials Science and Eng	CHEN 210	3	CHEM 281
4	Engineering Mechanics	MEN 225	3	PHYS 281
5	Engineering Management	IEN 256	3	IEN 202, IEN 255
6	Operations Research I	IEN 311	3	MATH 204
7	Computer Programming for IE	IEN 322	3	EEN 170
8	System Analysis and Design	IEN 323	2	IEN 322, MATH 204
9	Engineering Prob. & Statistics	IEN 331	3	STAT 110, MATH 202
10	Numerical Methods in Eng	EEN 332	3	EEN 170, MATH 204
11	Work Study	IEN 341	3	IEN 331
12	Human Factors Engineering	IEN 342	3	IEN 341
13	Manufacturing Processes I	IEN 361	3	MEN 130, CHEN 210
14	Manufacturing Systems Design	IEN 363	3	IEN 361
15	Thermo – Fluids	MEN 367	3	PHYS 281, MATH 202
16	Summer Training	IEN 390	2	Complete 110 CU
17	Industrial Information Systems	IEN 421	2	IEN 323
18	Industrial Systems Simulation	IEN 422	3	IEN 322, IEN 331
19	Industrial Quality Control	IEN 431	3	IEN 331
20	Design of Experiments	IEN 432	3	IEN 331
21	Production Planning and Control	IEN 451	3	IEN 256, IEN 341

22	Facilities Planning and Design	IEN 453	3	IEN 323, IEN 341
23	Industrial Entrepreneurship	IEN 482	2	IEN 256
24	Senior Project I	IEN 498	1	Complete 110 CU
25	Senior Project II	IEN 499	3	IEN 498
Total CU			67	

Elective Courses

#	Course Title	Code / No.	CU	Prerequisite
1	Automation and Control	IEN 321	3	MATH 204, EEN 170
2	Manufacturing Processes II	IEN 362	3	IEN 361
3	Industrial Internship	IEN 393	6	IEN 101, IEN 202, IEN 390, GPA 3.0
4	Operations Research II	IEN 411	3	IEN 311, IEN 331
5	Industrial Stochastic Systems	IEN 412	3	IEN 331
6	Feasibility Studies	IEN 423	3	IEN 255, IEN 323
7	Industrial Data Systems	IEN 424	3	IEN 421
8	Reliability Engineering	IEN 433	3	IEN 331
9	Maintenance Engineering	IEN 434	3	IEN 256, IEN 331
10	Industrial Safety Engineering	IEN 441	3	IEN 342
11	Marketing Management and Research	IEN 450	3	IEN 256
12	Engineering Cost Analysis	IEN 454	3	IEN 255
13	Global Logistics Management	IEN 455	3	IEN 255, IEN 331
14	Project Management	IEN 456	3	IEN 256
15	Supply Chain Management	IEN 457	3	IEN 256, IEN 451
16	Strategic Management	IEN 458	3	IEN 256
17	Operations Management	IEN 459	3	IEN 451
18	CAD / CAM	IEN 461	3	MEN 100, IEN 361
19	Computer Integrated Mfg.	IEN 462	3	MEN 100, IEN 361
20	Design for Mfg. and Assembly	IEN 463	3	MEN 130
21	Engineering Metrology	IEN 464	3	IEN 361
22	Special Topics in IE	IEN 490	3	Department Approval

Study Program

3rd Semester

Course Title	Code / No	CU	Pre-Req.
Linguistic skills	ARAB 101	3	---
Computer Programming	EEN 170	2	MATH 110 CPIT 100
Calculus II	MATH 202	3	MATH 110
General Physics II	PHYS 202	4	MATH 110 PHYS 110
General Physics Laboratory	PHYS 281	1	PHYS 110
Engineering Drawing	MEN 100	3	---

4th Semester

Course Title	Code / No	CU	Pre-Req.
Engineering Economy	IEN 255	3	MATH 110
General Chemistry Laboratory	CHEM 281	1	CHEM 110
Electrical Circuits (I)	EEN 100	3	PHYS 202
Islamic Culture (1)	ISLS 101	2	---
Calculus III	MATH 203	3	MATH 110
Technical Writing	IEN 101	2	ELI 104
Basic Workshop	MEN 130	1	---

5th Semester

Course Title	Code / No	CU	Pre-Req.
Arabic Writing	ARAB 201	3	ARAB 101
Intro to Eng. Design I	IEN 201	2	COMM 101 IEN 101
Computer Programming for IE	IEN 322	3	EEN 170
Engineering Prob. & Statistics	IEN 331	3	STAT 110 MATH 202
Differential Eqs.	MATH 204	3	MATH 202
Eng. Mechanics	MEN 225	3	PHYS 281

6th Semester

Course Title	Code / No	CU	Pre-Req.
Materials Sci. and Eng	CHEN 210	3	CHEM 281
Intro to Eng. Design II	IEN 202	2	IEN 201
System Analysis and Design	IEN 323	2	IEN 322 MATH 204
Work Study	IEN 341	3	IEN 331
Islamic Culture (2)	ISLS 201	2	ISLS 101
Numerical Methods in Eng	EEN 332	3	EEN 170 MATH 204

7th Semester

Course Title	Code / No	CU	Pre-Req.
Eng. Management	IEN 256	3	IEN 202 IEN 255
Operations Research I	IEN 311	3	MATH 204
Manufacturing Processes I	IEN 361	3	MEN 130, CHEN 210
Islamic Culture (3)	ISLS 301	2	ISLS 201
Thermo – Fluids	MEN 367	3	PHYS 281, MATH 202
Human Factors Engineering	IEN 342	3	IEN 341

8th Semester

Course Title	Code / No	CU	Pre-Req.
Manufacturing Systems Design	IEN 363	3	IEN 361
Industrial Information System	IEN 421	2	IEN 323
Industrial Quality Control	IEN 431	3	IEN 331
Design of Experiments	IEN 432	3	IEN 331
Free Course I*	xxx	3	---
Free Course II*	xxx	3	---

Summer Training

Course Title	Code / No	CU	Pre-Req.
Summer Training	IEN 390	2	Complete 110 CU

9th Semester

Course Title	Code / No	CU	Pre-Req.
Industrial Systems Simulation	IEN 422	3	IEN 322, IEN 331
Production Planning and Control	IEN 451	3	IEN 256, IEN 341
Senior Project I	IEN 498	1	Complete 110 CU
Group Elective I*	IEN xxx	3	IEN xxx
Group Elective II*	IEN xxx	3	IEN xxx
Group Elective III*	IEN xxx	3	IEN xxx

10th Semester

Course Title	Code / No	CU	Pre-Req.
Facilities Planning and Design	IEN 453	3	IEN 323, IEN 341
Industrial Entrepreneurship	IEN 482	2	IEN 256
Senior Project II	IEN 499	3	IEN 498
Group Elective IV*	IEN xxx	3	IEN xxx
Islamic Culture (4) (Professional Ethics)	ISLS 401	2	ISLS 301

Department Faculty

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Assistant Professor
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University of Wisconsin,
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University of Calicut, **India**,
2005

MECHANICAL ENGINEERING DEPARTMENT

About the Department

The department of mechanical engineering, Faculty of Engineering - Rabigh, King Abdulaziz University was established in 2009 to be one of the pioneer engineering institute in Kingdom of Saudi Arabia. The mechanical engineering is a wide specialization which has relation with all fields of life. The graduate of the mechanical engineering is a potential candidate to become one of the pillars of the nation's industry, and the graduates may find good opportunities in different sectors especially in the fields of operation, maintenance, analysis, design and development in mechanical and mechatronic systems, and many others.

The department of mechanical engineering has implemented several initiatives to meet changes around the world and industrial needs. As a result, a new study plan of undergraduate program was designed based on well-known academic standards to meet the market requirements in this important area in the Kingdom. The department is provided with a highly qualified scientific faculties and staffs. Finally, new developed laboratories with highly accurate instruments are established to use recent techniques and ensure quality and accreditation requirements.

Vision:

Innovation and leadership in education of mechanical engineering and applied research

Mission:

To prepare a distinguished graduate having analytical capabilities, creativity and innovation to keep up with evolution of the latest engineering fields and to conduct scientific research and provide training programs that contribute to community service and development of the environment

Program Educational Objectives

The program educational objectives of Bachelor of Science in Mechanical Engineering program are listed below.

Within a few years of graduation, our graduates will:
- Have successful careers in mechanical engineering and its related applications and have assumed professional roles of increasing responsibility and impact.
- Be engaged in an advanced study, life-long learning and/or professional development to pursue flexible career paths among future multidisciplinary engineering aspects.
- Participate in and contribute to professional societies, community services, and entrepreneurship.

Program Graduation Requirements

In order to qualify for a Bachelor of Science degree in Mechanical Engineering:
- A student must successfully complete 155 credit hours with an overall GPA of 2.75 out of 5 or better while satisfying the curricular requirements of his program of specialization.
- Each student is also required to complete one summer training of 10 weeks in industry under the supervision of a faculty member.
- The typical study period is five years and the credit hours are distributed as follows;
  - University Requirements   26
  - Faculty Requirements   44
  - Program Compulsory Requirements   67

    o   Program Elective Requirements   12

    o   Free courses (from outside Faculty)   6

Program Courses

Compulsory Courses

#	Course Title	Code / No.	CU	Prerequisite
1	Electrical Circuits (I)	EEN 100	3	PHYS 202
2	Basic Workshop	MEN 130	1	---
3	Statics	CEN 201	3	PHYS 281
4	Mechanical Eng. Drawings	MEN 201	3	MEN 100
5	Engineering Materials	CHEN 212	3	CHEM 281, PHYS 281
6	Eng. Mechanics (Dynamics)	MEN 220	3	CEN 201
7	Numerical Analysis	MEN 241	3	MATH 204, EEN 170
8	Fluid Mechanics (1)	MEN 250	3	MATH 202, PHYS 281
9	Thermodynamic (1)	MEN 260	3	MATH 202, PHYS 281
10	Machine Element Design	MEN 310	3	MEN 201, MEN 340
11	Machine Dynamics	MEN 321	3	MEN 220
12	System Dynamics & Control	MEN 322	3	MEN 220, MATH 204
13	Manufacturing Technology	MEN 332	3	MEN 130, CHEN 212
14	Engineering Measurements	MEN 333	3	MEN 332, MEN 250
15	Mechanics of Materials	MEN 340	3	CEN 201
16	Fluid Mechanics (2)	MEN 351	3	MEN 250
17	Thermodynamic (2)	MEN 361	3	MEN 260, MEN 250
18	Heat Transfer	MEN362	3	MEN 260, MEN 250
19	Summer Training	MEN 390	2	Complete 110 CU
20	Mechanical Design	MEN 411	3	MEN 310
21	Fluid Machinery Design	MEN 452	2	MEN 260, MEN 250
22	HVACR	MEN 463	3	MEN 361, MEN 362
23	Intro to Entrepreneurship	IEN 481	1	IEN 202
24	Senior Project(1)	MEN 498	2	Complete 110 CU
25	Senior Project (2)	MEN 499	2	MEN 498
Total CU			67	

Electives Courses

#	Course Title	Code / No.	CU	Prerequisite
1	Machine Tool Design	MEN 412	3	MEN 310, MEN 332
2	CAD/ CAM	MEN413	3	MEN 310
3	Production Facilities Design	MEN 414	3	MEN 310, MEN 332
4	Tribology	MEN 415	3	MEN 310
5	Mechanical Vibrations	MEN 423	3	MEN 321
6	Mech. Behavior of Materials	MEN 434	3	CHEN 212
7	Material Selection in Design	MEN 435	3	MEN 340, MEN 332
8	Advanced Manufacturing	MEN 436	3	MEN 332
9	Welding Technology	MEN 437	3	MEN 332
10	Plasticity and Metal Forming	MEN 438	3	MEN 340
11	Introduction to FEM	MEN 442	3	MEN 201, MEN 340
12	Pneumatic & Hydraulic System	MEN 453	3	MEN 250
13	Design of Heat Exchangers	MEN 464	3	MEN 362
14	Thermal Desalination Process	MEN465	3	MEN 361, MEN 362
15	HVACR Control Systems	MEN 466	3	MEN422
16	HVACR Systems and Equipment	MEN467	3	MEN 463
17	Maintenance of HVACR Systems	MEN 468	3	MEN 333, MEN 463
18	Unitary Sys. Design for HVACR	MEN 469	3	MEN 463
19	Mechatronic 1	MEN 470	3	EEN 170, MEN 322
20	Industrial Process Control	MEN 471	3	MEN 322
21	Mechatronic 2	MEN 472	3	MEN 470
22	Robotics	MEN 473	3	MEN422
23	Programmable Logic Controllers	MEN 474	3	MEN422
24	Power Plants Systems	MEN480	3	MEN 362
25	Combustion Theory	MEN 481	3	MEN 361
26	Renewable Energy	MEN 482	3	MEN 351, MEN 362
27	Energy Conversion	MEN 483	3	MEN 361, MEN 362
28	Energy Management and Auditing	MEN 484	3	MEN 333, MEN 362
29	Numerical Methods in HVAC Sys.	MEN 485	3	MEN 351, MEN 441

Study Program

3rd Semester

Course Title	Code / No	CU	Pre-Req.
Linguistic skills	ARAB 101	3	---
Computer Programming	EEN 170	2	MATH 110 CPIT 100
Calculus II	MATH 202	3	MATH 110
General Physics II	PHYS 202	4	MATH 110 PHYS 110
General Physics Laboratory	PHYS 281	1	PHYS 110
Engineering Drawing	MEN 100	3	---

4th Semester

Course Title	Code / No	CU	Pre-Req.
Engineering Economy	IEN 255	3	MATH 110
General Chemistry Laboratory	CHEM 281	1	CHEM 110
Electrical Circuits (I)	EEN 100	3	PHYS 202
Islamic Culture (1)	ISLS 101	2	---
Calculus III	MATH 203	3	MATH 110
Technical Writing	IEN 101	2	ELI 104
Basic Workshop	MEN 130	1	---

5th Semester

Course Title	Code / No	CU	Pre-Req.
Statics	CEN 201	3	PHYS 281
Intro to Eng. Design I	IEN 201	2	COMM101 IEN 101
Differential Equations	MATH 204	3	MATH 202
Thermodynamic (1)	MEN 260	3	MATH 202 PHYS 281
Arabic Writing	ARAB 201	3	ARAB 101
Mechanical Eng. Drawings	MEN 201	3	MEN 100

6th Semester

Course Title	Code / No	CU	Pre-Req.
Intro to Eng. Design II	IEN 202	2	IEN 201
Islamic Culture (2)	ISLS 201	2	ISLS 101
Numerical Analysis	MEN 241	3	MATH 204 EEN 170
Dynamics	MEN 220	3	CEN 201
Engineering Materials	CHEN 212	3	CHEM 281 PHYS 281
Fluid Mechanics (1)	MEN 250	3	MATH 202 PHYS 281

7th Semester

Course Title	Code / No	CU	Pre-Req.
Free Course (from outside the faculty)	xxx	3	---
Islamic Culture (3)	ISLS 301	2	ISLS 201
System Dynamics & Control	MEN 322	3	MEN 220 MATH 204
Manufacturing Technology	MEN 332	3	MEN 130 CHEN 212
Mechanics of Materials	MEN 340	3	CEN 201
Heat Transfer	MEN362	3	MEN 260 MEN 250

8th Semester

Course Title	Code / No	CU	Pre-Req.
Islamic Culture (4)	ISLS 401	2	ISLS 301
Machine Element Design	MEN 310	3	MEN 201 MEN 340
Machine Dynamics	MEN 321	3	MEN 220
Engineering Measurements	MEN 333	3	MEN 332 MEN 250
Fluid Mechanics (2)	MEN 351	3	MEN 250
Thermodynamic (2)	MEN 361	3	MEN 260 MEN 250

Summer Training

Course Title	Code / No	CU	Pre-Req.
Summer Training	MEN 390	2	Complete 110 CU

9th Semester

Course Title	Code / No	CU	Pre-Req.
HVACR	MEN 463	3	MEN 361 MEN 362
Senior Project (1)	MEN498	2	Complete 110 CU
Elective course (1)	MEN xxx	3	MEN xxx
Elective course (2)	MEN xxx	3	MEN xxx
Free Course (from outside the faculty)	xxx	3	---

10th Semester

Course Title	Code / No	CU	Pre-Req.
Mechanical Design	MEN 411	3	MEN 310
Fluid Machinery Design	MEN 452	2	MEN 260 MEN 250
Intro to Entrepreneurship	IEN 481	1	IEN 202
Senior Project (2)	MEN499	2	MEN498
Elective course (3)	MEN xxx	3	MEN xxx
Elective course (4)	MEN xxx	3	MEN xxx

Department Faculty

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Ph.D. in Mechanical Eng.
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COURSE CATALOG

Faculty Departments' Codes

Department	Code
Civil Engineering	CEN
Chemical and Materials Engineering	CHEN
Electrical Engineering	EEN
Industrial Engineering	IEN
Mechanical Engineering	MEN

CEN Courses

CEN 201 **Statics** 3

Prerequisite: PHYS 281

General principles of statics; Force vectors (2D & 3D); Equilibrium of a particle (2D & 3D); Force system resultants (2D & 3D); Equilibrium of a rigid body (2D); Structural analysis (Trusses-2D); Center of gravity and centroid of a body; Moments of inertia; Friction.

CEN 202 **Strength of Materials** 3

Prerequisite: CEN 201

Review of statics, internal reactions. Concept of stress. Concept of strain, Stress-strain relations. Deformation of axially loaded members. Torsion of circular members. Normal force, shear force and bending moment diagrams. Flexure and shearing stresses in beams. Transformation of plane stresses. Concept of design of beams. Concept of beam deflection. Concept of buckling of columns. Lab experiments.

CEN 221 **Construction Management** 3

Prerequisite: IEN 255

Introduction to Construction; Construction Contracts; Construction Planning; Construction Scheduling; Financial Planning and Cost Control; Construction Equipment and Economics; Construction Safety and Health; Engineering Ethics.

CEN 240 **Structural Analysis (1)** 3

Prerequisite: CEN 201

Basic principles. Analysis of statically determinate trusses, beams, frames, arches, suspension cables. Influence lines for statically determinate structures. Deflection of structures. Buckling of columns.

CEN 251 **Hydraulics (1)** 3

Prerequisite: MATH 203

Dimensions and Units, Properties of fluids, Fluid pressure and its measurements, Hydrostatics and its applications, Equilibrium of floating bodies, Fluid masses subjected to acceleration, Hydro-kinematics of fluids, Bernoulli equation and its applications, Momentum equation and its applications, Flow in pipes. Dimensional analysis; Model analysis and similitude. Lab experiments.

CEN 260 **Environmental Eng. Principles** 3

Prerequisite: CHEM 281

Introduction, Components of global environment, Definition and building blocks of the biosphere, Ecosystem and its biotic component, Natural equilibrium in the environment, disturbances in natural equilibrium, Basis of environmental engineering, Environment and human interaction, Water quality, Engineered systems for wastewater treatment and disposal, Air quality, Engineered systems for air pollution control.

CEN 271 **Surveying** 3

Prerequisite: MATH 202

Introduction to the basic surveying theory and practice; Units of measurements and conversions; Error analysis; Distance measurements by taping; Electronic surveying measurements; Leveling; Angle measurements; Traversing and traverse computations; Topographic surveying and mapping; Area and volume computations; Circular curves; introduction to photogrammetry; introduction to geographic information system (GIS); introduction to global positioning system (GPS) and 3D scanning; Use of surveying software such as Surfer and photo modeler. Laboratory experiments.

CEN 333 **Geotechnical Engineering** 3

Prerequisite: CEN 202

Introduction to engineering geology, Earth surface and physical properties of earth materials; Weight-volume relationships; Physical properties of soil; Soil classification; Permeability and seepage; Shear strength; Compressibility; Consolidation and settlement; Introduction to lateral earth pressure and slope stability. Lab experiments.

CEN 334 **Foundation Engineering** 3

Prerequisites: CEN 333 + CEN 342

Site exploration and selection; Types of foundations; Bearing capacity of shallow foundations; Foundation settlement; Structural Design of shallow foundations; Deep foundations; Structural Design of Deep foundations; Retaining walls; Structural Design of retaining walls; Computer applications.

CEN 340 **Structural Analysis (2)** 3

Prerequisite: CEN 240

Analysis of statically indeterminate structures by method of consistent deformations; Method of slope-deflection and moment distribution; Influence lines for statically indeterminate structures; Approximate methods for analysis of multi-sections forms; Classical stiffness method of structural analysis;

Direct stiffness method for trusses.

CEN 341 **Materials of Construction** 3

Prerequisite: CEN 202

Manufacturing, Properties and Tests of metals, aggregate, cementing materials, fresh and hardened PC concrete, asphalt concrete, masonry, wood and plastics. Design and production of PC concrete and asphalt mixtures. Computer applications in mix design. Laboratory experiments.

CEN 342 **Reinforced Concrete Design (1)** 3

Prerequisite: CEN 240

Introduction to properties of concrete and reinforcing steel; Behavior of reinforced concrete under flexure and shear; Introduction to ACI-Code; Types of loads and their factors; Ultimate strength method of design; Analysis and design of singly and doubly reinforced sections; Analysis and design of T-section; Design of beams against shear forces; Development length; Design of solid one-way slab, two-way slab, cantilever slab; Design of short columns.

CEN 352 **Hydraulics (2)** 3

Prerequisite: CEN 251

Flow in open channels, Types of flow in channels, Uniform flow through open channels, most economical section of channels, Rapidly varied flow, gradually varied flow, measurements of flow in open channels, flow over weirs, flow under sluice gates, Hydraulic machines (turbines and pumps). Lab experiments.

CEN 353 **Hydrology** 3

Prerequisite: CEN 352

Introduction, The hydrologic cycle, Hydrologic processes, Precipitation & measurement methods, Evaporation and evapotranspiration, Water sheds and it's characteristics, Methods of calculating maximum surface runoff, Hydrograph and unit hydrograph, Floods and methods of calculating Design floods, Stream flood routing. Movement of ground water, Hydraulics of wells, Design of wells, ground water exploration, well testing. Laboratory experiments.

CEN 361 **Environmental pollution** 2

Prerequisite: CEN 260

Natural and anthropogenic environment, definition and concerns of environmental pollution, Hydrological cycle, Nutrient cycles, Population growth and its consequences, Energy problem, Global environmental issues, Acid rain, Ozone layer depletion, sources and classification of water pollutants, control strategies, Air pollution sources and effects, Sampling and measurement, Control methods, Land pollution and its types.

CEN **381 Transportation Engineering** 3

Prerequisite: CEN 271

Transportation as a system; human and vehicle characteristics; traffic flow characteristics; highway capacity analysis; highway control devices; public transportation; urban transportation planning; parking facilities; transportation safety; intelligent transportation system and computer applications; introduction to railway, waterway, airport and pipeline. Laboratory experiments.

CEN **390 Summer Training** 2

Prerequisite: Complete 110 credit units

Field training conducted under the supervision of a faculty member; The student must submit a detailed technical report by the end of training period explaining what he learned during this training.

CEN 402 **Numerical Meth. for Civil Eng.** 3

Prerequisite: CEN 340

Errors in numerical computations; Nonlinear Equations; Systems of Linear Equations; Numerical Interpolation; Curve Fitting; Numerical Integration; Numerical differentiation; Initial Value Problems for Ordinary Differential Equations; Finite Difference Methods for Differential Equations; Application to practical problems in civil engineering.

CEN 422 **Construction Engineering** 3

Prerequisite: CEN 221

Construction cost estimation; Construction estimation using Excel; Earthmoving materials and operations; Excavating and lifting; Loading and hauling; Compacting and finishing; Value engineering; Concrete form design.

CEN 424 **Construction Contracting** 3

Prerequisite: CEN 221

Contract definition. Participants in a construction contract. Types of contracts; formation principles of a contract, performance or breach of contractual

obligations. Analysis and comparison of the different kinds of construction contracts. Bidding logistics. Legal organizational structures. Types and uses of specifications. Sample of different forms of contracts utilized in construction.

CEN 435 **Applications in Foundation Eng** 3

Prerequisite: CEN 334

Aspects of Geotechnical Engineering. Topics include: site investigation, terrain analyses, in situ testing, groundwater problems, deep foundations, tie back walls and bracing, and coffer dams. Computer applications.

CEN 439 **Soil Improvement** 3

Prerequisite: CEN 334

Principles of soil improvement. Types of improvement and factors influencing them. Mechanical and hydro improvements. Physical and chemical improvements. Computer applications.

CEN 442 **Reinforced Concrete Design (2)** 3

Prerequisite: CEN 342

Review ACI 318- Code provisions; Design of paneled beams, Design of continuous beams; Design of one-way hollow blocks slab; Design of two-way hollow blocks slab; Design of flat slabs; Design of RC stairs; Design of sections under moment and normal force; Design of eccentrically loaded columns using interaction diagrams; Design of RC frame with reinforcement details.

CEN 443 **Design of Steel Structures** 3

Prerequisite: CEN 340

Properties of steel. Types of loads. Philosophy of load resistance factor design (LRFD) method. Analysis and design of tension and compression members. Axially loaded columns. Base plate. Design of beams in flexure and shear. Beams with cover plates. Unsymmetrical bending. Deflection. Design of beams-column. Bolted and welded connections.

CEN 444 **Adv. Reinf. Concrete Design** 3

Prerequisite: CEN 342

Introduction to prestressed concrete, ACI provisions; Types of prestressing, losses stresses; Deflection, flexural and shear strengths of P.S.C.; Retaining walls, types and forces on R.W. and design of R.W; Construction of R.C. water tanks, water-proofing, loads detailing of reinforcements and joints; Design of R.C. circular and rectangular tanks.

CEN 445 **Maintenance & Rehab. of Struc** 3

Prerequisite: CEN 342

Maintenance and rehabilitation of structures concepts; Evaluation of existing structures: strength, durability and deficiencies; Destructive and non-destructive testing; Damaged structures and deterioration mechanisms; Criteria and techniques for repairing and strengthening of concrete structures.

CEN 446 **Adv. Construction Materials** 3

Prerequisite: CEN 341

Properties and strength of light weight concrete, massive concrete, high strength concrete, hot weather concrete, high performance concrete. Waterproofing materials. Sound insulating materials, advanced technology in concrete.

CEN 451 **Design of Hydraulic Structures** 3

Prerequisite: CEN 352

Crossing up structures, Bridges (Timber, Steel, RC), Culvert structures, Siphon structures, Aqueduct Structures, Dams, Gravity dams, Buttress dam, Earth dam, Rock fill dam, Arch dam.

CEN 453 **Water Supply Engineering** 3

Prerequisite: CEN 353

Introduction; work of the sanitary engineer; Water demand; Water quality; Various sources of water; Water intakes; Hydraulic analysis of water distribution systems; Conventional water treatment processes; Advance treatment processes of drinking water: softening, removal of ferrous and manganese, control of taste and odor, and reduction of dissolved salts; Pumps and pumping stations.

CEN 457 **Water Resources Engineering** 3

Prerequisite: CEN 353

Principles of water resources engineering, Objective of water resource development, Water laws, Reservoirs, Dams, Hydropower generations, Flood routing and control, Water resources environment, heating pollution of water, Reuse of wastewater.

CEN 462 **Wastewater Engineering** 3

Prerequisite: CEN 353

Introduction; Flow and characteristics of wastewater; Design of a storm collection system; Design of a sewerage system; Wastewater treatment processes; Advance biological wastewater treatment

processes: nitrification and denitrification, phosphorus removal; Design of biological wastewater treatment systems; Sludge treatment and disposal; Refuse collection and disposal; Reuse of wastewater. Laboratory experiments.

CEN 463 **Wastewater Reclamation & Reuse** 3
Prerequisite: CEN 361

Potential reuse applications. Sources of water for reuse. Treatment technologies suitable for water reuse applications. Criteria for each type of reuse application. The overall procedures for determining the feasibility and planning of water reuse systems as well as the management structure of reuse projects. The management of the bio-solids resulting from the treatment of wastewater and related regulations governing their use and disposal.

CEN 464 **Solid Wastes Engineering** 3
Prerequisite: CEN 361

Introduction, The impacts of solid waste generation, Variations in the composition and quantity of solid waste, types of land pollution, Characterization of municipal solid wastes including physical, Chemical, and biological characteristics; Functional elements of solid waste management, Solid waste management systems, Engineering principles of integrated solid Waste management practices including resource recovery, composting, Incineration and landfill design.

CEN 465 **Environmental Impact Assess.** 3
Prerequisite: CEN 361

Environmental inventory, Environmental impact assessment, Features of the environmental policy act and its implementations, Planning and management of impact studies, Methodology for environmental impact assessment, Role of environmental engineering firms, Role of regulatory agencies and control boards, Role of the public, Guidelines for preparation of project report and its evaluation, methods of clearance from the concern authorities at various levels, Environmental monitoring.

CEN 471 **GPS and GIS Applications** 3
Prerequisite: CEN 271

Introduction to the basic for GPS and GIS applications; Geodesy: introduction, the ellipsoid and geoids, geodetic position , geoids undulation ,deflection of the vertical, geodetic coordinate system; Map Projection: projections used in state plane coordinate systems, UTM projection; GPS: overview of GPS, differential GPS, GPS static survey, GPS kinematic survey; GIS: introduction to GIS, GIS data sources and data format, creating GIS databases, GIS applications, use of surveying software such as GeoMedia and Leica Geo Office.

CEN 482 **Highway Design & Construction** 3
Prerequisite: CEN 381

Characteristics of driver, pedestrian vehicle, and traffic flow affecting highway design; geometric design of highways; layouts of intersections, interchanges and terminals; highway drainage; review of highway paving materials; design of asphalt paving mixtures; pavement design; highway construction and supervision; categorize common pavement surface distress and associated correction activates; introduction to maintenance management system; computer applications on highway geometric design.

CEN 483 **Traffic Engineering** 3
Prerequisite: CEN 381

Traffic Engineering studies and measurement; traffic flow theory and queuing theory; highway capacity analysis; parking analysis and layout design; traffic signs, marking and channelization; signalized intersection design and operation; roundabout design and management; ITS applications in traffic Eng.; computer application in traffic engineering.

CEN 486 **Flexible Pavement Maintenance** 3
Prerequisite: CEN 381

Essential terminologies and concepts of preservation existing highway asphalt pavements; characterizing flexible pavement distresses and identifying possible cause of distresses; relating pavement distress types and distress severity to cost-effective repair alternatives; simple procedure to inventory pavement conditions and select maintenance methods.

CEN 497 **Special Topic in Civil Eng.** 3
Prerequisite: Chairman's Approval

In-depth study of relevant civil engineering topics not covered in other courses of the program in order to enhance students' knowledge in the field of civil engineering.

CEN 499 **B.Sc. Senior Project** 4
Prerequisite: Complete 110 credit units

Team-work on a civil engineering capstone design project involving comprehensive design experience; exposure to professional practice with practitioner

involvement. Preparation of the project report and its presentation.

CHEN Courses

CHEN 201 **Intro to Chemical Engineering**3

Prerequisites: CHEM 281

Broad definitions of Chemical Engineering, introduction to chemical engineering calculations, material balances in processes with and without chemical reactions, recycle by-pass and purge calculations, critical properties and compressibility charts, vapor-liquid equilibrium, partial saturation and humidity, computer applications.

CHEN 202 **Chemical Eng Thermodynamics**3

Prerequisites: CHEM 240

Introduction to thermodynamics concepts, first law of thermodynamics, Mass and energy balances in closed and open systems, volumetric properties of pure fluids, heat effects, humidity charts, second law of thermodynamics, entropy, Computer applications to thermodynamics problems, power cycles

CHEN 210 **Materials Science and Eng**3

Prerequisites: CHEM 110

Classification of engineering materials. Atomic and molecular bonding. Properties and microstructure. Elastic and plastic behavior. Order in solids, phases and solid- solutions, crystal geometry, disorder in solids, atomic movement and rearrangement, phase diagrams, solid-state transformations. Applications of metals, ceramics, polymers and composites .Service stability, corrosion and failure. Involves laboratory experiments and practices

CHEN 211 **Polymer Science and Eng**2

Prerequisites: CHEM 231

Classification of polymeric materials, calculation of molar mass and molar mass distribution, poly-merization reactions, kinetics of polymerization reactions, composites materials, polymer processing, mechanical and physical properties, commercial polymer, laboratory experiments

CHEN 212 **Engineering Materials** 3

Prerequisites: CHEM 281, PHYS 281

Classification of Engineering Materials, Atomic Structure and Interatomic Bonding, The Structure of Materials, Phase diagram, The driving force for structural change, Kinetics of structural change (nucleation and transformation), Steels (carbon steel, alloy steel), The light alloys, Ceramic materials, Polymers, Composite materials, Design with materials (design-limiting properties of materials), Corrosion, Failure. Involves laboratory

experiments.

CHEN 231 **Fluid and Particle Mechanics**3

Prerequisites: CHEN 201, MATH

Fluid static, mass balance, momentum balance, energy balance on finite and differential systems, laminar and turbulent flow in pipes, fluid flow in porous media, boundary layer theory, fluid flow, flow behavior, flow applications

CHEN 240 **Phys Chem for Non Chem Majors**4

Prerequisites: CHEM 281

Explores experimental and theoretical principles of chemistry including gases, liquids, solids, Zeroth law of thermodynamics, First law of thermos-dynamics, second law of thermodynamics, chemical equilibrium, phase equilibrium, Electrochemical equilibrium, quantum theory, atomic structure and spectroscopy basics, Chemical kinetics in liquid and gas phases, Chemical potential, chemical potential, Macromolecules, introduction to solid state chemistry, Surface dynamics

CHEN 301 **Thermodynamics of Materials**3

Prerequisites: CHEN 210

Helmholtz free energy and Gibbs free energy, energy-property relationships, Thermal equilibria, Ellingham diagrams, 1st and 2nd order transformations, equilibrium constant, Fugacity and Chemical activity, Equilibrium constant and its variation with temperature, Vant Hoff equation, Gibbs-Duhem relationship, Thermodynamics of solutions, Typical Equilibrium Phase Diagrams.

CHEN 310 **Materials Properties** 3

Prerequisites: EEN 210, CHEM 281

Atomic structures and inter atomic bonding, bonding forces and energies, the structure of Crystalline solids, polymorphism and allotropy, mechanical properties of metals, stress strain behavior, Elastic properties of materials, application and processing of metal alloys, polymer structures, thermoplastic and thermosetting structures, Composites, fiber and matrix phase, hybrid composites, corrosion and degradation of materials, corrosion rates, forms of corrosion, corrosion environment, electrical conductivity and thermalconductivity, Diamagnetism and Paramagnetism, refraction, reflection absorption, ferrous and nonferrous metals , Ferro electricity.

CHEN 311 **Electrochem and Corrosion Eng**2

Prerequisites: CHEM 240

Electrochemical mechanisms, corrosion kinetics,

polarization and corrosion rates, passivity. Methods of testing corrosion of iron and steel and the effects of various parameters. Pourbaix diagrams. Effect of stresses on corrosion, (stress corrosion cracking, cold working, hydrogen cracking, etc.). Corrosion control technologies, corrosion of some engineering alloys. Design of simple processes.

CHEN 321 **Chemical Reaction Engineering**3

Prerequisites: CHEN 201, MATH 204

The course is intended to develop the student' s ability to understand mole balances, conversion and reactor sizing, rate laws and stoichiometry for single and multiple reactions and its applications to steady-state no isothermal reactor design. Collection and analysis of rate data and catalysis and catalytic reactor

CHEN 331 **Mass Transfer**3

Prerequisites: CHEN 231

Fundamentals of mass transfer processes. The control volume approach to the mass transfer processes, differential equations of mass transfer. Steady and unsteady –state molecular diffusion. Natural and forced convection mass transfer. Mass transfer theories. Convective mass transfer correlations. Analysis of chemical engineering operations involving mass transfer. Simultaneous heat and mass transfer; mass transfer accompanied by chemical reaction.

CHEN 332 **Heat Transfer**3

Prerequisites: CHEN201

Modes of heat transfer, steady and un-steady-state conduction in different co-ordinates, convective heat transfer with and without phase change, correlations for forced and natural convection, analogy between momentum and heat transfer, heat transfer applications.

CHEN 333 **Separation Processes**3

Prerequisites: CHEN 201

Phase equilibrium, continuous contact and stage wise processes; fractional distillation, gas absorption and liquid-liquid extraction processes, involves laboratory experiments and practices

CHEN 341 **Process Dynamic and Control I**2

Prerequisites: CHEN 321

Mathematical modeling of process control, transfer functions, dynamic behavior of chemical processes, feedback control, dynamic behavior of closed-loop systems, stability analysis, frequency response analysis, controller design and tuning, introduction to computer control, laboratory and simulations

applications

CHEN 342 **Numerical Methods in ChemEng**3

Prerequisites: MATH 204

This course deals with Linear, non-linear equations, systems of equations. Jacobi, Gauss-Seidel, SOR. LU decomposition, Newton-Raphson, bisection and Wegstein's method - convergence acceleration; zeros of, polynomials; interpolating polynomial; finite difference methods; numerical differentiation, Newton-Coates and Gaussian quadrature. Solution of ODE's; the shooting method; numericalsolution of reaction network equations; solution of transient heat and mass transfer models

CHEN 390 **Summer Training Course**2

Prerequisites: Complete 110 credit units

10 weeks of training in industry under the supervision of a faculty member. Students have to submit a report about their achievements during training in addition to any other requirements assigned by the department

CHEN 411 **Materials Selection** 4

Prerequisites: CHEN 210

Selection criteria for metals, alloys, ceramics and plastics, mechanical behavior, corrosion and oxidation resistance at ambient and elevated temperatures, materials for marine environments, oil production and transport, refineries, petrochemical and desalination industries, refractory materials. Computer applications, and economic considerations, laboratory experiments

CHEN 412 **Composite Materials** 3

Prerequisites: CHEN210

Role of interfaces, processes and production of polymer matrix composites, metal matrix composites, ceramic matrix composites, design aspects of composites bases structures, application and properties of composite materials, production of glass fiber and carbon fiber composites, Titanium bases composite materials.

CHEN 413 **Materials Structure and Failure Analysis**3

Prerequisites: CHEN 201

Structural characterization, quantitative and qualitative analysis, thermal analysis, differential calorimetry, molecular spectroscopy, engineering aspects of failure and failure analysis, failure modes, characterization of fractured surface, chemical analysis, failure prevention and histories, mechanical and metallurgical causes of failures, creep failures,

corrosion induced failure, pitting as stress concentration.

CHEN 414 **Mat and Nanomat Character**4

Prerequisites: CHEN 211

Nano fabricated computed devices, bio molecular devices and molecular electronics, integrated micro systems and MEMS, molecular manufacturing and nano robots, material engineering processes applied to electro-active polymers, micro-nano scale instrumentation measuring

CHEN 415 **Biomaterials**3

Prerequisites: CHEN 210, CHEN 211

Classification of biomaterials, classes of materials used in medicine, biomaterials surfaces, practical aspects of biomaterials, surface characterization of biomaterials, applications of materials used in medicine.

CHEN 416 **Extractive Metallurgy**3

Prerequisites: CHEN 210

Major operations in the iron and steel-making industry; direct reduction processes, blast furnaces, converter and electric-arc steel-making and steel refining methods; electro slag (ESR) and vacuum induction refining (VIR). Bauxite production. Electro-thermal reduction of cryolite to produce commercial aluminum. Production of TiO_2 Extractive metallurgy of titanium.Gold extraction. Continuous casting.

CHEN 421 **Fundamentals of Biofuel**3

Prerequisites: CHEN 321

Biofuel introduction, chemistry of biofuels, bioenery production technologies, first and second generation technologies for biofuel production, sources of fuel and fuel properties, environmental impacts, biorefinery, biofuel process design, recent developments in biotechnology.

CHEN 431 **Unit Operations Lab**2

Prerequisites: CHEN 333

Introduction, Laboratory Safety Rules, Familiarization with Experiments, Studies in Fluid Flow, The Study of Heat Exchanges, Experimental study of mass transfer, Modern separations techniques, and reaction engineering, Emphasis is on open-ended laboratory projects with electronic instrumentation; Experimental design with analytical, numerical, and statistical analysis of data.

CHEN 432 **Energy Conservation**3

Prerequisites: CHEN 332

World and local energy situation, energy policies and strategies, the environment and the economy, renewable sources and social energy requirements, conservation, substitution and technology options, integrated energy management systems, energy conservation technologies.

CHEN 441 **Process Dynamic and Control II**2

Prerequisites: CHEN 341

Review of feedback control, cascade control, Ratio, override, selective, feed-forward, and multivariable process control, Dynamic simulation of control systems using SIMULINK and other commercial software packages, Instrumentation, design case studies, tuning case studies

CHEN 442 **Modeling and Simulation**3

Prerequisites: CHEN 333

This course is designed to give a chemical engineering student the ability to solve system of algebraic-differential equations. The course will develop student ability's to drive system models and simulate digitally, simulation computer packages, aspen, Hysys, chem.-cad

CHEN 451 **Plant Design**3

Prerequisites: CHEN 321, CHEN 333

Chemical and petrochemical processes plant design, locations and layout of chemical process plant, operability, controllability reliability and safety requirement of the design, cost estimation, utilization of simulation and design packages

CHEN 452 **Water and Wastewater Treatment**4

Prerequisites: CHEN 333

Wastewater introduction, Wastewater charac-teristics, Technologies in wastewater treatment, wastewater constituents, wastewater sampling and analytical procedures, physical characteristics of water, metallic and nonmetallic constituents, analysis and selection of wastewater flow rates, Physical unit operations, chemical unit processes, biological treatment, advanced wastewater treatment, water reuse

CHEN 454 **Water Desalination**3

Prerequisites: CHEN 332

Resources for water, composition of sea water, introduction to desalination, desalination processes, single effect evaporation, evaporators, single effect thermal vapor compression, single effect mechanical vapor compression, multiple effect evaporation

CHEN 455 **Design of Altern Energy Sys**4

Pre-Req.requisite: CHEN 202

Introduction and overview of the energy system, modeling skills in energy systems, design of energy systems, issues associated with alternative energy

CHEN 461 **Petroleum Refinery Engineering**4

Prerequisites: CHEN 321, CHEN 333

Oil production. Surface operations. Characterization and classification of crude oils. Physical properties of oils. Refinery operations; atmospheric and vacuum distillation, treatment processes, catalytic cracking, reforming, alkylation, coking, asphalt production and lubricating oil production. Blending of refinery products. Waste treatment.

CHEN 462 **Natural Gas Engineering**3

Prerequisites: CHEN 321, CHEN 333

Characterization and properties of natural gas. Gas gathering systems. Gas-oil multistage separation. Gas treatment and liquefaction. Gas transportation through pipelines, signal-telemetering Industrial usages.

CHEN 463 **Petrochemical Technology**3

Prerequisites: CHEN 333

Production technologies of synthesis gas, olefins and aromatic. Manufacture of important petrochemicals derived from base chemicals and synthesis gas. Production technologies of important polymers and plastics.

CHEN 466 **Safety in Chem Process Indust**3

Prerequisites: CHEN 333

Safety and loss prevention. Major process hazards. Hazard identification, assessment and prevention. Personal safety in industrial environment. Fire explosion and toxic release. Safety systems.

CHEN 471 **Chem Eng Design for Environ**4

Prerequisites: 201CHEN

Meteorology, lapse rate, introduction of plume, air pollution dispersion models, devices and techniques for control of particulates, Wastewater treatment techniques, membrane separation, biological treatment, chemical treatment, design for wastewater treatment plant

CHEN 472 **Industrial Pollution Control**3

Prerequisites: CHEN 442

Sources of pollution from chemical industries. Standards and legislations. Health and environmental effects of pollution. Air pollutants; particulate, SO_x, NO_x and organic vapors. Air pollution control.

Treatment of industrial wastewater. Handling of solid waste. Monitoring of pollutants. Case studies for specific industries like petrochemicals, fertilizers, desalination and petroleum refining

CHEN 481 **Biochemical Engineering**3

Prerequisites: CHEN 321

Introduction to biofuel, sources of biofuel, biofuel properties, manufacturing processes for biofuel, biodiesel, bioethanol, biogas

CHEN 497 **Selected Topics in ChemEng**3

Prerequisites: Chairman's Approval

In-depth study of relevant Chemical and Materials engineering topics not covered in other courses of the program in order to enhance students' knowledge in the field of chemical engineering.

CHEN 499 **Senior Project** 4

Prerequisites: CHEN 333

Selection of topic, literature review, project design planning, arranging for data collection and experimental work, interim report, experimental work and data collection or field study (if any), data processing analysis and results, preparation of a first draft of the final report, presentation of the project

EEN Courses

EEN 100 **Electrical Circuits I** 3

Prerequisites: PHYS 202

Electric quantities and circuit elements; Kirchhoff's laws; Mesh and node analyses; Sinusoidal steady-state analysis using phasors; Network theorem and transformations. Three-phase circuits.

EEN 170 **Computer Programming**2

PREREQUISITES: MATH 110, CPIT 100

Introduction to computers. Simple algorithms and flowcharts. Solving engineering and mathematical problems using a mathematically oriented programming language. Programming concepts: i/o, assignment, conditional loops, functions and subroutines. Programming selected numerical and non-numerical problems of mathematical and engineering nature.

EEN 201 **Electrical Circuits II** 3

Prerequisites: EEN 100

This course covers several topics such as analyze the three-phase systems, identify the two types of resonance circuits, analyze electric circuits with magnetically-coupled elements, express circuit elements into Laplace domain and more.

EEN 202 **Electrical Measurements** 3

Prerequisites: EEN 201

Introduction to Measurement Concepts & units, Measurement system types, Static and Dynamic characteristics of measuring instruments, errors in measurements, Analog DC/AC multimeters, Power measurement in single and three phase circuits, DC / AC bridges, Oscilloscopes.

EEN 210 **Electronics I** 2

Prerequisites: EEN 100

Semiconductor Physics. PN junction. Diode applications. BJT and MOSFET physics and I-V characteristics. DC basing. Analog electronics applications (BJT and MOSFET small signal amplifiers).

EEN 211 **Electronics Lab.** 1

Prerequisites: EEN 100

Solid state materials, Construction of P/N junctions , Diode as an electronic device , diode characteristics, diode types, diode applications, Bipolar Junction Transistor ,BJT characteristics, Biasing of BJT.

EEN 212 **Digital Logic Design**2

Prerequisites: MATH 110

Study the basic principle of representation and manipulation of digital information. Apply the Boolean Algebra and Karnaugh Maps to design the digital circuits. Several digital building blocks such as MUX, Decoder, ROM, and PLA are used for designing complex combination circuits. Sequential circuits such as counters, code converters and shift registers are designed using flip-flops.

EEN 213 **Digital Logic Design Lab.**1

Prerequisites: MATH 110

Digital Design. It involves simulation using logic simulation tools such as NI-Multisim and hardware realization in the laboratory. Logic simulation and Implementation AND-Gate, OR-Gate, Decoder, MUX, DEMUX, ADDER, counters, Shift registers, Sequential networks.

EEN 220 **Electromagnetic Fields** 3

Prerequisites: EEN 201, MATH 203

Electrostatic fields, Poisson and Laplace equations, Steady electric current, Steady magnetic fields, Time-varying electric and magnetic fields, Maxwell equations.

EEN 271 **Engineering Numerical Methods**3

Prerequisites: EEN 170, MATH 204

Introduction. Solution of non-linear equations. Solution of large systems of linear equations. Interpolation and curve fitting. Function approximation. Numerical differentiation and integration. Special Functions. Solution of the initial value problem of ordinary differential equations.

EEN 303 **Signals and Systems**2

Prerequisites: MATH 204

Continuous-Time Signals And Systems, Continuous-Time Linear Time-Invariant Systems, Fourier Series, The Fourier Transform, Applications Of The Fourier Transform, The Laplace Transform, State Variables For Continuous-Time Systems, Discrete-Time Signals And Systems, Discrete-Time Linear Time-Invariant Systems, The Z-Transform, Fourier Transforms Of Discrete-Time Signals.

EEN 304 **Automatic Control**3

Prerequisites: EEN 201, MATH 204

Introduction to control systems with examples from different fields, Transfer functions and block diagram algebra, Stability analysis (Routh-Hurwitz and Nyquist), Design of Control Systems using Bode diagrams and root locus techniques.

EEN 305 **Probability and Statistic**2

Prerequisites: EEN 303

Frequency distributions –descriptive measures – calculations for central tendency and variability – sample spaces and events – counting – axioms of probability – elementary probability theorems – conditional probability – Bay's theorem – mathematical expectations – discrete random variables – Binomial distribution – mean and variance of a probability distribution – Chebyshev's theorem – Poisson process– normal distribution – uniform, log-normal– joint probability densities.

EEN 314 **Electronics II**3

Prerequisites: EEN 210

Power Amplifier: Class A, Class A Transformer coupled, Class B, Class AB, Class C, and Class D. Tuned Amplifiers. Amplifier Frequency Response. Negative Feedback Amplifiers, Positive Feedback and Oscillator Circuits. Internal structure of an OP-AMP. Differential Amplifier DC and AC analysis, OP-AMP applications, Multi-vibrators: A stable and Mono-stable applications. Regulated Power Supply. Active Filter circuits.

EEN 330 **Fundamental of Power Systems**3

Prerequisites: EEN 201

Electrical Characteristics and steady state performance of overhead transmission lines. Equivalent Circuit and Power Circle Diagrams. Per-unit Systems and Transformers. Transmission line parameters. Power systems flow.

EEN 331 **Power Systems Lab.** 1

Prerequisites: EEN 201

Transients in ac and dc networks experiments, Magnetism/electromagnetism experiments, Three-phase synchronous machines experiments, Three-phase transformer experiments, Transmission line model experiments.

EEN 332**Engineering Numerical Methods**3
Prerequisites: EEN 170, MATH 204
Introduction. Solution of non-linear equations.Solution of large systems of linear equations.Interpolation and curve fitting. Function approximation. Numerical differentiation and integration.Special Functions.Solution of the initial value problem of ordinary differential equations.

EEN 340 **Electrical Machines I**2

Prerequisites: EEN 220

Analysis of magnetic circuits, Transformers: operating principles, important parameters, test methods, efficiency, regulation, load sharing, autotransformers, tap changing. Principles of electro mechanical energy conversion, DC rotating machines, operating principles, constructional details, characteristics & applications.

EEN 341 **Electrical Machines lab.**1

Prerequisites: EEN 220

No-load test of DC Generator – load test of different types of self-excited DC generators - loading test of DC motors- single phase transformer testing.

EEN 350 **Introduction to Communications**3

Prerequisites: EEN 303

Introduction to communication systems, Analysis of AM, FM and PM transmitters and receivers.AM and FM transmitters and receivers, Detectors, Mixers, Super heterodyne receiver. RF power amplifiers and applications, SSB transmitters and receivers. FM stereo broadcast transmitter and receivers. Sampling Theorem, PAM, TDM.

EEN 351 **Communications Lab.**1

Prerequisites: EEN 303

AM, FM and PM transmitters and receivers.Detectors, Mixers, Super heterodyne receiver. RF power amplifiers, SSB transmitters and receivers. FM stereo broadcast transmitter and receivers. Sampling Theorem, PAM, TDM.

EEN 390 **Summer Training**2

Prerequisites: Complete 110 credit units

10 weeks of training in industry under the supervision of a faculty member, students have to submit a report about their achievements during training in addition to any other requirements as assigned by the department.

EEN 415 **Embedded systems**3

Prerequisites: EEN 212

Design of embedded systems. Overview of a single-chip microcontroller. Hardware and software concepts in microcontrollers. System architecture, central processing unit (CPU), internal memory (ROM, EEPROM, RAM, FLASH). Input/ Output ports, serial communication, programmable interrupts. ADC, DAC, interfacing and timers. Programming model and instruction set, assembly and C language programming.

EEN 421 **Electromagnetic Waves** 3

Prerequisites: EEN 220, EEN 350

Electromagnetic Theory. Plan waves, Maxwell's equations, boundary conditions, Pointing theorem, Wave equation, Plane waves. Transmission lines: Distributed circuit parameters, HF transmission lines, reflections, standing waves. TL measurements. Wave guides: TEM, TM and TE transmission, parallel plates waveguides- TE and TM modes. Cavity resonators. Impedance Transformation and Matching. Smith Chart.

EEN 422 **Antennas and waves Propagation** 3

Prerequisites: EEN 421

Radiation and Antenna Fundamentals. Linear Antennas, Current distribution, Short dipoles And Monopoles/2 dipoles, radiation resistance and gain, longer dipoles, folded dipoles. Antenna Arrays. Aperture Antennas. Special types of antennas. Traveling wave antennas, loop antennas. Frequency independent antennas, helical Antennas, corner reflector, lenses. Space Wave Propagation. Ground Wave Propagation. Tropospheric waves. Ionospheric waves.

EEN 432 **High Voltage Engineering** 3

Prerequisites: EEN 330

High voltage generation and transmission electrical breakdown theories in different insulators (gases, liquids, and solids). High voltage testing (impulse generation, and specifications of high voltage laboratories).Different insulators for overhead transmission lines and substations. Single and 3-core cables Electrical stresses cables calculation of different grounding and earthling schemes

EEN 433 **Protection and Switchgear** 3

Prerequisites: -

Switch gear, busbar systems, couplers, cubicles, auxiliaries, and single line diagram. Relays, electromagnetic, static, thermal relay, and over current, voltage. Distance relays. Differential relays. Feeder protection system. Transformer protection system. Generator protection system.

EEN 434 **Power Systems Analysis** 3

Prerequisites: -

Load Flow Analysis, Solution of Load Flow Equations, Gauss-Seidel and Newton Raphson Techniques, Asymmetrical Faults, Phase Sequence Networks, Use of Matrix Methods. Power System Stability: Steady-State and Transient.

EEN 435 **Power Networks Planning** 3

Prerequisites: -

Load forecasting, Load demand management, Load curves and load characteristics, Bulk power system planning, Distribution network planning, Financial and regulatory analysis, Electricity tariff, Power networks reliability studies.

EEN 436 **Power System Control** 3

Prerequisites: EEN 304, EEN 330

Analysis and characterization of electric Power Quality, Shunt and series compensation of various power quality events, Power system control: Frequency control of power systems, Voltage control of power systems for single area and multi-area systems, Operational concepts of an electricity power systems in a competitive environment, Transmission access fees assessment and calculations

EEN 437 **High Voltage Applications** 3

Prerequisites: EEN 432

Phenomenon of over-voltages in power systems, Theory of traveling waves and standing waves, Electrostatic field of extra-high-voltage (EHV) lines, Lightning and lightning protection, Over-voltages in EHV systems caused by switching operations, Insulation characteristics of long air gaps, Power-frequency voltage control and over-voltages, EHV testing and laboratory equipment, Design of EHV lines, Design examples.

EEN 438 **Special Topics in Power System** 3
Prerequisites: Department Approval
In-depth study of Electrical Power Systems topics not covered in other courses of the program in order to enhance students' knowledge in the field of Electrical Power Systems.

EEN 442 **Power Electronics** 3

Prerequisites: EEN 314

Thyristors, theory of operation, methods of turning on, thyristor limitations, commutation methods. Single and three-phase AC voltage controllers for resistive and inductive loads. Single-phase and three-phase AC-DC converters for resistive and large inductive loads. Analysis of DC-DC converters for resistive, large inductive, and general inductive loads. Single-phase to single-phase cyclo-converter, output voltage and frequency control.

EEN 443 **Electrical Machines II** 3

Prerequisites: EEN 340, EEN 341

Poly-phase induction and synchronous machines. Models and performance characteristics for steady-state operations. Fractional horsepower machines, their performance and application.

EEN 444 Electric Drive Systems 3
Prerequisites: EEN 442, EEN 443

Elements of electric drive systems, speed-torque characteristics of electric motors and mechanical loads, 4-quadrant operation, dynamics of electrical drives, traction drives, selection of motor power rating, DC motor drives, induction motor drives, synchronous motor drives.

EEN 445 Special Electrical Machines 3
Prerequisites: EEN 443

Single phase induction motor, Switched Reluctance motors, Stepper motors, Permanent magnet motors, Linear Motors, Synchronous Reluctance Motors. Models and performance characteristics for steady-state operations. their performance and application.

EEN 446 Programmable logic controllers 3
Prerequisites: EEN 212, EEN 304

Relays, ladder logic diagram, programming using PLC, timers, counters, sequencers, applications of PLC in industry.

EEN 447 Industrial Power Electronics 3
Prerequisites: EEN 442

Single and three-phase AC voltage controllers for resistive and inductive loads. Analysis of DC-DC converters for resistive, large inductive, and general inductive loads. Single-phase and three-phase inverters for different loads. Buck and boost DC/DC converters, pulse width modulation (PWM) techniques.

EEN 448 Electrical Machines Analysis 3
Prerequisites: EEN 271, EEN 443

Basic principles of electrical machines analysis, dynamic analysis of a separately excited DC machines, reference-frame theory, dynamic analysis of three phase induction machines, dynamic analysis of synchronous machines, linearized equations of induction machines and synchronous machines.

EEN 449 Special Topics in Machines 3
Prerequisites: Department Approval

In-depth study of Electrical Machines topics not covered in other courses of the program in order to enhance students' knowledge in the field of Electrical Machines.

EEN 452 Digital Communications 3
Prerequisites: EEN 212, EEN 350

Sampling theory, pulse amplitude modulation, time division multiplexing. Pulse code modulation, TDM/PCM, Digital multiplexers. Random Processes, power spectral density, narrow band representation. Noise effect on continuous wave modulation. Base band transmission, matched filter, line codes, and equalizers. M-aary signaling, Eye diagram. Signal Space Analysis, pass band data transmission: PSK, FSK, MSK and QAM. Multi carrier systems, OFDM

EEN 453 Mobile Communications 3
Prerequisites: EEN 452

Basic Concepts of Mobile Communications. Cell Site Planning. RF Propagation Characteristics. Frequency Planning. GSM Cellular System: features, multiple access techniques, GSM architecture. CDMA (IS 95) System: Spread spectrum systems, Direct sequence SSS, CDMA air links, the forward channel, the reverse channel, diversity receivers. Third Generation Mobile Communication.

EEN 454 Satellite Communications 3
Prerequisites: EEN 421, EEN 452

Overview of satellite systems. Orbits and launching methods. Communication satellite subsystems. Modulation schemes and satellite multiple access (FDMA, TDMA, CDMA, and SDMA). Space link analysis. Satellite antennas. Applications of satellites.

EEN 455 Optical Communications 3
Prerequisites: EEN 421, EEN 452

Optical fiber waveguides: ray and mode theories. Step-index and graded-index fibers. Transmission characteristics of optical fibers; losses and dispersion. Methods of manufacture of optical fibers and cables. Connection of optical fibers. Measurements of attenuation, dispersion, refractive index profile, numerical aperture, diameter and field. Optical sources, the semiconductor laser and the light emitting diode. Optical detectors. Optical fiber system. Digital and analog systems. Design of a simple optical fiber communication link

EEN 456 Digital Signal Processing 3
Prerequisites: EEN 452

Classification of signals and their mathematical representation. Discrete-time systems classification. Linear shift invariant system response, difference equations, convolution sum, and frequency response.

Discrete Fourier transform. Z-transform and its application to system analysis. Realization forms. Sampling and aliasing. Finite-impulse response (FIR). Design windowing technique. Introduction to infinite impulse response (IIR). Filter design techniques.

EEN 457 Information Theory and Coding 3
Prerequisites: EEN 452

Concept of information and its measurement. Entropy source coding theorem. Huffman codes, LZW, arithmetic codes. Introduction to rate distortion theory. Channel coding theorem, channel capacity. Block codes: detection and correction. Linear codes, cyclic codes, hamming codes, BCH codes, encoding, and decoding algorithms. Introduction to convolutional codes.

EEN 458 Special Topics in Comm. Eng. 3
Prerequisites: Department Approval

In-depth study of communications engineering topics not covered in other courses of the program in order to enhance students' knowledge in the field of communications engineering.

EEN 460 Computer Networks 3
Prerequisites: EEN 212, EEN 350

Components of data communication systems. Error detection techniques. Network Protocols including the open System Inter-connection model. Communication carrier facilities. System planning considerations.

EEN 461 Optical Networks 3
Prerequisites: EEN 460

Introduction to optical networking. Time-Division Multiplexing (TDM). Fiber-optic technologies. Wavelength-Division Multiplexing (WDM). SONET architectures. SDH architectures. Packet ring technologies. Optical network case studies.

EEN 462 Data Comm. and Networks 3
Prerequisites: EEN 460

Introduction to computer networks: Network topologies; Network architecture and the OSI reference model; Data Link Control: flow control and error control, ARQ Stop/wait , Sliding window protocols, DLC standards : HDLC , PPP and SLIP; Medium Access control Protocols and standards; ALOHA, CSMA, CSMA/CD, Token Ring , Wireless; LAN standards & Devices: Ethernet and IEEE standards for LANs; LAN devices: Bridges, HUBs, Ethernet Switches; Network Layer Services: Datagram and Virtual Circuits; WAN Standards and techniques: X.25, Frame relay, ATM

EEN 463 Telecommunication Networks 3
Prerequisites: EEN 452

Introduction to Telecommunication networks, telegraph, telephony, Network topologies. Data transmission interface equipment: modems. Digital data interface equipment. Traffic engineering. Exchange and switching. Copper lines: Open wire, Twisted pair, Coaxial cable, Optical fiber technology, Applications. Radio relay technology, wireless networks. Advanced communication networks: ISDN, Broadband, Satellite, Mobile, Digital subscriber lines, VOIP.

EEN 464 Special Topics in Networks 3
Prerequisites: Department Approval

In-depth study of Computer Networks topics not covered in other courses of the program in order to enhance students' knowledge in the field Computer Networks.

EEN 498 Senior Project I 1
Prerequisites: EEN 390

Selection of topic, literature review, project design planning, arranging for data collection and preparing to experimental work.

EEN 499 Senior Project II 3
Prerequisites: EEN 498

Experimental work and data collection or field study (if any), data processing analysis and results, preparation of the first draft of final report, presentation of the project.

IEN Courses

IEN 101 **Technical Writing in English**2

Prerequisites: ELI 104

Writing skills: writing strategies, general versus technical writing, technical report writing. Presentation skills: use of spoken English, professional computer-based oral presentations. Project-based course work on technical communication.

IEN 201 **Intro to Engineering Design I**2

Prerequisites :COMM 101, IEN 101

Introduction to active learning: team work, team dynamics, team norms and communication, conducting effective meetings and quality assessment. Problem solving procedure: problem definition, generation of solutions, selection methodology, solution implementation, assessment of implementation. Levels of learning and degrees of internalization. Ethical decision. Organization of the work and design notebook. Reverse engineering and design projects.

IEN 202 **Intro to Engineering Design** II2

Prerequisites: IEN 201

Engineering modeling process. Computer modeling and heuristics for solving problems, in teams, in the areas of comparison of strategies, trade-offs, decision making, stochastic processes, optimization and expert systems. Interpretation of results. Preparation of professional technical reports of engineering work and multimedia presentation. Stochastic and deterministic models.

IEN 255 **Engineering Economy**3

Prerequisites: MATH 110

Fundamentals of engineering economy. Time value of money. Evaluation of alternatives. Replacement and retention analysis. Break even analysis. Depreciation methods. Basics of inflation.

IEN 256 **Engineering Management**3

Prerequisites: IEN 202, IEN 255

Role of engineers in management of organizations. Managerial functions related to production, inventory and human resources. Project planning and control. Case studies pertaining to Eng. problems.

IEN 311 **Operations Research** I3

Prerequisites: MATH 204

Introduction to Operations Research. Formulation of linear programming problems. Graphical solution. The Simplex algorithm. Duality and sensitivity analysis. Transportation and assignment problems. Integer and Goal programming.

IEN 321 **Automation and Control**3

Prerequisites: MATH 204, EEN 170

Provide the student with basic skills useful in identifying the concepts of automatic control, automated machines and equipment and describe the terms and phrases associated with automatic control and industrial automation. The student will perform preventative maintenance, identify or solve problems in machines, and other technologies. Performance will be satisfactory when student can demonstrate competence in maintaining and troubleshooting technology includes identifying, understanding, and performing routine preventative maintenance and service on technology; detecting more serious problems; generating workable solutions to correct deviations; and recognizing when to get additional help.

IEN 322 **Computer Programming for** IE3

Prerequisites: EEN 170

Basics of computer programming languages. Object oriented programming concepts. Development of application and appropriate algorithms for solving Industrial Engineering problems.

IEN 323 **System Analysis and Design**2

Prerequisites: IEN 322, MATH 204

System definition, characteristics and concepts. Systems development projects: identification, selection, initiation, planning and managing. System analysis: determining and structuring requirements. System design: overview, forms and reports, interfaces and dialogues, and finalizing design specifications. Designing distributed and internet systems. System implementation and maintenance.

IEN 331 **Engineering Prob. &Statistics**3

Prerequisites: STAT 110, MATH 202

Descriptive statistics with graphical summaries. Basic concepts of probability and its engineering applications. Probability distributions of random variables. Confidence intervals. Introduction to hypothesis testing. Correlation and linear regression.

IEN 341 **Work** Study3

Prerequisites: IEN 331

Introduction to work study (WS). Productivity and WS. WS approaches. Basic procedure of motion study: job selection, recording facts, critical

examination, etc. String diagram, Multiple activity chart, Travel chart. Principles of motion economy. Two-handed chart. Fundamental hand motions. Micro-motion and Memo-motion studies. Cycle graph and Chrono- cycle graph. Work measurement (WM). Work sampling. Time study. Computerized WM. PMTS: MTM, Work factor and Standard data. Wage payment and incentive plans.

IEN 342 **Human Factors Engineering**3
Prerequisites: IEN 341

Introduction to human factors engineering. Muscular work. Nervous control. Work efficiency. Body size and anthropometrics. Work station design. Heavy work. Handling loads. Man-machine systems. Mental activity. Fatigue. Stress and boredom. Vision and lighting. Noise and vibration.

IEN 361 **Manufacturing Processes** I3
Prerequisites: MEN 130, CHEN 210

To introduce the students with the fundamentals of: the role of manufacturing processes, mechanical behavior of materials, casting processes, bulk deformation processes, material removal processes, sheet metal forming processes and modern manufacturing systems.

IEN 362 **Manufacturing Processes** II3
Prerequisites: IEN 361

Fundamentals of cutting. Mechanics of chip formation. Cutting forces and power. Effect of temperature on cutting. Tool life. Machinability: Metal removal rate, Cutting tool materials and fluids. Machining processes: turning, thread cutting, boring, drilling, milling, shaping and planning, broaching, gear cutting. Abrasives, grinding processes. Super finishing process: Lapping, honing, blasting. Non-conventional machining: Principles, Ultrasonic machining, Electromechanical machining, Electro-discharge machining, Plasma arc machining, Laser beam machining, Electron beam machining. Numerical Control of machine tools: Automation of manufacturing processes, Numerical control, Coordinate systems, Types and components of CNC systems, Adaptive control, CIM.

IEN 363 **Manufacturing Systems Design**3
Prerequisites: IEN 361

Manufacturing operations, manufacturing models and performance metrics, design of manufacturing systems including cellular, manufacturing and flexible manufacturing systems. Analysis of process selection, planning, optimization and economic of manufacturing systems, group technology, transfer lines. Computer–aided manufacturing.

IEN 390 **Summer Training**2
Prerequisites: Complete 110 credit units

On-site industry based training spanning over a period of 10 weeks in a manufacturing or service industry under the supervision of an industry based advisor. The student is required to communicate, clearly and concisely, training details and gained experience both orally and in writing. The student is evaluated based on his abilities to perform professionally, demonstrate technical competence, work efficiently, and to remain business focused, quality oriented, and committed to personal professional development.

IEN 393 **Industrial Internship**6
Prerequisites: IEN 101, IEN 202, IEN 390, Minimum GPA 3.0

4 months' occupational experience in an industrial facility. Work experience is cooperatively planned by the department and employer to fulfill the student's objectives. Weekly conferences, assignments, and reports required.

IEN 411 **Operations Research** II3
Prerequisites: IEN 311, IEN 331

Non-linear programming. Dynamic programming. Inventory models. Waiting line models. Markov analysis. Introduction to game theory. Applications in industrial, service and public systems.

IEN 412 **Industrial Stochastic Systems**3
Prerequisites: IEN 331

Deterministic and stochastic processes. Poisson process and related distributions. Birth and death processes. Markovian decision processes in industry. Queuing systems and its optimization. Markovian and non-Markovian systems. Queuing applications in production, transportation, communication and public service systems. Stochastic models for transportation and maintenance systems. Introduction to simulation modeling of stochastic systems.

IEN 421 **Industrial Information Systems**2
Prerequisites: IEN 323

General concepts. Values and attributes of information. Different types of information systems. Concepts of managerial information systems. Analysis, design and development of industrial information systems. Understanding the development of information systems such as ERP.

IEN 422 **Industrial Systems Simulation**3

Prerequisites: IEN 322, IEN 331

Basic theory of industrial simulation. Building simulation models. Organization of simulation studies. Simulation modeling and application to medium and large-scale production and service system problems. Output analysis. Variance reduction and optimization. Use of software such as ARENA for discrete and continuous system simulation.

IEN 423 **Feasibility Studies**3

Prerequisites: IEN 255, IEN 323

Introduction to feasibility studies: project identification, product mix and scope. Marketing feasibility: present and future market study, demand, pricing, and revenue. Technical feasibility: site selection, material, labor, equipment, knowhow, and shipping. Financial feasibility: project financing, production cost, break-even analysis, profitability analysis organizational and administrative feasibility: organizational structure, governmental regulations, safety and environmental standards, patents and human relations. Reporting and presentation. Case studies.

IEN 424 **Industrial Data Systems**3

Prerequisites: IEN 421

Concepts of advanced database management system design, principles and techniques. Entity relationship diagram. Normalization. Object oriented and object relational databases. Data warehousing. Data mining. Web and semi structural data. Data Security.

IEN 431 **Industrial Quality Control**3

Prerequisites: IEN 331

Introduction to quality systems and process improvement. Cost of quality and the effects of quality on productivity. Introduction to principles and philosophies of total quality management. Quality systems and standards: six sigma approach to quality and ISO. Reengineering. Statistical quality control: Control charts for variables and attributes and their applications in process control. Process capability studies, acceptance sampling plans. Quality function development. Quality circles. Quality loss functions. Case studies in applied quality control

IEN 432 **Design of Experiments**3

Prerequisites: IEN 331

Principles of experimental design. Randomized complete block designs. Latin square and Graeco-Latin square designs. General factorial designs. 2^k Factorial designs. Response surface methodology and robust design. Planning, performing and analyzing industrial experiments.

IEN 433 **Reliability Engineering**3

Prerequisites: IEN 331

Introduction to reliability analysis. Reliability measures: reliability function, expected life, hazard function of important distribution functions. Hazard models and product life. Extreme value distribution. Static reliability models. Dynamic reliability models. System effectiveness measures. Reliability allocation and optimization. Introduction to fault tree analysis and human reliability.

IEN 434 **Maintenance Engineering**3

Prerequisites: IEN 256, IEN 331

Maintenance systems. Maintenance organization. Maintenance strategy, Maintenance capacity planning, Maintenance measurement and standards, Scheduling of maintenance, Maintenance material control, Quality of maintenance jobs, Maintenance productivity, Maintenance audit, Maintenance management information. Economics of main-tenance. Optimal maintenance strategies. forecasting the spare parts and determining optimal stocking policy. Component replacement decision models. Maintenance operation and control. Preventive Maintenance: Predictive maintenance concepts, modeling, and analysis. Computerized maintenance management systems. Replacement studies. Case studies.

IEN 441 **Industrial Safety Engineering**3

Prerequisites: IEN 342

Accident: causes and costs. Appraising safety performance and risk assessment. Analysis of accident causes. Accident reports and records. Job safety analysis. Plant inspection. Accident investi-gation. Plant layout and arrangement. Plant housekeeping. Maintenance and safety. Material handling and safety. Machine guarding. Explosion and fire prevention. Personal protection. First aid. Planning for emergencies.

IEN 450 **Marketing Management and Research**3

Prerequisites: IEN 256

Study of marketing theory. Methods of marketing. Interrelationship of the different phases of marketing strategies. Consumer decision processes through behavioral sciences. Theories and techniques of

planning, analyzing and presenting market studies. Methodologies of marketing research with emphasis on primary research including questionnaire design.

IEN 451 **Production Planning and** Control3
Prerequisites: IEN 256, IEN 341

Basic concepts of production and operations management (POM). Design of products and services. Processes and technologies. E-commerce and operations management. Inventory management. supply-chain management. Just-in-time and lean production. Forecasting. Material requirements planning (MRP). Introduction to enterprise requirement planning (ERP). Capacity and aggregate planning. Scheduling.

IEN 453 **Facilities Planning and Design**3
Prerequisites: IEN 323, IEN 341

Fundamentals of facilities planning. Facilities design. Flow, space and activity relationships. Material handling systems. Layout planning models. Ware-house operations. Quantitative facilities planning models. Preparing, presenting, implementing and maintaining facilities plan**.**

IEN 454 **Engineering Cost Analysis**3
Prerequisites: IEN 255

Importance of cost analysis in engineering. Cost terms and concepts. Cost estimation for decision making: cost-volume-profit analysis, measuring relevant costs and revenues, cost assignment and activity-based costing. Cost evaluation of engineering alternatives. Case studies.

IEN 455 **Global Logistics Management**3
Prerequisites: IEN 255, IEN 331

This course will provide an intensive and coordinated approach to study the flow of goods and services from raw material suppliers to the final customer. This product flow will be reviewed from a global perspective, providing a comprehensive under-standing of the international business. Students will gain an insight into every step of the global logistics process, from order processing and purchasing to packaging and warehousing. Different functional aspects of the logistics system are discussed including customer service, materials handling, packaging, storage and transportation. The course will discuss the consequences of globalization for local logistics structures, management concepts and strategies to control international networks as well as sustainability of supply chains.

IEN 456 **Project Management**3
Prerequisites: IEN 256

Introduction to engineering project management. Planning successful projects. Specifying, budgeting, implementing, executing, scheduling, delivery options, and closeout. Scheduling tasks and resources. Resource leveling. Common Charact-eristics of projects. Network tools for project planning and monitoring. Cost optimization to meet project objectives. Project crashing, time-cost trade-offs. Risk analysis. Software for project planning and scheduling.

IEN 457 **Supply Chain Management**3
Prerequisites: IEN 256, IEN 451

Introduction to Supply Chains (SC). Flow across SC of products, information and revenue. SC operations: issues, opportunities, tools, approaches, inter-corporate relationships, incentives and risk factors. SC design: customer service, quality, logistics, inventory, business processes, system dynamics, control, design, and re-engineering. Integrated SC management: forecasting, global sourcing, and virtual integration. Technology as an SC tool: internet technologies and digital coordination of decisions and resources. Case studies.

IEN 458 **Strategic Management**3
Prerequisites: IEN 256

Overview of operations strategy for competitive advantage. Evaluation of a firm's external environment using Porter Five Forces Model. Evaluation of a firm's internal capabilities using the VRIO framework. Cost leadership versus product differentiation strategies. Vertical integration and corporate diversification. Strategic alliances, mergers and acquisitions. Real life examples and case studies from industry.

IEN 481 **Introduction to Entrepreneurship**1
Prerequisites: IEN 202

Overview of the entrepreneurial process from an engineering perspective. Idea generation, planning, financing, marketing, protecting, staffing, leading, growing, and harvesting. Basic framework for understanding the process of entrepreneurship, principles of management and related techniques in decision making, planning, marketing, and financial control. Exercises in practical ideas about launching own enterprises. Classroom lectures are combined with field study and exercises supplemented with guest lectures and case studies on small and medium scale industries. Students write startup business plans.

IEN 482 **Industrial Entrepreneurship**2

Prerequisites: IEN 256

Overview of the entrepreneurial process from an engineering perspective. Idea generation, planning, financing, marketing, protecting, staffing, leading, growing, and harvesting. Basic framework for understanding the process of entrepreneurship, principles of management and related techniques in decision making, planning, marketing, and financial control. Exercises in product design and prototype development, preparation of workable project feasibility reports, practical ideas about launching own enterprises. Classroom lectures are combined with field study and exercises supplemented with guest lectures and case studies on small and medium scale industries. Students write startup business plans.

IEN 459 **Operations Management**3

Prerequisites: IEN 451

Concepts, problems and techniques applicable to the operations of a variety of business organizations – manufacturing/production and services. The emphasis is on decision making (to include business ethics) in operational areas such as: facility requirements and utilization, control and coordination of resource inputs and outputs, types of transformation/conversion processes, and performance measurements. The course will analyze operations from both the strategic and operational perspectives and highlight the competitive advantages that operations can provide for the organization.

IEN 461 **CAD/CAM**3

Prerequisites: MEN 100, IEN 361

Foundation of CAD/CAM. Fundamentals of CAM. Computer graphics software and data. Computer aided manufacturing: numerical control, NC part programming, NC, DNC and CNC systems.

IEN 462 **Computer Integrated Mfg.**3

Prerequisites: MEN 100, IEN 361

This course is designed to highlight the major automation-related subjects within the scope of manufacturing system. Special emphasis will be given on industrial robotics, robot programming and flexible manufacturing systems (FMS). Laboratory exercises will deal with robotic programming and experiment with FMS systems. The elements of a flexible manufacturing environment such as CNC machines, robots, conveyors are modeled and operated via OpenCIM software package.

IEN 463 **Design for Mfg. and Assembly**3

Prerequisites: MEN 130

Introduction to Product Development, Introduction to Design For Manufacture And Assembly (DFMA), Selection of Material and Process, Design For Manual Assembly, Design For Automated Assembly, Design For Machining, Design For Injection Molding, Design For Sheet Metalworking, DFMA software.

IEN 464 **Engineering Metrology**3

Prerequisites: IEN 361

Standards, calibration, traceability and laboratory accreditation. Accuracy and precision. Sensitivity and magnification systems. Errors, geometric tolerances. Surface texture. Interferometry, vision system and laser applications. Inspection and limit gauging, machine tool metrology industrial measurement system, type of sensing devices, contact and noncontact, actuators, data acquisition, signal processing, statistical treatment of data.

IEN 490 **Special Topics in Industrial Eng.**3

Prerequisites: Department Approval

In-depth study of relevant industrial engineering topics not covered in other courses of the program in order to enhance students' knowledge in the field of industrial engineering.

IEN 498 **Senior Project I**1

Prerequisites: Complete 110 credit units

Technical writing skills. Project proposal: a team-based capstone design work involving a practical, open ended, real life defined problem, literature review, problem formulation (objectives, constraints, and evaluation criteria), generation of design alternatives, work plan, preliminary design of the selected alternative, design refinement, detailed design, design evaluation, and documentations. emphasis on synthesis of knowledge and skills to assimilate and demonstrate a professional attitude and ethics in problem solving with assessment of environmental, cultural and social impacts.

IEN 499 **Senior Project II**3

Prerequisites: IEN 498

Project work: a team-based capstone design work involving a practical, open ended, real life defined problem; emphasis on synthesis of knowledge and skills to assimilate and demonstrate a professional attitude and ethics in problem solving with assessment of environmental, cultural and social impacts; final output in the form of written report based on specified standard format, followed by a multimedia presentation of the work undertaken in the project.

MEN Courses

MEN 100 **Engineering Drawing** 3

Prerequisites: None

Introduction, Skills of freehand sketching, Methods of projection: Orthographic, isometric, Dim-ensioning of view, Third view prediction, sectioning, Introduction to assembly drawings, Introduction to Solid Works, Two dimensional sketching, Basic part modeling, patterning, revolved features, shelling and ribs, creating drawings, Laboratory.

MEN 130 **Basic Workshop** 1

Prerequisites: None

Introduction to principles of production, Engineering materials, Measurements, Standards Specifications, Foundry, Metal forming (forging, extrusion, drawing, press work, rolling, wire drawing), Sheet metal work, Welding, metal cutting and machine tools (sawing, drilling, turning, milling, shaping, slotting, grinding), Fitting, Industrial safety, Production management and production planning.

MEN 201 **Mechanical Eng. Drawings** 3

Prerequisites: MEN 100

Introduction to CAG, Skills of using a drafting package, Geometrical and dimensional tolerances, Applications on mechanical elements (Bolts, welded and riveted joints, shafts and keys, springs, gears), Applications on assembly and working drawings (valves, presses, etc.), Laboratory.

CHEN 212 **Engineering Materials** 3

Prerequisites: CHEM 281, PHYS 281

Classification of Engineering Materials, Atomic Structure and Interatomic Bonding, The Structure of Materials, Phase diagram, The driving force for structural change, Kinetics of structural change (nucleation and transformation), Steels (carbon steel, alloy steel), The light alloys, Ceramic materials, Polymers, Composite materials, Design with materials (design-limiting properties of materials), Corrosion, Failure. Involves laboratory experiments.

MEN 220 **Eng. Mechanics (Dynamics)** 3

Prerequisites: CEN 201

Review of particle motion, Rotation and translation of a rigid body in the plane, General plane motion, Displacement, velocity, and acceleration of rigid bodies, including Coriolis motion, Motion about a fixed point, Equations of motion for a rigid body, Constrained plane motion. Work and energy, Impulse and momentum, Mass moment of inertia, Introduction to mechanical vibrations.

MEN 225 **Engineering Mechanics** 3

Prerequisites : PHYS 281

General Principles of Statics; Force Vectors (2D & 3D); Equilibrium of a Particle (2D & 3D); Force System Resultants (2D & 3D); Equilibrium of a Rigid Body (2D); Center of Gravity and centroid of a Body, Mass moment of inertia, Rotation and translation of a rigid body in the plane, General plane motion, Displacement, velocity, and acceleration of rigid bodies, Equations of motion for a rigid body,

MEN241 **Numerical Analysis** 2

Prerequisites: MATH 204, EEN 170

Introduction, Curve fitting to measure data, Classification of differential equations, Finite difference formulations, Numerical solutions for ordinary differential equations, Mesh and grid generation, Numerical solution for partial differential equations, Applications with Fortran code programming. Laboratory.

MEN 250 **Fluid Mechanics (1)** 3

Prerequisites: PHYS 281, MATH 202

Concepts and definitions, Fluid statics, Forces on submerged surfaces and bodies, Non–viscous flow, Conservation of mass, momentum and energy equations, Bernoulli's equation. Dimensional analysis, the Pi–theorem, and similarity, Pipe flow, Losses in conduit flow, Laminar and turbulent flow, Laboratory.

MEN 260 **Thermodynamics (1)** 3

Prerequisites: MATH 202, PHYS 281

Concepts and definitions, Energy, heat and work, Energy Transfer, Properties of pure substances, Ideal gases, Mixture of gases, Phase change, First law of thermodynamics, Specific heats and enthalpy, Application to first law on closed system and control volume, Second law of Thermodynamics, Entropy, Principle of increase of entropy and definition of isentropic efficiency, Availability and reversibility, Some power and refrigeration cycles including Rankine and vapor compression cycles, Laboratory.

MEN 310 **Machine Element Design** 3

Prerequisites: MEN 201, MEN 340

Material selection in design, Static failure theories, Fatigue failure, Design of shafts for static and dynamic loads, Gear geometry and forces, Use of the AGMA code in gear design, Power screws, Bolted joints, Welded joints. Introduction to clutches, brakes and couplings, Laboratory.

MEN 321 **Machine Dynamics** 3

Prerequisites: MEN 220

Design of ordinary gear trains and analysis of epicyclic gear trains, Analytical design of disk cams, Grashof rules, Basic types of mechanisms, Design of mechanisms for transmission angle and time ratio, Position, velocity and acceleration analysis of linkages, Static and dynamic force analysis of mechanisms with the aid of computers.

MEN 322 **System Dynamics and Control** 3

Prerequisites: MEN 220, MATH 204

Introduction, Laplace transforms, Mathematical modeling of dynamic systems: mechanical, electrical, electro-mechanical, liquid-level, thermal and pressure systems, Transfer function, Block diagrams, State space equations of control systems, Industrial automatic controllers: basic control actions, Pneumatic and hydraulic controllers, Transient response analysis: First and second order systems, Root locus analysis and design, Frequency response analysis and design, Computer program applications.

MEN 332 **Manufacturing Technology** 3

Prerequisites: MEN 130, CHEN 212

Introduction, Casting processes (solidification, melting, permanent and expendable mold casting), Bulk forming processes (cold forming, hot forming, formability, and forming limits), Sheet metal processes (formability of sheets and sheet forming processes, Manufacturing of polymer, Powder and Ceramic materials, Welding process, Principles of metal cutting and machining, Mechanism of chip formation, Heat treatment of materials, Laboratory.

MEN 333 **Engineering Measurements** 3

Prerequisites: MEN 332, MEN 250

Introductions on use of computers on the Lab., Mathematical fundamentals, System description, Error analysis, Strain and force measurements, Temperature measurements, Pressure measure-ments, Mass flow rate measurements, velocity, and flow visualization, Torque, speed, and power Measurements, Data collection processing, Dynamic response, Laboratory.

MEN 340 **Mechanics of Materials** 3

Prerequisites: CEN 201

Types of loads and stresses, Mechanical behavior of materials, Shearing forces and bending moment diagrams, Shearing stresses in beams, Stresses in compound bars, Bending stresses and deflection, Torsion of bars, Principal stresses and Mohr's circle of stress, 3-Dimensional stresses, Principal strains and Mohr's circles of strain, Stress-strain relations, Strain energy, Yield criteria, Fatigue analysis of thin and thick cylinder.

MEN351 **Fluid Mechanics (2)** 3

Prerequisites: MEN 250

Review of the basic concepts, Differential analysis of fluid flow, Approximations of the Navier-Stokes equations, Flow over bodies, drag and lift, Compressible flow, Specific applications of one-dimensional compressible flow include one-dimensional isentropic flow, Flow with area change, Normal and oblique shock waves, Adiabatic flow with friction, Flow with heat addition, Introduction to computational fluid dynamics. Laboratory.

MEN 361 **Thermodynamic (2)** 3

Prerequisites: MEN 260, MEN 250

Irreversibility and availability, Thermodynamic Relations, Mixtures and solutions, Chemical reactions and combustion, Phase and chemical equilibrium, Thermodynamics of compressible Flow, Laboratory.

MEN 362 **Heat Transfer** 3

Prerequisites: MEN 260, MEN 250

Principles of heat transfer, Steady state and transient conduction in different co-ordinates, Extended surfaces, Convective heat transfer, Analysis and empirical relations for forced and natural convection, Radiation heat transfer, radiation exchange between black and gray surfaces, Heat transfer applications (Heat Exchangers), Numerical methods in heat transfer with computer applications, Laboratory.

MEN 367 **Thermo-Fluids** 3

Prerequisites: PHYS 281 , MATH 202

Fundamentals of Thermodynamics, First and Second Laws of Thermodynamics, Various power and refrigeration cycles, Heat transfer modes including steady and unsteady conduction, convection and radiation, Flow statics and buoyancy, Mass, momentum and energy conservation, Bernoulli equations, Internal and external flows.

MEN 390 **Summer Training** 2

Prerequisites: Complete 110 credit units

10 weeks of supervised hands-on work experience at a recognized firm in a capacity which ensures that the student applies his engineering knowledge and acquires professional experience in his field of study at KAU. The student is required to communicate, clearly and concisely, training details and gained experience both orally and in writing. The student is

evaluated based on his abilities to perform professionally, demonstrate technical competence, work efficiently, and to remain business focused, quality oriented, and committed to personal professional development. Laboratory.

MEN411 **Mechanical Design** 3
Prerequisites: MEN 310

Introduction, Design methodology (concept, alternatives, considerations, skills of team work, reports, construction and detailed drawings of machines), Mechanical systems, Comprehensive design projects include; fixed and moveable joints, shafts, sliding and rolling bearings, Gears, couplings, clutches and brakes, belt drivers, Use of standard and technical manuals, Application of computer programs, Application on design of production facilities, Quality and reliability.

MEN 412 **Machine Tool Design** 3
Prerequisites: MEN 310, MEN 332

Design and working principles of machine tool elements (speed and feed of gear boxes. spindle and spindle bearings), Rigidity and strengthening of structures- frames, beds and design of slide ways against wear, Power sources and types of drives, Mechanisms design, Motion control and transmission systems in machine tools, Safety devices, Static and dynamic acceptance tests for machine tools.

MEN 413 **CAD\CAM** 3
Prerequisites: MEN 310

Foundation of CAD /CAM, Fundamentals of CAM, Computer graphics software and data, Computer aided manufacturing: numerical control, NC part programming, NC, DNC and CNC systems, Lab.

MEN 414 **Production Facilities Design** 3
Prerequisites: MEN 310, MEN 332

Hoisting machinery: crane chains, sprockets, pulleys, drums, ropes, sheaves and hooks, Gain in force and gain in speed systems, Wheels, rails, and drives, Jigs and fixtures: specifications of jigs and fixtures, conventions in fixture design, Degreesof freedom, location points, fixation point, Clamping devices, fool-proofing, Rigidity and wear considerations.

MEN 415 **Tribology** 3
Prerequisites: MEN 310

An introduction to the principles of wear resistance of machine parts and tribology, Physical understanding of different mechanisms of wear and friction and methods of increasing durability.

MEN 423 **Mechanical Vibrations** 3
Prerequisites: MEN 321

Free and damped vibration of single degree of freedom systems, Viscous damping, Forced vibration, Resonance, Harmonic excitation; Rotating unbalance, Base motion, Vibration isolation, Fourier analysis, Vibration measuring, General excitation, Step and impulse response, Two degree of freedom systems, Frequencies and mode shapes, Modal analysis, Undammed vibration absorber, Multi degrees of freedom systems, Matrix methods, Raleigh and Raleigh-Ritz methods, Continuous systems, axial, torsional and bending vibrations.

MEN 434 **Mech. Behavior of Materials** 3
Prerequisites: CHEN 212

Testing of materials under static and dynamic loading, Plastic deformation in metal single crystal and poly-crystalline material and dislocation lines, Introduction to fracture mechanics, Fatigue, creep, and wear mechanisms, Evaluation and presentation of materials testing and failure data, Laboratory.

MEN 435 **Material Selection in Design** 3
Prerequisites: MEN 340, MEN 332

Engineering materials and their properties, Materials selection charts, Materials selection without shape, Case studies involving materials selection without consideration of shape, Selection of materials and shape, Case studies of designs in which both the material and its shape play a role, Multiple constraints and compound objectives, Materials processing and design, Case studies emphasizing choice of processing Method(s) critical to system performance.

MEN 436 **Advanced Manufacturing** 3
Prerequisites: MEN 332

Non-conventional machining: principles, ultrasonic, electromechanical, electro-discharge, plasma arc, laser beam, electron beam machining, Numerical control of machine tools: automation of manu-facturing processes, numerical control, coordinatesystems, types and components of CNC systems, Programming for CNC, Adaptive control, Computer integrated manufacturing, Laboratory.

MEN 437 **Welding Technology** 3
Prerequisites: MEN 332

Fusion welding, Weldability, Selection of welding electrodes, Hot cracking, Cold cracking. Welding metallurgy, heat affected zone, Welding of heat-treatable alloys, Welding of dissimilar alloys, Destructive and nondestructive testing of welds, Weld thermal cycles and residual stresses, Welding in

manufacturing: pressure vessels, boilers and ship building industries, welding in automotive maintenance, Welding codes, Laboratory.

MEN 438 Plasticity and Metal Forming 3
Prerequisites: MEN 340

Yield criteria, plastic stress-strain relations, Plane stress and plane strain, Determination of flow stress, Applications in beam bending, instability in thin shells, Classification of metal forming processes, Bulk deformation processes, Techniques of analysis: slab method, upper bound method, Slip-line fields, application to indentation problem, Forging, rolling, extrusion, wire drawing equipment and dies.

MEN 442 Introduction to FEM 3
Prerequisites: MEN 201, MEN 340

Virtual formulation, Finite element analysis: shape formation, equilibrium conditions, element classification, and assembly of elements, modeling methodology, Structures and elements: trusses, beams, 2-D solids, 3-D solids, axisymmetric solids, thin-walled structures, Dynamic analysis, Heat transfer and thermal analysis, Laboratory.

MEN 452 Fluid Machinery Design 2
Prerequisites: MEN 250, MEN 260

Fundamental relations for the flow through an arbitrary turbo machine, Momentum relations through an arbitrary Turbo machine, Energy relations through an arbitrary Turbo machine, Theoretical operational characteristics of Turbo machinery, Dimensional analysis and similitude; Actual operational characteristics and pump system combinations, Hydraulic pumps, Hydraulic turbines, Centrifugal compressors and fans, Axial compressors and fans, Design considerations, Positive displacement fluid machinery, Lab.

MEN 453 Pneumatic & Hydraulic System 3
Prerequisites: MEN 250

This course introduces the basic components and functions of hydraulic and pneumatic systems. Topics include standard symbols, pumps, control valves, control assemblies, actuators, FRL, maintenance procedures, and switching and control devices. The operation of a fluid power system, including design, application, and troubleshooting. Lab.

MEN 463 HVACR 3
Prerequisites: MEN361, MEN362

Review of basic thermodynamics, vapor comPre-Req.ssion cycles, Refrigerants and their characteristics, Basic vapor compression equipment, Introduction to absorption refrigeration, Psycho-metrics and psychometric processes, Human comfort, Heat gain-through walls and fenestrations, Cooling load calculations, Duct design and air distribution system, Load calculation using software packages, Lab.

MEN 464 Design of Heat Exchangers 3
Prerequisites: MEN362

Classification of heat exchangers, Basic design methods in heat exchangers, Forced convection correlations for the single-phase side heat exchangers, Heat exchanger pressure drop and pumping power, Double pipe heat exchangers, Design correlations for condensers and evaporators, Shell and tube heat exchangers, The gasketed plate heat exchangers, Condensers and evaporators, Lab.

MEN465 Thermal Desalination Processes 3
Prerequisites: MEN 361, MEN 362

Phase rule and equilibria, Thermodynamics and colligative properties, Scales and chemical treatment, Multi-effect desalination systems, Multi stage flash desalination systems, Mechanical and thermo-vapor compression systems, Dual purpose plants, Lab.

MEN 466 HVACR Control Systems 3
Prerequisites: MEN422

Introduction to Automatic control, Automatic control components, Sensors, Automatic Controller, Direct control devices, Application on Control system in AC, Power and control circuits and drawings, Three phase motor, System control in Central air conditioning and Commercial storage, Direct digital control, Pneumatic control, Noise control, Programmable Linguistic Control, Lab.

MEN467 HVACR Systems and Equipment 3
Prerequisites: MEN 463

Air-Conditioning and Heating Systems, System analysis and selection, In-room terminal systems, Centralized and decentralized systems, Heat pumps, Panel heating and cooling, Cogeneration and engine-driven systems, Heat recovery, Steam and hydraulic systems, District systems, Air-Handling Equipment, Duct construction, Air distribution, Fans, coils, evaporative air-coolers, Humidifiers, dehumidifiers, air cleaners, Heating Equipment, boilers, furnaces, chimneys, radiators, and solar equipment, General components, compressors, condensers, cooling towers, liquid coolers, liquid-chilling systems,

centrifugal pumps, motors and drives, Pipes and fittings, Valves, Heat exchangers, and energy recovery equipment, Lab.

MEN 468 **Maintenance of HVACR Systems** 3
Prerequisites: MEN 333, MEN 463

Maintenance strategies, preventive, emergency, maintenance programs. Maintenance types, periodic, weekly, annual. Maintenance tools. Performance analysis. Troubleshooting charts. Maintenance sequence. Types of A/C units, window, split, package. Leak detection. Evacuation and dehydration. Refrigerant charging. Maintenance of window type, Split type and package Units; Maintenance of domestic refrigerator. Maintenance of car A/C. Maintenance of cooling towers and evaporative condensers. Maintenance of commercial and industrial units. Cooling towers and evaporative condensers maintenance. Maintenance of accessories. Maintenance of central A/C units. Water chiller maintenance. AHU maintenance. Trouble shooting and log sheet analysis. Overhauling of components. Lab.

MEN 469 **Unitary Sys. Design for HVACR** 3
Prerequisites: MEN 463

The study of residential and light commercial HVACR systems design including load calculations (comp. applications), Duct and pipe design, Heat recovery methods, Restaurant ventilations requirements, Humidification, insulation, sound and measurement techniques and applicable codes, Laboratory work.

MEN 470 **Mechatronics -1** 3
Prerequisites: EEN 170, MEN 322

Concepts and definitions of mechatronics, Mechatronics design and modeling, Sensors and actuators, Control fundamentals and techniques, Introduction to robotics, Computer control and interfacing

MEN 471 **Industrial Process Control** 3
Prerequisites: MEN 322

Process control fundamentals, Process characteristics: single and two capacitance process, identification, parameters estimation, industrial transmitters, Industrial controllers two position controller - P, PI, PID, controllers, Closed loop characteristics and controller design, controller tuning - basic factors affecting stability - open loop method, closed loop method, state feedback, feedback gain matrix, pole placement method - industrial applications – level /

flow temperature control process, Design of process control systems applying MATLAB, virtual control software packages and Control Station Package

MEN 472 **Mechatronics-2** 3
Prerequisites: MEN 470

Introduction to mechatronics design. Mechatronics design philosophy, Mechatronics design versus traditional design, Case study on design of mechatronic products, A gentle look inside simulation-examples of simple systems, Comparison of different software packages for simulation of multidisciplinary systems, Intelligent sensors- intelligent product & Intelligent devices, Intelligent controller-case study on mechatronics system.

MEN 473 **Robotics** 3
Prerequisites: MEN422

Basics of robotics, Analysis and design of robotic systems including arms and vehicles, kinematics, Inverse kinematics and dynamics of robots (stationery and mobile robots), Algorithms for describing, planning and commanding, Robotic control systems. Position, speed and force control of robot Grippers, Examples on various practical applications of robots.

MEN 474 **Programmable Logic Controllers** 3
Prerequisites: MEN422

Overview of programmable logic controllers(PLCs), Central processing unit, I/0 system, Programming, Terminal and peripherals, Relay logic, Ladder logic, Timers, Counters, Sequencers, Data transfer, Mathematical functions, Numerical systems and codes, Digital logic.

MEN 480 **Power Plants Systems** 3
Prerequisites: MEN 362

Energy demand and power generation systems, Steam and gas power cycles, Fuel and combustion, Basic and auxiliary systems of a steam power plant, Steam generator Analysis, Steam Turbines and their controls, Diesel engine and gas turbine power plants, Overall plant performance, Economics of power plants

MEN 481 **Combustion Theory** 3
Prerequisites: MEN 361

Introduction, Energy types–energy crisis, Classical and chemical thermodynamics, Introduction to heat and mass transfer in multi-component reacting system, Chemical kinetics, Simplified conservation equations for reacting flows, Laminar premixed flame, Laminar diffusion flames, Applications, Lab.

MEN 482 **Renewable Energy** 3

Prerequisites: MEN 351, MEN 362

Review of Heat Transfer, Solar angles, and solar radiation on earth's surface, Solar radiation on tilted surfaces, Radiation measurements, Solar collectors and concentrators, Storage, Photovoltaic, Wind energy, Geothermal energy, Other renewable energy sources.

MEN 483 **Energy Conversion** 3

Prerequisites: MEN 361, MEN 362

Energy sources and their classification, Conventional energy conservation, Power plant and vapor cycles, Renewable energy, Solar energy with emphasis on solar cells, and wind energy, OTEC systems, Geothermal energy, Nuclear fission and types of fission reactors.

MEN 484 **Energy Management and Auditing** 3

Prerequisites: MEN 333, MEN 362

Concepts and definitions, Principles of energy management and energy audit, Heating and cooling management, Electrical load and lighting management, Process energy management, Integrated building systems, Economic aspects of energy management, Energy audit instruments.

MEN 485 **Numerical Methods in HVAC Sys.** 3

Prerequisites: MEN 351, MEN 441

Introduction to CFD, Flow fields, Conservation equations, Classification of flows and partial differential equations, Finite differences solver, Finite volume solvers, Boundary conditions. Mesh and grid generation, Application to elliptic, parabolic, and hyperbolic equations, Turbulence modeling, Boundary layers, Large eddy simulation, Heat transfer modeling, Applications for HVAC systems, Lab.

MEN 498 **Senior Project (I)** 2

Prerequisites: Complete 110 credit units

The student is required to function on multi-disciplinary team to design a system, component, or process to meet desired needs within realistic constraints. A standard engineering design process is followed including the selection of a client defined problem, literature review, problem formulation (objectives, constraints, and evaluation criteria), generation of design alternatives, work plan.

MEN 499 **Senior Project (2)** 2

Prerequisites: MEN 498

Preliminary design of the selected alternative, design refinement, detailed design, design evaluation, and documentations. The student is required to communicate, clearly and concisely, the details of his design both orally and in writing in several stages during the design process including a final public presentation to a jury composed of several subject-related professionals.

Courses FromOther KAU Faculties

ARAB 101 **Linguistic Skills** 3
Prerequisites: None
The main focus of this course is to improve student's vocabulary, grammar, and reading skills through in-class learning activities and self-study approach. The course aimsto give students a firm grounding in the basic language structure by covering syntax, word morphology, spelling, and punctuation. The course also focuses on how students can become effective writers and editors by evaluating their own writing.

ARAB 201 **Arabic Writing** 3
Prerequisites: ARAB 101
This course aims to make deep instructor of linguistic knowledge (dictionary) and grammatically and morphological and rhetoric, for students and developing the sense of Arts at them, and methods of formulating and Arabic editing, and ability to use the modern technical educational aids, and to practice on them through the selection texts not through direct delivery.

BIO 110 **General Biology** 3
Prerequisites: None
Getting Acquainted with Biology- What is Biology \ Branches of Biology-Historical Development of Biology-Characteristics of Life-How Biological studies Are Conducted-Applications of Biology \ Relations with other Sciences-Careers for Biology Majors-Chemical Basis of Life-Inorganic Components of Living. Organisms-Organic Components of Living Organisms-Biological Reactions and Enzymes-Cells and Tissues: Structure and Functions -Prokaryotic Cells-Eukaryotic cells-Replication of cells: Mitosis and Meiosis-Plant and Animal Tissues-Biodiversity-Principles of Taxonomy and Classification-Viruses, Bacteria, Algae and Fungi-Plants-Animals-Nutrition-Metabolism and Bioenergetics-Photosynthesis: Fixation of Sun Energy-Synthesis of Biological Macromolecules, Energy Storage-Breakdown of Biological Macromolecules, Energy Release-Excretion-Excretion in Simple Forms of Life-Excretion in Plants-Excretion in Animals-Respiration-Circulatory System-Blood: Composition & Functions-Heart & Vessels-Lymph & Lymphatic System-Reproduction, Fertilization and Development- Simple Forms of Life-Plants- The Basic Genetic Mechanisms-Classic Genetics-Molecular Genetics.

CHEM 110 **General Chemistry** 3
Prerequisites: None
It provides an introduction to the general principles of chemistry for students planning a professional career in chemistry, a related science, the health professions, or engineering. By the end of this course the student will be able to understand the following: Significant figures, scientific notation and units, stoichiometry, atomic structure & periodic table, chemical bonding, gases, ionic equilibrium, basic principles of organic and basic principles of biochemistry.

CHEM 231 **Principles of Organic Chem I** 4
Prerequisites: CHEM 110
This course aims to give a detailed discussion about the electronic structure of the elements, nomenclature of nonfunctional molecules, isomerism, common and important reactions of different classes of organic compounds.

CHEM 240 **PhysChem for Non Chem Majors** 4
Prerequisites: CHEM 281
This course aims to give a detailed discussion about of thermodynamic systems; first, second and third law if thermodynamics; free energy functions and their applications, chemical equilibriums, phase equilibriums, electrochemical cells, kinetics, theory of gases, chemical kinetics and reaction rates.

CHEM 281 **General Chemistry Laboratory** 1
Prerequisites: CHEM 110
Safety rules, Chemical nomenclature, Acid radicals; Dil. HCl group Acid radicals; Conc. H2SO4 group General group, General scheme for testing acid radicals + unknown, Basic radicals (1-6), General scheme for testing base radicals + unknown; Determination of the molecular weight of the volatile solution's vapor; Determination of percentage and number of molecules of water of crystallization; Titration using different indicators; 1- Determination of solubility product of sparingly soluble salt, 2- effect of common ion effect on the solubility.

COMM 101 **Communication Skills** 3
Prerequisites: CPIT 100
The course is structured as an introductory communication course. It is designed to expose students to theories, skills, and strategies needed to become effective communicators in academic and professional settings. It explains the major theories of human communication and persuasion in interpersonal, small group, and public communication contexts. The course also focuses on effective communication skills and strategies for writing reports and CV's and for preparing and

delivering effective presentations.

CPIT 100**Computer Skills**3

Prerequisites: None

This course aims to provide the students with the advanced skills to operate and make use of a personal computer in different environments such as in academia, in business, and at home. The course introduces the students to the main concept and terminologies of information technology, and equipped them with the knowledge to administer one of widely-used operating systems. The course also aims to provide the students with the practical skills to utilize an office productivity package for different purposes. The course will prepare the students to new learning methodologies namely, distance learning and e-learning. The delivery of the course contents will be based on a hand-on approach.

ELI 101**English Language (1)**0

Prerequisites: None

ELI 101 is a beginner course intended to provide studentswith a foundation from which they can advance from A1 Breakthrough to A2Waystage on the Common European Framework of Reference for Languages (CEFR).It is a seven-week module course with 18 hours of instruction each week.

ELI 102**English Language (2)**2

Prerequisites: None

ELI 102 is an elementary level course aiming to build and further develop language proficiency at A2 Waystage level on the Common European Framework of Reference for Languages (CEFR), moving towards a higher level of proficiency at this stage. It is a seven-week module course with 18 hours of instruction each week.

ELI 103**English Language (3)** 2

Prerequisites: ELI 102

ELI 103 is a pre-intermediate level course aiming to build andfurther improve language proficiency at A2 Waystage level on the CommonEuropean Framework of Reference for Languages (CEFR), moving into the B1Threshold on the CEFR. It is a seven-week module course with 18 hours ofinstruction each week.

ELI 104**English Language (4)**2

Prerequisites: None

ELI 104 is an intermediate level course aiming to build andfurther improve language proficiency at

B1 Threshold level on the CommonEuropean Framework of Reference for Languages (CEFR). It is a seven-week modulecourse with 18 hours of instruction each week.

ISLS 101**Islamic Culture (1)** 2

Prerequisites: None

This course aims to familiarize students with the fundamental aspects and basic concepts of Islamic culture. It further discusses the basic tenets of Islam as well as the issues and principles related to faith and their impact on both individuals and society. The course also looks at the position of Islamic culture versus other cultures and civilizations.

ISLS 201**Islamic Culture (2)** 2

Prerequisites: ISLS 101

This course aims to identify the Islamic legislation to the student with its general aims, and identifying with Holy Quran and its specifications, and the position of its coming, and its proof, and take the Muslims attention to its rights, and fixed the Prophet Muhammed (Peace be upon him).

ISLS 301**Islamic Culture (3)**2

Prerequisites: ISLS 201

This course aims to identify the Islamic systems to the students, with its general specifications and its principles and concentrate in the special way on the family system, and social system in Islam, with connect between theoretical provision and the actual practical with its all different problems and affairs, and show the ways how to deal with these affairs, in Islamic form.

ISLS 401**Islamic Culture (4)**2

Prerequisites: ISLS 301

This course aims to identify the Islamic concept of morality, and its importance in life, and to clarify the significance of ethics in the modern era, and to highlight the assets and Islamic landmarks of Sciences linguistics, psychological, social and media, and a statement contributions Muslims practical and scientific therein, including strengthens affiliation Muslims youth to his nation and his religion and civilization, and to clarify the jurisprudence and Islamic Studies required in the above areas.

MATH 110**Calculus I**3

Prerequisites: None

This course is a first Calculus dealing mainly with differential calculus. After a discussion of few mathematical preliminaries, we introduce functions

and models, limits and derivatives, differentiation rules, and finally applications of differentiation.

MATH 202 **Calculus II** 3

Prerequisites: MATH 110

This course deals mainly with Integral Calculus. We cover Integrals, Applications of Integration, Techniques of Integration, and further applications of Integration to the Sciences and Engineering.

MATH 203 **Calculus III** 3

Prerequisites: MATH 110

This course deals with Calculus topics that are not treated in Math 110 and Math 202. We will study in details Parametric Equations and Polar Coordinates, Vectors and the Geometry of Space, Vector Functions, and Partial derivatives.

MATH 204 **Differential Equations** 3

Prerequisites: MATH 202

First-order differential equations - Existences and Uniqueness for initial – boundary value problems - Separable variables - Homogeneous equations - Exact equations. Linear equations - Equations of Bernoulli - Ricatti. Substitutions - Picard's methods - Linear differential equations of higher-order - Homogeneous equations with constant coefficients, Method of undetermined coefficients, Method of variation of parameters. Differential equations with variable coefficients, Cauchy-Euler equations - Laplace Transform - Applications of Laplace transform to solve ordinary differential equations.

PHYS 110 **General Physics I** 3

Prerequisites: None

Physical quantities and dimensional analysis, vectors, motion in one dimension, motion in a plane, Newton's laws, friction, work and energy, impulse, momentum, collisions, and rotational motion.

PHYS 202 **General Physics II** 4

Prerequisites: MATH 110, PHYS 110

Charge and electric force , electric field , Gauss' law , electric potential , capacitance , current and resistance , DC circuits , magnetic force , magnetic field , induction and inductance, magnetism of matter and Maxwell's equations.

PHYS 281 **General Physics Laboratory** 1

Prerequisites: PHYS 110

Registration- safety & regulations- friction- free fall- force table- Newton's law- projectile motion- air track- rotational motion- simple pendulum- hook's law.

STAT 110 **General Statistics I** 3

Prerequisites: None

What is Statistics?; Collecting data, graphical presentation and tabulation; Measures of central tendency: mean, median and mode; Measures of dispersion: range, and standard deviation; Relative Dispersion and Skewness; Elementary probability: random experiment, sample space, event, and computation of probability. Rules of addition and multiplication, conditional probability and Independence; Random variables, probability distributions, variance and expected value – Some probability distributions (Binomial, Poisson, and Normal); Sampling and sampling distribution: Sampling distribution of Sample Mean (in case of large samples), central limit theorem and sampling distribution of proportion; Estimation of population mean and proportion; Tests of statistical hypotheses: testing of mean, differences between two means, proportion, differences between two proportions in large samples; Simple linear regression and Correlation: Pearson's correlation coefficient and Spearman's rank correlation coefficient.