KHALIFA UNIVERSITY

KHALIFA UNIVERSITY
of Science, Technology, and Research

UNDERGRADUATE CATALOG 2011-2012

The Catalog is an official Khalifa University document describing academic programs, course offerings, faculty listings, policies, procedures, regulations and requirements of the University. Every effort has been made to ensure the accuracy of the information presented in this catalog. However, no responsibility is assumed for editorial, clerical or printing errors, or errors occasioned by mistakes. The University reserves the right to make changes without prior notice to the information contained in this publication, including the alteration of various fees, schedules, conditions of admission and credit requirements, and the revision or cancellation of particular courses or programs.

CONTENT

Welcome to Khalifa University of Science, Technology and Research, for what promises to be one of the most important and fulfilling experiences in your life. In tomorrow's world, high quality technical training will be at a premium to address many pressing societal concerns, relating to energy, environment, health care, security, communications, transportation, civil infrastructure, and many others. The co-educational and multicultural community of scholars we are assembling at Khalifa University will prepare you to face these challenges, and to enter society prepared to make your unique contribution to the solutions demanded by them. In addition to a high quality grounding in technical fundamentals, technological leaders find that they need a variety of other attributes to succeed in the world, including the ability to communicate, the ability to work in teams, competence in carrying out technological work within economic and societal constraints, a sense of professional and personal ethics, and the interest and capacity to serve others. We are dedicated to helping you develop and refine these skills.

Khalifa University is a dynamic institution that has a proven track record of providing high quality education and practical experience. The University strives to create a learning culture that exemplifies excellence in teaching and scholarship that emphasizes faculty-student interaction, that promotes lifelong learning, and that prepares individuals for leadership and service in the global society. A university has the responsibility to help each student develop as a complete and well-rounded person, and to aid him or her in maximizing potential and finding a career to pursue with passion and purpose. We are here to help you in this process.

We offer a diverse portfolio of degree programs that are designed to meet the criteria set by the appropriate national and international accreditation bodies. The faculty and staff are highly qualified, experienced, and dedicated professionals, who are always willing to impart their knowledge and experience to their students. The University campuses in Abu Dhabi and Sharjah have first class facilities, both inside and outside the classroom, which will make your learning experience productive and enjoyable.

This guide is designed to give you information and advice to make your academic planning easier. Decisions about which major to study, specializations, and course selection require careful consideration. Whatever study program you wish to pursue, this guide will help you plan your degree from your first year through to your final year.

If you need more information or advice, please take advantage of the experience and professional expertise of our faculty and administrative staff. Your academic advisor will be happy to give you the appropriate advice.

In my second year of leading Khalifa University, I look forward to meeting you on our campuses in Abu Dhabi and Sharjah, and to sharing the great adventure of university life with you and the rest of our community. I believe you'll find KUSTAR to be an exciting, stimulating and supportive environment in which to shape your future.

Dr. Tod A. Laursen
President, Khalifa University

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THE UNIVERSITY

2.1

HISTORY OF KHALIFA UNIVERSITY

Khalifa University of Science, Technology and Research was inaugurated on 13 February 2007 by the President of the UAE: His Highness Sheik Khalifa bin Zayed Al Nahyan.

The Board of Trustees which is chaired by His Highness General Sheikh Mohammed bin Zayed Al Nahyan the Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces was announced on 26 February 2008. Khalifa University is an Abu Dhabi Government initiative and is owned solely by the Emirate of Abu Dhabi.

The University opened its new temporary campus in Abu Dhabi in September 2008 to add to the campus in Sharjah (formerly Etisalat University College). The University's permanent Abu Dhabi campus is currently being developed. The Sharjah branch campus has a very proud history that stretches back to 1989 and on 11 February 2008 was merged with the Khalifa University of Science, Technology and Research.

Khalifa University offers a wide range of programs that are designed to be flexible, competitive, and intellectually stimulating. The programs at Khalifa University are currently offered through its College of Engineering.

2.2

BOARD OF TRUSTEES

H.H. General Sheikh Mohammed bin Zayed Al Nahyan - Chairman
Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Force

H.H. Sheikh Hamed bin Zayed Al Nahyan - Vice Chairman
Chief of Abu Dhabi Crown Prince's Court

H.E. Dr. Mugheer Al Khaili - Member
Director General. Abu Dhabi Education Council (ADEC)

H.E. Mohammed Hassan Omran - Member
Chairman, Emirates Telecommunication Corporation, Etisalat

H.E. Mohammed Khalfan Al Romaithy - Member
General Manager, National Crisis and Emergency Management Authority (NCEMA)

H.E. Hussain Jasim Al Nowais - Member
Chairman, Khalifa Fund to Support & Develop Small & Medium Enterprises

H.E. Waleed Ahmed Mokarrab Al Muhairi - Member
Chief Operating Officer, Mubadala Development Company

H.E. Eng. Hussain I. Al Hammadi - Member
Chairman, The Institute of Applied Technology

H.E. Professor Elias Zerhouni - Member
President, Global R & D, Sanofi

H.E. Richard A. Clarke - Member
Chairman, Good Harbor Consulting

H.E. Professor Kiyoshi Kurokawa - Member
Professor Emeritus, University of Tokyo, Japan

H.E. Professor Maw - Kuen Wu - Member
Director, Institute of Physics, Academia Sinica, Taipei, Taiwan

H.E. Hilel Lewis - Member
President, International Council of Ophthalmology Foundation

2.3

UNIVERSITY VISION

Khalifa University aspires to be a leading international center of higher education and research in technology and science.

2.4

UNIVERSITY MISSION

Khalifa University of Science, Technology and Research is an independent, non-profit coeducational institution, dedicated to the advancement of learning through teaching and research and to the discovery and application of knowledge. It pursues international recognition as a world class research university, with a strong tradition of inter-disciplinary teaching and research and of partnering with leading universities around the world.

The University endeavours to serve the Emirate of Abu Dhabi, UAE society, the region and the world by providing an environment of creative enquiry within which critical thinking, human values, technical competence and practical and social skills, business acumen and a capability for lifetime learning are cultivated and sustained. It sets itself high standards in providing a caring, rewarding and enriching environment for all of its students and staff. It ensures that its graduates, on entering the workplace, form a superlative cadre of engineers, technologists and scientists, capable of making major contributions leaders and innovators.

The University insists on the highest world class standards of academic excellence in all that it does. It complements other universities in the region by providing, in its chosen areas of activity, the best teaching and research available in the region. It strives to meet demands for expansion while never compromising on quality.

2.5

LICENSURE AND ACCREDITATION

Khalifa University is licensed by the UAE Ministry of Higher Education and Scientific Research (MoHESR). All academic programs offered by the University are recognized by the Ministry and have been awarded either full or initial accreditation status.

2.6

UNIVERSITY FINANCIAL RESOURCES

Khalifa University is a not-for-profit institution. All the financial needs of the University are supported by the Government of Abu Dhabi. The University has two campuses; one in Abu Dhabi, which is also the headquarters of the University, and the second one in Sharjah.

3

ADMISSIONS REQUIREMENTS AND FEES

Khalifa University admits female and male students from the UAE and beyond. The admissions rules and requirements stated in this section are the basis on which a prospective student's application is assessed. Details of the admissions requirements, placement tests, recognized secondary school certificates, and the process for transfer students are set out below.

3.1 GENERAL ADMISSIONS REQUIREMENTS

Admission to Khalifa University is competitive. Students are admitted to the University's undergraduate programs solely on the basis of an assessment of their ability to successfully pursue university level work as evidenced by their academic record. Students seeking admissions to the University must meet the following minimum criteria:

- Maximum age of 20 years. An exception may be granted by University management.
- UAE Secondary School Certificate (SSC) in Science with a minimum overall achievement of 80%.
- For students without the UAE SSC, the equivalent requirements as approved by the UAE Ministry of Higher Education are applied. *(see section 3.3 on Recognized Secondary School Certificates)*

Freshman (Full) Admission

In addition to the minimum criteria mentioned above, to be considered for full-admission applicants must satisfy the following requirements:

- Proof of English language proficiency which may take one of the following forms (effective June 2010):
  - A TOEFL minimum score of 79 on the Internet Based Test (IBT).
  - An IELTS minimum score of 6.0 (out of 9).

** TOEFL and IELTS sores are valid for two calendar years only*

- Pass a placement test in Mathematics (Algebra and pre-Calculus)
- Pass a placement test in Computer Technology.
- Pass a personal interview conducted in English.

Conditional Admission

Candidates who do not meet the requirements for full admission as Freshmen, but are judged to have the potential to reach these standards may be offered conditional admission. Conditionally admitted students participate in the University's Preparatory Program.

The Preparatory Program is an intensive full-time program of developmental study in academic and technical English, Mathematics, Physics and Information Technology required for success in a KUSTAR degree program. Students who successfully complete the program are offered full admission into the degree programs.

Students who have the required proof of English proficiency for full admission but are asked to take preparatory technical courses may be approved to take a limited number of credit courses that will count toward the degree (a maximum of 15 credits).

Students who are not able to achieve the standard for successful completion of the Preparatory Program will have their conditional admission withdrawn and they will be asked to leave the University.

3.2 ENTRY ASSESSMENT

Students who do not have proof of English proficiency for full admission are required to take a University administered test of English. In addition, students in all engineering programs must sit for required placement tests in mathematics (algebra and pre-calculus) and computer technology.

Applicants may be exempted from placement testing if they have attained a satisfactory level of achievement as documented by a recognized external examination.

- For exemption from the Mathematics examination, a student must have at least a B on either A-Level or AS-Level Math, a minimum score of 4 on the College Board Advanced Placement Calculus test (AB or BC), or a minimum score of 5 on the IB Math test.
- For exemption from the computer technology test, a student must have earned a computer certificate such as ICDL or IC3 *in English.*

In addition, all students must participate in a personal interview conducted in English by a KUSTAR Admission Committee. Students will be assessed on: a minimum standard of ability to communicate in English, their familiarity with the relevant profession, their commitment to pursue a professional degree program, their reasons for wanting to attend Khalifa University, and their potential for assuming a leadership role in the UAE evolving knowledge-based economy.

3.3 RECOGNIZED SECONDARY SCHOOL CERTIFICATES

To be considered for admission, interested students must submit the following required information:

- UAE National General Secondary School Certificate
- UAE Institute of Applied Technology (IAT) Certificate
- UK Board(s) Certificates: IGCSE / GCSE / GCE
- American High School Diploma
- International Baccalaureate (IB)
- Lebanese Baccalaureate
- Indian Board(s) Certificates: Senior Secondary School Certificate
- Pakistani Board(s) Certificates: Higher Secondary School Certificate
- Iranian Leaving School Certificate

3.4 APPLICATION DOCUMENTATION REQUIREMENT

To be considered for admission, interested students must submit the following required information:

- Completed application form for admissions.
- Passport photocopy accompanied by four recent passport-size photographs.
- UAE Secondary School Certificate (SSC) or its equivalent as approved by the Ministry of Higher Education.
- Khulasat Al Qaid for UAE nationals.
- Good Conduct Certificate (from last school attended)
- TOEFL or IELTS score (if available)
- Computer Certificate (if available)
- Medical Certificate of fitness (required after place has been offered).
- Visa Documentation (if applicable)

The application form and any supporting documents, including school certificates/transcripts, English language test scores, etc., remain the property of Khalifa University and will not be returned to the applicant irrespective of the admissions decision.

3.5 SELECTION PROCEDURE

The Khalifa University Admissions Committee recommends academically able applicants to the University management who make the final admissions decision. Successful applicants are notified of their admission and asked to confirm their intent to enroll.

3.6

TRANSFER STUDENTS

A student who has completed twelve or more credits at an accredited or recognized institution following graduation from high school may be considered for admission as a transfer student. Admission as a transfer student is highly competitive and is based on the number of students that can be accommodated in a particular program or level of study. The decision to admit a transfer student is based on the student's record of achievement in both secondary and university studies. The following rules apply:

- Only students transferring from a federal or licensed institution in the UAE or a recognized foreign institution of higher learning (as identified by the UAE Ministry of Higher Education and Scientific Research) are eligible for admission.
- Transfer applicants must meet the English language proficiency requirements in effect for the term in which they intend to enroll.
- Official transcripts must be submitted from all previous institutions attended. The applicant must have a minimum cumulative GPA of 2.0 for all courses completed at the institution from which he/she is transferring .

If a transfer student is admitted, the student may request to transfer courses and credits (not grades) from the student's previous institution to Khalifa University. The decision to accept a course in transfer is discretionary and will be based on two factors: a review of the content and level of the course under consideration and an assessment of a student's overall academic performance at Khalifa University.

Transfer evaluations are done on a course by course basis. Students who request a transfer course evaluation must provide information about the course from the official catalog, including course descriptions and course syllabi. In order to consider a course for transfer, the student must have earned a grade of C (2.0) or better.

Any decision to approve a course transfer will include an assessment of the student's overall academic performance at Khalifa University. High marks in transfer coursework should be matched by high performance in Khalifa coursework. Transfer courses may not be used to avoid the University's progression rules or the consequences of poor performance in other Khalifa University courses.

t to an existing Khalifa University course in terms of content and level of difficulty. These evaluations are conducted by knowledgeable faculty whose decisions are final.

- The maximum number of approved transfer credits allowed must be less than 50% of the total credits required by the student's degree program at Khalifa University.
- Only credits transfer, not grades. Credits accepted in transfer are not used in calculating a student's grade point average at Khalifa University. Credit will not be granted twice for substantially the same course taken at two different institutions.
- Transfer credits will not be given for work experience, vocational or training courses or coursework that is considered pre-collegiate.
- The above criteria also apply to transfer credit evaluations involving articulation agreements between Khalifa University and other institutions of higher education.
- Transfer students must also meet all graduation requirements as specified in the University Degree Requirements (Section 4.3) and Graduation Residence Requirements (Section 4.17) of this Catalog.

3.7

APPLICATION PROCESS

Prospective students can apply on-line and obtain information about the University by visiting the Website:

http://www.kustar.ac.ae

The academic year at Khalifa University is made up of two semesters, (Fall and Spring) and a Summer session. In general, the Fall Semester runs from September through early January; the Spring Semester from February through early June; and the Summer session in June and July.

The majority of the students enter in Fall. The availability of admission to Khalifa University in Spring is limited. Consult the Website or the Office of Admission and Registration to confirm which programs will accept applications for Spring.

The Office of Admission and Registration handles admissions to all the University colleges and the study programs they offer.

Application Form

Khalifa University on-line application form is available on the Web at

http://www.kustar.ac.ae

On-line application can be made to any program at Khalifa University. The application can be used by regular applicants, as well as special, visiting or exchange students.

All admission decisions by the University are taken in good faith on the basis of the statements on the application form. If the University discovers that the applicant has made a false statement or has omitted significant information on the application form, it may withdraw its offer of admission or terminate the applicant's registration.

Application Deadlines

- Applications must be submitted via the Web, or postmarked, on or before the date listed. Supporting documents may be submitted later.
- Supporting documents should be sent as soon as they are available.

Deferred Admissions

Admission is valid only for the academic semester specified in the admission letter. If an applicant is given admission and for some reason does not register but intends to join the University in the following semester, then he/she should submit a written request to the Admission and Registration Office not later than one month before the beginning of the semester. Admission consideration for the following semester will depend on availability of places.

3.8

SCHOLARSHIPS, INCENTIVES AND FEES

Details of student scholarships and incentives at Khalifa University of Science, Technology and Research are outlined below. The University reserves the right to change its fees, scholarships and incentives at any time.

- Full scholarships covering all direct academic costs (tuition, books, lab equipment and supplies, etc.) are provided to all enrolled students. To retain their full scholarship, non-national students must maintain a Cumulative Grade Point Average (CGPA) of 3.0.

  Non-national students who do not maintain a CGPA of 3.0 in a semester will be charged 20% of the fees for the subsequent semester (currently AED 10,000) until they raise their CGPA to 3.0.

- Monthly incentive payments are provided to eligible students based on their Cumulative Grade Point Average (CGPA). UAE national students are awarded a monthly incentive ranging from AED2,000-8,000. Presently, a minimum CGPA of 2.0 is required to receive an incentive.

  Non-national students may receive an incentive if they have a minimum CPGA of 3.8 and are among the top twenty of all undergraduate students in the University (based on CGPA).

Fees

The annual fees are currently AED100,000 per year (or AED50,000 per semester).

Additional fees may be charged for non-academic costs such as accommodation, meals, transportation, personal computer repairs, etc.

4

DEGREE REQUIREMENTS, REGISTRATION, AND ACADEMIC RULES AND REGULATIONS

4.1

DEGREE PROGRAMS OFFERED

Khalifa University offers curricula, through its College of Engineering, leading to the following undergraduate degrees:

- Bachelor of Science in Aerospace Engineering
- Bachelor of Science in Communication Engineering
- Bachelor of Science in Computer Engineering
- Bachelor of Science in Electronic Engineering
- Bachelor of Science in Industrial and Systems Engineering
- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Software Engineering
- Bachelor of Science in Biomedical Engineering (Proposed)
- Bachelor of Science in Civil Infrastructure and Environmental Engineering (proposed)

The requirements for each degree are listed in this Catalog under the particular department within the college responsible for the program. Students should select a degree program, or indicate their preferences, with their application for admission. Enrolled students receive academic advice from the appropriate department.

All Khalifa University undergraduate degree programs consist of general education requirements and a major field of study. Additional options, such as academic minors, double majors and concentrations are available to academically able students.

4.2

DEGREE PROGRAMS OFFERED

As English is the medium of instruction in all Kahlifa University degree programs, students must: have a working knowledge of academic and scientific English; be able to use mathematics to solve abstract problems and describe observable phenomena; and possess necessary computing skills for the study of professional engineering. Students who lack these skills but show promise of success in Khalifa's professional engineering degree programs may be conditionally admitted to the Preparatory Program.

The Preparatory Program consists of a full-time program of intensive study in English, mathematics, physics, computer technology, and necessary study skills. Based on the results of placement testing, students are enrolled in coursework appropriate to the level of their academic achievement. Students are regularly assessed to determine if they meet program requirements for continued study in the Preparatory Program or for full admission to the degree program.

Based on an assessment of a student's overall achievement in the Preparatory Program, a student with required English proficiency may be allowed to take appropriate degree courses to a limit of 15 credits.

To be fully admitted to the degree program, a Preparatory student must achieve a minimum composite score of 6.0 on the IELTS examination (or equivalent IBT TOEFL score of 79) and demonstrate sufficient progress in mathematics, physics and computing.

4.3

UNIVERSITY DEGREE REQUIREMENTS

A student is required to adhere to the graduation requirements stated in the Catalog in effect for the year in which the student was admitted to a degree program, or for the year in which the student declared their academic major, or in the Catalog that was effective for the academic year when the student graduates. Degree and major requirements change from time to time and there are established procedures for making such changes that protect the University's integrity and the individual student's welfare. In case of major changes in course offerings, the Dean determines the equivalent graduation requirements to be applied. Khalifa University will confer the bachelor's degree when the following requirements have been met:

1. Successful completion of the University General Education Requirements described in this Catalog.
2. Satisfactory completion of the requirements of the chosen degree program as described in the appropriate sections of this catalog.
3. A minimum cumulative grade point average (CGPA) of 2.00.
4. Completion of the last two (2) years in residence at the University. Transfer and exchange students must also meet the additional conditions specified in the Graduation Residence Requirements section of this Catalog.
5. Students completing programs with major and minor components must satisfy the requirements specified by the College/Department offering the major/minor.
6. Students registered for a double major must satisfy the requirements of each major as specified by the College/Department offering the major.
7. Candidates for degrees must file an "Application for Graduation" form in the Office of Admission and Registration during the first week of classes for the semester in which the student is expected to graduate. The Office of Admission and Registration initiates the process for graduation only after the application has been filled and signed by the student and his/her academic advisor. Students must complete all degree requirements by the end of the semester for which they apply to graduate. If a student fails to meet all degree requirements, he/she must reapply to graduate later.

Total Degree Credits

To receive a bachelor's degree from Khalifa University, a student must complete a minimum of 120 semester credit hours. The total degree credits for engineering programs typically range from 130-140 semester credit hours. Students should consult with their college or department advisor for information on specific credit requirements. Consultation with the academic advisor is essential, as it will also enable the student to complete the required degree credits within four years.

Graduation Residence Requirements

Candidates for an undergraduate degree program must comply with the following residence requirements:

1. Unless otherwise approved by the Dean of the student's college, students must complete their last two academic years at Khalifa University;
2. Students registered on a University recognized semester exchange program must complete their final academic year in residence at Khalifa University;
3. Transfer students must complete more than 50% of the intended degree program credit hours in residence at Khalifa University. These credits must include a minimum of 36 credit hours from the intended degree program courses at the 300-level or above.

Enrollment at Other Universities while a Khalifa University Student

All enrolled students are expected to focus exclusively on their courses and degree program at Khalifa University. As all students are on scholarship, the objective of their study is to complete the degree they have chosen and to attain the grade point average required by their scholarship. Except as noted below, students are not permitted to pursue courses or degrees offered at another college or university even if it is at the student's own expense and during the student's own time.

Students who will be away from the campus in the summer and wish to take coursework at another college or university must have prior approval from the Dean of their college. Pre-approved coursework, taken at colleges and universities that are accredited or recognized by the UAE Ministry of Higher Education and Scientific Research, equivalent to courses offered at Khalifa University may be accepted in transfer. Students who apply for permission to take a course at another university must be in good academic standing (not on probation|), not have transferred more than 50% of the total number of credits required for the degree, and not be in senior standing.

Students may earn credit while enrolled in officially sponsored exchange or study abroad programs. All students must complete their final academic year in residence at Khalifa University.

4.4

GENERAL EDUCATION REQUIREMENTS

Purpose

The purpose of the General Education Requirements (GER) at Khalifa University is:

- to provide all undergraduate students, regardless of their majors, with the foundation they will need to be informed members of society;
- to help students develop intellectual skills, practical skills, and emotional and aesthetic sensitivities;
- to prepare them to think critically, to feel, and to act thoughtfully and competently in a complex and diverse world;
- to help students understand the values inherent in their culture and to be aware of other cultural traditions, values, and beliefs;
- to enable the students to enjoy a life dedicated to learning and creativity in a continually changing world.

Basic University General Education Courses

All students entering Khalifa University as freshmen or undergraduate transfer students must satisfy the General Education Requirements (GER). Students should check with their academic advisors to see if their College has any additional requirements that go beyond the basic GERs, or whether certain programs will require them to undertake specific courses or to follow a particular order.

The basic university-wide General Education Requirements are:

I Humanities and Social Sciences (Unless specified by the major, students must complete a total of three courses including at least one course from each of the two groups below.

a. Arabic Heritage & Culture	
ARBH 101	Arabic Language (in Arabic)
ARBH 102	Islamic Culture (in Arabic)
ARBH 105	Emirates Society
ARBH 106	Gulf Region Economic and Social Outlook
b.Humanities and Social Sciences Breadth	
HUMA 110	Middle East Studies
HUMA 111	Islamic History
HUMA 112	Sciences in Islam
HUMA 130	Introduction to Linguistics
SOCS105	Science, Technology, and Society
SOCS 130	Mass Media and Society
SOCS 140	Crtitical Thinking
SOCS 150	Comparitive Cultural Studies

II Communication Skills: select two courses

ENGL101	Academic English I
ENGL102	Academic English II

III Quantitative Reasoning: select two courses

MATH105	Calculus I
MATH106	Calculus II

IV Natural and Physical Sciences: select two courses as specified by the intended major, from the list below.

PHYS 101	General Physics I
PHYS 102	General Physics II
GSCI 101	Earth Science
GSCI 105	General Astronomy

V Computing and Information Technology: select one course

CMPE 111	Principles of Computer Programming

4.5

MAJORS, MINORS AND DOUBLE MAJORS

ACADEMIC MAJORS: RULES AND REGULATIONS

General information

- A major is a structured program of study in an academic or professional discipline which leads to a Bachelor's degree. In order to fulfill the requirements of a major, students are required to select subjects as specified by the department offering the major. A major comprises at least 30% of the total credits required by the Bachelor's degree program.
- Every degree awarded by Khalifa University requires students to complete a major field of study. All majors include a specific number of credits and a particular sequence of courses. Students must meet the minimum course and grade requirements to be awarded their bachelor's degree with a desired major.
- Each major must be developed and monitored by the Curriculum Committee; new or substantially revised majors require the approval of the Board of Trustees based on recommendations from the Curriculum Committee, College Dean, the University Provost and the University President.
- Academic majors and their requirements are published in the University Catalog.
- Students are required to follow the major requirements that are current at the time a student's choice of major is effective.

Declaring a Major/Change of Major

- Students should make their initial choice of major after completing 15 degree credits. However, they must make their final choice of a major before reaching junior standing (60 credits).
- To initially request a major, a student must file an application with the Office of Admissions and Registration. The application form must be approved by the student's advisor and the head of the academic department that offers the major.
- Changes of major are subject to space being available in the sought major.

Concentration Track

A concentration track is a focused area within the major field of study which the student may choose to follow but does not lead to a specialized award or degree. Concentration tracks are normally used to help students focus their selection of advanced elective courses within their selected major. The concentration track will only be noted on the student transcript once the requirements are completed and the bachelor's degree is awarded.

Academic Minors

Academic minors afford students the opportunity to pursue a limited but structured field of study outside their major. The minor may be a truncated version of a major or a distinctive subset of a discipline. Minors are not available in every field of study. In general, a minor requires no fewer than 15 and no more than 21 credits, with at least 12 credits in upper level coursework (300-400 level). No more than 6 credits or two courses may be used to satisfy the student's minor and major fields of study. All courses taken to fulfill minor requirements must be passed with a minimum grade of C. Students must follow requirements for the minor that were in effect when the student's application to pursue a minor was approved.

- Minors are optional.
- An undergraduate student may not complete a major and a minor in the same program.
- Students must apply to pursue a minor before reaching senior standing (90 credits). An application to pursue a minor must be approved by the student's advisor, by the head of the student's major department and the head of the department which offers the minor.
- A student may have a major in one College and a minor in another. In this case the student must complete the general education requirements of the College of his/her major. The student is not required to meet the general education requirements of the College of his/her minor.

- A student earns a minor only when concurrently completing all major and degree requirements. A student may not be enrolled solely to complete requirements for a minor.
- When students apply to graduate, their final degree audit will determine if they have satisfied the requirements for the minor. If they have failed to do so, they will graduate without the minor.

Double Major

A student who wishes to complete a second major concurrently with his or her primary major must obtain advanced written permission from the appropriate department heads and Deans. So as not to delay graduation, students seeking a second major must be academically well qualified and have a minimum cumulative grade point average of 3.0. In addition, students must apply for a second major by the time they reach junior standing or 60 credits.

- A student wishing to graduate with a double major must apply for a second major field of study by the time the student has earned 60 degree credits. A student must also have a cumulative grade point average of 3.0. The student's application must include a proposed study plan for both majors, with no more than 18 credits applied to both majors.
- The student's application for a double major must be approved by the chairs of both departments concerned and the Dean(s) of the college(s).
- Students approved for a double major will have an advisor in each of the two approved major programs.
- To graduate with a double major, the student must meet departmental requirements for each major.

Applying to Graduate

One year prior to their expected graduation date, each student shall apply for an official degree audit to be conducted with their academic advisor. This audit will confirm all remaining unfulfilled degree requirements and guide student registration for their remaining terms of enrollment. Students are required to submit a petition to graduate, prior to the end of the first week of instruction, in their final semester of enrollment. A final graduation audit, conducted after grades are submitted for the student's final semester of study, will determine if the student has satisfied all requirements for the degree including: major, minor, double major or concentration as applicable.

4.6 VARIATION TO ACADEMIC PROGRAM

In exceptional circumstances, a student may petition the Department Chair of the major/minor program of study for approval of changes to the prescribed plan of study. Small changes may be approved by the Department Chair. Significant changes require approval of the Department Chair and the College Curriculum Committee.

Students seeking an exception to their official plan of study must submit a signed *Variation to Academic Program Form* to the Admissions and Registration Office. When it becomes necessary to request a deviation from the prescribed plan of study, students shall consult their academic advisor prior to submitting the *Variation to Academic Program Form* to the Admissions and Registration Office. In preparing the form, students should be mindful of the following:

1. The course to be substituted must be in the same area as the required course or in a closely related area.
2. Substitution of a course for a previously failed required course is seldom granted.
3. A required course that is not scheduled during a given semester is not acceptable for a course substitution.

Any approved course substitutions and associated pre-requisite requirements affected by the approved Variation to Academic Program must be satisfied.

4.7 TIME LIMIT ON DURATION OF STUDY AND RE-ADMISSION

All degree requirements must be completed within seven years of admission to Khalifa University as an undergraduate degree student, inclusive of any leave. A student in good academic standing is allowed no more than two consecutive semesters leave. A student who is out of the University, for any reason, for more than two consecutive semesters must submit a new application for re-admission, to the Admissions and Registration Office, prior to the semester or summer term for which registration is sought. Students who are re-admitted are required to comply with the Catalog requirements in effect at the time of re-admission.

4.8 ACADEMIC ADVISING AND REGISTRATION

Academic advising is integral to effective learning and academic progress throughout the student's undergraduate program. Khalifa University is composed of colleges that serve as "academic homes" for each student. The student is assigned to one of the colleges based on his/her intended major/program. A full-time faculty member from the assigned college acts as the academic advisor and works with the student from the beginning of his/her academic career.

Academic advisors provide information about selecting courses and areas of specialization and are knowledgeable about regulations and requirements. They also provide resources, guidance, and support to enable students to explore, define, and realize their aspirations throughout their academic careers. Well-advised students acquire the knowledge needed to create and fulfill educational plans, and meet their goals for the future in a timely manner.

Academic Advising Guiding Principles

Both students and advisors have advising responsibilities. Advising is guided by the following principles:

- Effective academic advising can play an integral role in student development.
- Mutual respect and shared responsibility should govern the personal interactions between advisors and students.
- Students and advisors must prepare for, actively participate in, and take appropriate action following advising sessions.
- Advising information provided to students must be accurate, accessible, and timely.
- Academic advising should encourage students to explore many possibilities and broaden their educational experience.
- Academic advising should encourage a positive attitude toward lifelong learning.
- Academic advising should use all available resources and means to provide advising tailored to the individual needs of students.
- Academic advisors should keep records of the advising sessions held with a student.

Guidelines for Graduating in Expected Time

Khalifa University has a strong commitment to ensuring that students graduate with a degree in the expected time. Students are encouraged to follow these guidelines to earn their degrees in the minimum time required.

- Consulting an advisor should be the first priority. Students should confirm with the

advisor that their academic preparation is appropriate for the courses they plan to undertake. Transfer students should make sure that they know which credits will be transferable and plan accordingly. Students should seek help in planning course work to meet academic and career goals.

- Students should be certain they understand the requirements of their intended major as well as the options it will provide for future studies and employment.
- Students should be aware of the number of credits the degree program requires, and should make sure they fulfill one quarter of these each year. Credits may be taken in the fall, spring, and summer, but the annual total should equal at least 25 percent of the total credits needed to graduate. In addition, students should recognize that a degree requiring more than 120 credits will be difficult to complete in four years without undertaking substantial loads and/or summer sessions.
- Students should make sure that the courses they select will count toward the fulfillment of the University general education, major, and degree requirements. They should limit elective credits to the number the program allows.
- When students consider changing their major, or do not get admitted to the major program of their choice, they should consult an advisor, explore options, and find out how a change of major might affect their graduation plans.
- Students should make the most of course schedules and the plan of study for their degree program. They should plan to take required courses as soon as possible (as not all courses are offered every semester) and be flexible about course times. If a required course is not available, advisors can help determine an alternative.

Orientation Program

Newly admitted students participate in an orientation program that introduces them to various aspects of the Khalifa University community. During these programs the students meet with academic advisors, plan an academic program, register for classes, learn about University resources and campus life, and meet with Khalifa University students, faculty, staff and new classmates. The orientation sessions are held before the fall semester and the spring semester.

Advising and Registration

In order to register each semester, students are required to meet with their faculty academic advisors to discuss their academic progress and course selection, and obtain the faculty advisors' signatures on their registration form. This process ensures that the student is on course to meet the graduation requirements of his or her particular degree program.

Change of Academic Advisor

Students may request a change of an assigned academic advisor when they are unable to resolve communication problems with their current advisor. Students must make an effort to resolve any differences before requesting a change. A request to change advisors should be make to the student's Department Chair.

Faculty Office Hours

Faculty office hours are allocated for student's consultation and advising. Faculty are required to show their office hours on their office doors. Students are encouraged to make use of these times for advising or for consulting with faculty on the courses they are teaching.

Plan of Study

The plan of study for a major or minor outlines the minimum approved courses, internships, projects, and academic requirements that must be completed to be eligible to graduate. Plans of study change over time, consequently students are required to follow the requirements of the approved plan of study that were in effect at the time of their admission to the academic major program or minor.

Students may petition the Department Chair for approval of changes to the prescribed plan of study. Small changes may be approved by the Department Chair. Significant changes require approval of the Department Chair and applicable University standing committee(s). Please refer to the University's policy on Variation to Academic Program for additional information.

4.9 REGISTRATION

Registration Process

The Admissions and Registration Office is responsible for the management of the registration process by which students enroll in classes. Registration information is provided to students before the registration period begins. Registration in the student's absence or by way of proxy is normally not permitted for new students.

Through the registration process, students assume academic and financial responsibilities for the classes in which they enroll. They are relieved of these responsibilities only after formally terminating enrollment by dropping or withdrawing from classes in accordance with procedures and deadlines specified in the Academic Calendar each semester.

Course Restrictions, Prerequisites and Co-requisites

Enrollment in some courses may be restricted. For example, a course may be restricted to students with a specific major or require that a student have junior or senior level standing. An instructor's approval may be required in some cases. These are referred to as "course restrictions".

A program of study may also require that courses be taken in a certain order or taken together. A course that is required to be taken before another course is called a "prerequisite". Students are not allowed to register for any course with a prerequisite unless the prerequisite course has been completed with a passing grade.

A "co-requisite" is a course that is designed to be taken together with another course.

- A co-requisite course may be satisfied if the student has previously completed it with a passing grade.
- Students may not drop a course if it is a co-requisite of another course in their schedule. In this case both courses would have to be dropped.
- If a student repeats a co-requisite course in which the student earned a grade of C- or lower, the companion course (if passed) does not have to be repeated.

Registration Deadlines

Khalifa University policies determine when students may enroll or adjust their enrollment in classes. The Admissions and Registration Office has the most up to date information regarding these policies. The registration period and other important dates are published in the Academic Calendar section of this Catalog.

Registration Holds

Students will not be permitted to register if there is a "hold" on their registration record. Holds may be related to academic standing (probation or dismissal), non-academic offense violations (disciplinary), incomplete admission files (missing transcripts), or financial issues. Holds may also be placed on students who are not UAE citizens or residents and have not submitted required immigration documentation. To clear a hold, the student must contact the office that has issued the hold to find out what must be done to fulfill the obligation(s).

Auditing Courses

Subject to availability, students may, with the approval of the Department Chair and the permission of the instructor, audit undergraduate courses without credit. The permission of the Department Chair and instructor must be obtained prior to registration, and the student must register as an auditor. Registration priority will be given to matriculated degree-seeking students.

Auditors are required to follow the same registration procedures as persons taking the course for credit. Auditors do not receive grades or credits. Participation in class discussion and written work is permitted at the discretion of the instructor. A fee per credit hour may be charged. The status of Auditor cannot be changed after the course has begun. The University reserves the right to cancel an audit registration if the class size is excessively large.

Limitation of Courses Offered

The University reserves the right to cancel a course even though it is listed in the Catalog or scheduled to be offered. Notification of a cancelled course will be sent to any affected students at their University email address.

4.10

WITHDRAWAL FROM COURSES AND FROM THE UNIVERSITY

Withdrawal from Courses

Students are permitted to withdraw from courses. All students are expected to maintain full-time status by carrying a minimum load of 12 credits per semester. However, under exceptional circumstances the Dean of the College may allow a student's credit load to drop below 12 credits. The payment of incentives or scholarships will be suspended for the remainder of any semester during which a student is approved to drop below 12 credits.

- Drop and Add a course: Students are allowed to drop and/or add courses during the first week of the fall and spring semesters or during the first three days of a summer session. Such changes in course registration are not recorded on the students' transcripts. Students interested in dropping or adding courses should consult with their respective academic advisors.
- Withdraw from a course with grade of (W) recorded: A student may withdraw from a course by the end of the end of the 10th week of classes in a semester or by the end of the fourth week of classes in a summer session with a grade of W. The grade of W will not affect a student's Grade Point Average (GPA).
- Withdraw from a course with grade of (WP or WF) recorded: A student who withdraws from a course after the 10th week of classes, will be assigned either a grade of WP (withdraw passing) or WF (withdraw failing). The grade of WP or WF will be assigned by the course instructor. The grade of WF is equivalent to an F (0.0 quality points), and is used in the calculation of the GPA.

Withdrawal from the University

Any student voluntarily leaving the University before the close of the term must withdraw officially. A student initiates the withdrawal procedure and files the completed form at the Admissions and Registration Office in person or by letter. A withdrawal is effective on the date when the form or letter is received by the Admissions and Registration Office. A student who withdraws from the University after the first week and before the end of the 10th week of classes will receive the grade of (W) for all courses in progress. Students withdrawing after the 10th week and before the last day of classes will receive WP or WF in each course. Any student who leaves the University before the close of a semester without withdrawing officially will receive a failing grade (F) in each course for which he/she is registered.

4.11

ACADEMIC YEAR

The academic year at Khalifa University consists of two regular semesters and a summer term. The two regular semesters which are referred to as the fall semester and the spring semester, consist of 15 weeks of teaching and final examinations period. The summer term lasts for five to six weeks of teaching. In the summer, a three credit course meets 75 -90 minutes per day, five days per week. Because of the intense nature of summer coursework, students may take no more than two courses or seven credits.

4.12

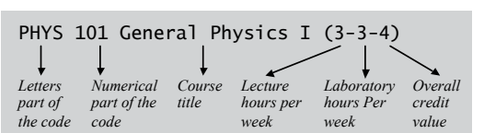
CREDIT SYSTEM

The unit of measurement of academic work at Khalifa University is the credit hour. It ordinarily represents one lecture hour per week for one semester. A lecture hour has a nominal duration of fifty minutes. A sequence of three laboratory hours per week or two hours of problem solving sessions per week are considered to be the equivalent of one credit hour. Credit hours are also referred to as credits or semester credit hours.

4.13

Course Title, Code, Credit Value and Description

Each course offered at the University has a unique code, a title and a credit value. A list of courses offered may be found in this Catalog. In addition, the Catalog contains a brief description of the course content and any required prerequisites or co-requisites. The course code consists of four letters that reflect its discipline or field of study, followed by a three-digit number that indicates its level. The title of the course gives an indication of its content. The credit value of the course has three numbers; the first one gives the number of lecture hours per week, the second shows the number of laboratory or problem solving hours per week, and the third one gives the overall credit value of the course which will contribute to the particular degree requirements. The example below further explains the course code and value information.



4.14

TOTAL DEGREE CREDITS AND SEMESTER CREDIT LOADS

The total degree credits for engineering programs typically range from 130-140 semester credit hours. Students should consult with their academic advisor for information on specific credit requirements. Consultation with the academic advisor is essential, as it will also enable the student to complete the required degree credits within four years.

The appropriate course load for an undergraduate student is dependent on two factors: scholastic ability, as reflected by the student's academic history, and available study time. Successful academic achievement usually requires about two hours of outside study for each hour spent in class. For example, enrollment in 16 credit hours would require about 32 hours of outside preparation per week.

A credit load of 15-18 credit hours constitutes a normal full semester program for undergraduates. A student must complete at least 15-18 credit hours per semester to finish a bachelor's degree in four academic years. Enrollment in more than 18 credits in a semester requires advance written approval of the Dean of the student's college. A standard load for an undergraduate student enrolled in a summer session is six to seven credit hours. Enrollment in more than seven credit hours in a single summer session requires advance written approval of the Dean of the student's college.

4.15

FULL AND PART-TIME STATUS

The status of a student is determined by the number of credits for which he/she is registered at the close of the add and drop period. To be considered full-time, a student must register for a minimum of 12 credit hours during each regular semester. A student enrolled for less than 12 credits will be considered a part-time student.

4.16

STUDENT CLASSIFICATION

Undergraduate students admitted to a bachelor's degree program are classified on the basis of earned semester credit hours:

Earned Credit Hours	Classification
0 – 29	Freshman
30 –59	Sophomore
60 – 89	Junior
90 or more	Senior

4.17
GRADUATION RESIDENCE REQUIREMENTS

Candidates for an undergraduate degree program must comply with the following residence requirements:

- Unless otherwise approved by the Dean of the Student's College, students must complete their last two academic years in residence at Khalifa University.
- Students registered on KUSTAR recognized semester exchange program must complete their final academic year in residence at Khalifa University.
- Transfer students must complete more than 50% of the intended degree program credit hours in residence at Khalifa University. These credits must include a minimum of 36 credit hours from the intended degree program courses at 300-level or above.

4.18
GRADING SYSTEM

The grading system of Khalifa University is based on letter grades that are assigned according to the grading scheme adopted by the instructor in charge of a particular course. In order to assess the student's academic standing, each letter grade is assigned a grade point on a four-point scale as set out below.

Letter Grade	Grade Point	Description
A+	4.00	Exceptional
A	4.00	Excellent
A-	3.70	Very Good
B+	3.30	
B	3.00	Good
B-	2.70	
C+	2.30	Satisfactory
C	2.00	
C-	1.70	Less than Satisfactory
D+	1.30	Poor
D	1.00	
D-	0.70	
F	0.00	Fail
WF	0.00	Withdrawal Fail

Other letter grades are used at Khalifa University but do not have corresponding grade points, and hence not used in the calculation of the grade point average

Letter Grade	Description
W	Withdrawn (Between 2nd and 10th Week of Classes)
WP	Withdraw Passing (after the 10th week of classes through the last day of classes)
P	Pass (in a Pass/Fail Course) performance of D- or better
U	Fail (in a Pass/Fail Course)
I	Incomplete
IP	In Progress
AUD	Audit
EX	Exempt; no credit
TR	Transfer; credit counted
N	No Grade Submitted

4.19
GRADE POINT AVERAGE

The grade point average (GPA) is the cumulative numerical average which measures student academic achievement at the University. It is reflective of the credit hours the student has attempted and the grades that the student has earned. Therefore, the GPA is calculated by multiplying the grade value of the letter grade by the number of credit hours of the course. The result is the quality points that the student has achieved in the particular course. The sum of the quality points of the courses taken is divided by the total credit hours completed to obtain the GPA. Grades without a corresponding grade value (W, WP, P, U, I, IP, AUD, EX, TR and N) are not included in the computation of the cumulative grade point average. A student transcript will have a semester GPA (SGPA) and a cumulative GPA (CGPA). The former only reflects the student's performance in a particular semester, while the later reflects performance in all the attempted degree credits since the student's first enrollment at the University. A sample of GPA calculations follows:

Sample GPA calculation

FALL SEMESTER				
Course	Credit Hours	Grade	Grade Value	Quality point
ENGL 101	3	B	3.00	9.0
MATH 105	3	A	4.00	12.0
PHYS 101	4	B	3.00	12.0
CMPE 111	3	A	4.00	12.0
ENGR 110	1	B	3.00	3.0
ARBH 101	3	A	4.00	12.0
Semester Total	**17**			**60**
SGPA = 60 ÷ 17 = 3.53				

SPRING SEMESTER				
Course	Credit Hours	Grade	Grade Value	Quality point
ENGL 102	3	B	3.00	9.0
MATH 106	3	B	3.00	9.0
PHYS 102	4	A	4.00	16.0
CMPE 201	3	A	4.00	12.0
ARBH 102	3	A	4.00	12.0
Semester Total	**16**			**58**
SGPA = 58 ÷ 16 = 3.63				
Cumulative Total	**33**			**118**
CGPA = 118 ÷ 33 = 3.58				

4.20 INCOMPLETE GRADES

The incomplete grade (I) is an optional grade that can only be assigned when a student has satisfactorily completed a major portion of the work in a course but, for non-academic reasons beyond the student's control and deemed to be acceptable in accordance with the University regulations, was unable to meet the full requirements of the course. An incomplete grade (I) assigned in a course must be removed and the grade change submitted by the end of the second full week of classes in the next regular semester. Failing to remove the grade of I in the allotted time will result in the grade of I being changed to the grade of F.

It is the student's responsibility to meet with the faculty member and request arrangements for the completion of the required course work.

4.21 REPETITION OF COURSES

A student may repeat a course for which he/she received a letter grade of C- or lower. The repetition is subject to the following guidelines:

- Repetition of a course more than once requires the approval of the College Dean.
- Degree credit for a course is given only once, but the grade assigned each time the course is taken is permanently recorded on the transcript.
- Only the highest grade earned for a repeated course will be used in calculating the GPA.
- A student is not allowed to repeat more than 10 degree courses throughout his/her undergraduate studies at the University.
- For prerequisite purposes, the highest grade will be used.

4.22 ADVANCED STANDING CREDIT

Khalifa University may award advanced standing credit for certain academic work completed prior to enrollment at the University. This includes sufficiently high scores on some national/international secondary school examinations such as the College Board Advanced Placement (AP), International Baccalaureate (IB), and Advance "A" Level GCE (General Certificate of Education). This may make it possible for a student to complete the Bachelor's degree in less than the normal duration or take other courses.

Advanced Standing Credit may only be granted after the student has been fully admitted as a freshman to Khalifa University. All students who would like to be considered for advanced standing credit must complete the *Advanced Standing Credit Evaluation form* at the Admissions and Registration Office and provide either the original score certificate or an official copy from the appropriate examining agency. Each student will be evaluated on a case-by-case basis. All students must submit their request for advanced standing credit evaluations within the first semester of their freshman year at Khalifa University. Credits earned through "Advanced Standing" are considered "transfer credits" (non residence credits) for degree requirement purposes.

4.23 CREDIT BY EXAMINATION

A qualified student enrolled at Khalifa University may pass a specially prepared challenge examination and receive credit for a University course without having undertaken the normal course work. Interested students should contact the Chair of the Department in which credit is sought to request administration of an examination. Since it may not be appropriate to award credit based on Advanced Standing for some courses, the decision to offer an examination rests with the Department. If the Chair of the Department authorizes an examination, the student is

instructed to complete the Credit by Examination form at the Admissions and Registration Office. Hours earned through Credit by Examination will be indicated on the transcript, but no grade points will be awarded. Hours attempted will be assigned equal to the hours earned. Failure on such an examination will incur no grade point penalty or hours attempted. Credits earned through "credit by examination" are considered in residence credits for degree requirement purposes.

Credit by Examination is subject to the following conditions:

- Credit by Examination testing will normally be offered during the final examinations period.
- Students may attempt Credit by Examination in a given course only once.
- No more than 12 credit hours of Credit by Examination may be included in a major program.
- No more than 6 credit hours of Credit by Examination may be included in a minor program.
- Credit by Examination test scores will be reported with a P or U grade. Neither grade will be included in the calculation of the student's GPA.
- Students requesting Credit by Examination must satisfy all pre-requisites of the course for which they are being examined.

4.24

FINAL GRADE CHANGES AND APPEALS

Final course grades, officially reported by the instructor at the end of an academic semester, are recorded by the Office of Admissions and Registration. Official recorded grades can only be changed with the approval of the Department Chair and the Dean. A request to change a grade may be initiated, in writing, by the student or the student's instructor. The student can only initiate a grade appeal no later than two weeks from the official release of the grades as specified by the Admissions and Registration Office.

4.25

LATENESS AND ATTENDANCE GUIDELINES

Khalifa University is committed to providing high quality education to its students. Attendance at classes is essential to their obtaining that education, and for taking advantage of the resources that the University provides for the intellectual growth and development of its students. For these reasons, students at Khalifa University are required to punctually attend all scheduled lectures, labs, recitation or tutorial sessions, etc., in each course for which they are registered and are responsible for completing the work from all class sessions. Absences from class may be excused for such reasons as personal illness, family emergency, religious holidays, or participating as an authorized University representative in an approved event.

Khalifa University guidelines on lateness and attendance are outlined below. The complete policy may be found in the student handbook.

- Attendance is mandatory for every session of every course in which a student is registered.
- Instructors are not obliged to give substitute assignments or examinations to students who miss classes.
- If a student misses 20% of the scheduled sessions in a course for any reason, the University may initiate withdrawal of the student from the course. If approved by the Dean of the student's college, the withdrawal is implemented. A grade of W will be entered on the student's record if the withdrawal is initiated before the end of the tenth week of class. If the withdrawal is initiated after the tenth week of classes, a grade of WF will be entered on the student's record and will be calculated in the GPA. Instructors are to keep attendance records and to draw students' attention to attendance requirements noted in each course syllabus.

4.26

LANGUAGE OF INSTRUCTION AND EXAMINATION

English is the official language of Khalifa University. All courses at Khalifa University are taught and examined in English with the exception of non-English content courses such as Arabic language.

4.27

LEAVE OF ABSENCE AND REINSTATEMENT

A leave of absence can interrupt a student's studies and delay the completion of degree requirements. Such leaves shall only be granted for good cause.

- Generally, a student must be in good academic standing. A student in good academic standing is allowed no more than two consecutive semesters leave of absence. The student must complete a *Leave of Absence form* at the Admissions and Registration Office. The leave of absence must be approved by the Provost or Campus Manager who may grant exceptions in those cases when the student is not in good academic standing or conduct standing.
- A student may apply for a leave of absence once throughout the duration of his/her undergraduate study at the University.
- To resume studies after a leave of absence a student must complete a *Reactivation form* at the Admissions and Registration Office.

4.28

EVALUATION AND EXAMINATIONS

Evaluation

A university degree certifies that its holder has attained a measurable level of achievement as established by a recognized system of evaluation. Thus, the performance of each student in each course must be evaluated by the instructor or instructors responsible for the course. Final grades are determined by students' performance in one or more of the following:

- Assigned work, term papers, projects, etc.;
- Class participation;
- Progress tests;
- Laboratory tests and/or laboratory work;
- Mid-term and/or final examinations;
- Level of written expression.

The weight accorded to the various elements is at the discretion of the academic department responsible for the course. At the beginning of a course, the instructor will provide students with a detailed syllabus. The scheme cannot be altered without appropriate notice in writing. To assist students in preparing for their final exams, no tests or significant assessments should be administered during the final week of classes.

Normally, an instructor will submit final grades no later than three days after the scheduled final examination in a course or, where there is no final examination, seven days after the last scheduled class in a course.

Examinations

The University Academic Catalog lists the official examination periods for mid-semester and final examinations. University policies and regulations governing the administration of examinations are available from the Admissions and Registration Office.

A final examination or other form of final assessment shall be given in every course. Exceptions may be made only in accordance with the approved course syllabus.

All final examinations shall be held on the date and at the time listed in the official final examination schedule issued by the Admissions and Registration Office. Approved alternative assessments shall be due on the date and time listed in the final examination schedule for the course involved.

In extraordinary situations, a student may apply for an excused absence from a mid-term or final examination if the absence is due to serious illness or other compelling circumstances beyond the student's control. These criteria shall be strictly applied. Students requesting an excused absence must apply in writing to the Admissions and Registration Office and provide documentary support for their assertion that the absence resulted from one of these causes.

Students who are excused from a final examination will be required to sit for a make-up examination administered at a time and place set by the Admissions and Registration Office. The make-up exam shall cover only the material for which the student was originally responsible and be at a comparable level of difficulty with the original examination. A make-up exam shall be scheduled as quickly as possible but shall not interfere with the student's other classes or examinations.

Students who are excused from a mid-term examination shall not be re-examined. Instead, their final examination mark(s) will be attributed to the mid-term exam.

4.29
RECORDS AND TRANSCRIPTS

A permanent academic record for each student enrolled in the University is maintained in the Admissions and Registration Office. The written consent of the student is officially required to disclose his/her academic record. Exceptions are made for parents, sponsors, and authorized Khalifa University officials and in compliance with a judicial order.

Students may obtain transcripts of their academic records from the Admissions and Registration Office. A transcript will only be released with a signed request from the student concerned.

4.30
ACADEMIC HONORS

The University has a number of academic honors that recognize student academic performance based on their GPA. Further information can be obtained from the Office of Admissions and Registration.

4.31
ACADEMIC PROBATION

Fully admitted degree students are placed on probation if their overall or cumulative GPA (CGPA) falls below 2.00. This is noted on the student's academic record and grade report. While on probation, a student may not take any course on a Pass/Fail basis. Probation ends at the close of a regular semester if a student has attained a CGPA of 2.00 or above. Unless otherwise approved by the Dean, a full-time student on probation is only allowed to register for a maximum of 13 credit hours per semester.

Conditionally admitted students, who are enrolled in the Preparatory Program, are not subject to academic probation. Conditionally admitted students must successfully complete the Preparatory Program or their conditional admission will be rescinded and they will be separated from the University.

4.32
ACADEMIC DISMISSAL

An undergraduate student who fails to remove his/her probation status by the end of the second regular semester on probation is academically dismissed from the University.

A student's transcript will indicate if they are subject to dismissal. A student in jeopardy of determination by the University that the student is making substantial and timely improvement in raising his cumulative grade point average to 2.0.

At the discretion of the University, an academic dismissal action may be delayed pending a final appeal to the Provost.

4.33
STUDENT RIGHTS AND RESPONSIBILITIES

Student Academic Rights

University life is about learning, growing, and discovering. This section describes your academic rights. These rights include:

1. Your instructor's obligations to you to inform you as to what you will learn and how you will be assessed on your accomplishments.
2. The right to a fair and impartial assessment of your performance as a student.
3. The obligation of the University to uphold and preserve its students' rights to exercise principles of academic freedom. This obligation reflects the University's mission, which is dedicated to the advancement of learning through teaching and research and to the discovery and application of knowledge. The principles of academic freedom protect the freedom of inquiry and research and freedom of expression and publication within the bounds of professional, ethical, cultural, contractual and legal behavior. In order to preserve the rights and freedoms of its students, the University has a formal process for adjudication of academic related student grievances.
4. The right of every student to a quality education.
5. Provision by the University of sufficient course information to permit students to make informed course selections.
6. Availability in each course of a course outline including (but not limited to):
   a. A description of the topics to be considered in the course;
   b. Objectives and outcomes; and
   c. A list of all required readings and other materials, a description of the means of evaluation to be used in the course, the instructor's office hours, and locations for office appointments.
7. Fair and reasonable evaluation of a student's performance in a course, with evaluation measure reflecting the content of the course. The method of evaluation shall be made known to the student as soon as practicable.
8. Subject to reasonable administrative arrangements, and provided the request is made by a student within a reasonable time after the notification of a grade:
   a. The right to consult any written submission for which he or she has received a grade and a right to discuss this submission with the examiner.
   b. The right to impartial and competent review of any grade.
9. Provision by the University of information and transparent delivery mechanisms for students in need of financial aid.

Student Responsibilities

An educated person realizes that rights are not to be taken for granted. Rights require responsibility. The University policy on Student Responsibilities to the University, the Faculty and fellow students include:

- Every student is responsible for the proper completion of his/her academic program. This includes knowledge of the University Catalog, maintaining the grades required, and meeting all other degree requirements.
- Every student is responsible for maintaining communication with the University and keeping on file with the Office of Admissions and Registration, his/her current address, home address, telephone number and e-mail address.

- Every student is expected to participate in campus and community life in a manner that will reflect credit upon the student and the University.
- Every student has the responsibility to pay the fees of the University when due.
- Every student is expected to be an active learner by attending classes, completing assignments, seeking help when needed, responding to administrative requests, and participating in all course activities including course feedback.
- Students share with faculty the responsibility for maintaining the academic integrity of the teaching and learning process.

4.34

STUDENT ACADEMIC REGULATIONS AND POLICIES

Academic Integrity Code

The academic community, like all communities, functions best when all its members treat one another with honesty, fairness, respect, and trust. Khalifa University expects high standards of scholarship and integrity from all members of its community. To accomplish its mission of providing an optimal educational environment and developing leaders of society, the University promotes the assumption of personal responsibility and integrity and prohibits all forms of academic dishonesty. The purpose of education is to develop a student's ability to think logically and to express himself/herself accurately.

Academic dishonesty in any form undermines the very foundations of higher education and will not be tolerated by the University. The most common form of academic dishonesty is plagiarism. Other forms of academic dishonesty are described in the sections below.

Plagiarism

Plagiarism is the act of stealing the ideas and/or the expression of another person and representing them as one's own. It is a form of cheating and a kind of academic misconduct that should result in some form of academic penalty. It is important that one understands what it consists of, so that a student does not jeopardize his academic career. A student has come to the University to learn, and this means acquiring ideas and exchanging opinions with others. But no idea is ever genuinely learned by copying it down from someone else's work.

A student commits plagiarism if he/she submits work that is not truly the product of his or her own mind and skills.

Forms of Plagiarism

1. A word-by-word copying of someone else's work, in whole or in part, without acknowledgment, whether that work be a magazine article, a portion of a book, a newspaper piece, another student's paper, or any other composition not your own. Any such use of another's work must be acknowledged by:
   a. Enclosing all such copied portions in quotation grades.
   b. Giving the original source either in the body of the paper or in a note. As a general rule, one should make very little use of quoted matter in papers, project reports and assignments.
2. An unacknowledged paraphrasing of the structure and language of another person's work. Changing a few words of another's composition, omitting a few sentences, or changing their order does not constitute original composition and therefore can be given no credit. If such borrowing or paraphrasing is ever necessary, the source must be indicated by appropriate notes.
3. Writing a paper based solely on the ideas of another person. Even though the language is not the same, if the thinking is clearly not one's own, then the person has committed plagiarism. If, for example, in writing a paper a student reproduces the structure and progression of ideas in an essay one has read, or a speech one has heard, the student in this case is not engaging his/her own mind and experience enough to claim credit for writing his/her own composition.

In summary plagiarism includes, but is not limited to:

1. Using published work without referencing (the most common);
2. Copying coursework;
3. Collaborating with any other person when the work is supposed to be individual;
4. Talking another person's computer file/program;
5. Submitting another person's work as one's own;
6. The use of unacknowledged material published on the web;
7. Purchase of model assignments from whatever source;
8. Copying another student's results.

Avoiding Plagiarism

To avoid plagiarism, a student must give credit whenever he or she uses:

1. Another person's idea, opinion, or theory;
2. Any facts, statistics, graphs, drawings, any pieces of information that are not common knowledge;
3. Quotations of another person's actual spoken or written words; or
4. Paraphrase of another person's spoken or written words.

Direct quotations should be put in "inverted commas", and referenced. Paraphrased or edited versions should be acknowledged and referenced.

Identification and Analysis of Plagiarism Guidelines

It is University policy that electronically-submitted coursework produced by students be regularly submitted to suitable plagiarism-detection software for the identification and analysis of possible plagiarism. The University holds a site license for reputable plagiarism-detection software and makes available to all teaching staff relevant access to the software. It is mandatory that all teaching staff use such software for all major student assignments and final project reports.

Plagiarism is deemed to have occurred if the plagiarism score is equal to or greater than 15%, after all individual instances of scores of 2% or less are discounted.

All coursework items that achieve a plagiarism score equal to or greater than 15% (after all individual instances of scores of 2% or less are discounted) will be awarded zero grades, subject to the following rider: For senior students only, where a piece of coursework or the final project report attains a plagiarism score between 15% and 17% (after all individual instances of scores of 2% or less are discounted), the report must be reviewed by the relevant instructor and a decision made jointly by the relevant instructor and the Department Chair as to the final score that will be recorded.

The only faculty member who may submit a coursework item for a particular course to a plagiarism-detection software program is the assigned instructor for that course. No other academic course member should submit any coursework item that relates to another faculty member's assigned course.

OTHER FORMS OF ACADEMIC DISHONESTY

Cheating

Cheating is defined as using or attempting to use in any academic exercise, materials, information, study aids, or electronic data that the student knows or should know is unauthorized.

Collusion

Collusion includes cooperation of student(s) with faculty or staff personnel in securing confidential information/material (tests, examinations, etc.); bribery by student(s) to change examination grades and/or grade point average(s); cooperative efforts by student(s) and student assistant(s) to gain access to examinations or answers to examinations for distribution; seeking, obtaining, possessing, or giving to another person an examination or portions of an examination (not yet given), without permission of the instructor.

Fabrication of Data

This means the invention of results that have not been achieved by any scientific processes, either through logical argument or empirical investigation.

Falsification of Results

This means the alteration, modification, or misrepresentation of results (including selective inclusion or exclusion of results).

Recycling

Submission of a student's work that has previously counted in another unit of study is not allowed, unless explicitly authorized by the faculty members of both study units. In such case, students must reference their previous work.

Sabotage

Destruction of or deliberate inhibition of progress of another student's work related to a course is considered academically dishonest. This includes the destruction or hiding of shared resources such as library materials and computer software and hardware to tampering with another person's laboratory experiments.

Procedures and Penalties for Academic Integrity Code Offenses

1. When an instructor suspects that a student has violated the University's Academic Integrity Code, he or she shall collect whatever evidence may be available and relevant and shall immediately address the matter with the student via an interview. During the interview, the instructor has the right to ask the student to provide additional evidence (such as sources used) to establish the facts of the case.
2. If, after the interview, the instructor believes that the charges are unfounded or the evidence is not sound, he/she shall dismiss the case.
3. If, however, at the conclusion of the interview, the instructor discovers that the student did act in violation of the Academic Integrity Code, the instructor shall consult with the Chair/Dean of the student's department/college to determine whether the student has had a previous offense. In the event the student has had a previous offense, the instructor shall forward the case directly to the Department Chair.
4. If the case represents a student's first offense and the student admits guilt during the interview, the instructor may take one of the following actions:
   a. Counsel the student and issue him/her a formal written warning;
   b. Require the student to resubmit the work or undertake another form of assessment in lieu of the work in question, with a capped pass grade;
   c. Give a grade of zero for the work (in cases involving plagiarism, the issuance of a grade of zero is mandatory if the student's plagiarism score is equal to or greater than 15% after all individual instances of scores of 2% or less are discounted);
   d. Refer the case immediately to the Department Chair, if the offense is serious.

   The instructor shall then write a brief report detailing the offense committed and the penalty imposed. This report shall be provided to the student and submitted, through the relevant Department Chair, to the Dean for inclusion in the student's file.
5. If the case represents a student's first offense and the student either does not admit guilt or wishes to appeal the sanction imposed by the instructor, the case will be referred to the Department Chair. To initiate the appeals process, the student must submit a written request to the Department Chair within five business days of receiving notification of the instructor's sanction.
6. The Department Chair (or designee) will make a determination based on the facts/circumstances of the case. Depending upon the Chair's findings, he or she may take one of the following actions:
   a. Dismiss the case; or
   b. Impose a penalty based on "case history" and clear, convincing, and reliable evidence in support of the charge. This may include, but is not limited to, the following:
      i. Counseling the student and issuing him/her a formal written warning;
      ii. Requiring the student to resubmit the work or to undertake another form of assessment in lieu of the work in question, with a capped pass grade;
      iii. Giving a grade of zero for the work;
      iv. Failing the student in the relevant course;
      v. Failing the student in all courses for the semester during which the academic misconduct has occurred;
      vi. Suspending the student from the University for a period of one year;
      vii. Dismissing the student from the University.
7. The Chair's determination shall be made and communicated to the student and the instructor within ten (10) business days. Included in this written notification should be information regarding the student's option to appeal the decision and the procedure/time limit in which to do so. A copy of the report shall be submitted to the Dean for inclusion in the student's file.
8. If the student or instructor believes he or she has grounds for appealing the decision of the Department Chair (e.g., new evidence), both parties have the option to submit a written appeal to the Dean within five (5) business days of receiving the decision.
9. The Dean will determine whether there are sufficient grounds to warrant a formal hearing. In reaching this judgment, the Dean will review all statements and supporting materials and may request additional information and/or interview individuals who may have information relevant to the incident, including the instructor who made the referral and the student involved.
10. If the Dean determines that there are sufficient grounds to warrant a hearing, he or she will refer the case to an ad hoc Discipline Committee. The Dean will appoint the committee and serve as chair.
    a. The committee shall meet as directed by the chair to review all statements and supporting materials and to determine whether an act of academic dishonesty occurred. The committee may also request additional information and/or interview individuals who may have information relevant to the incident, including the instructor(s) who made the referral and the student involved. The student will have the right to be accompanied at all times by his/her advisor or a nominated faculty member. Legal counsel, however, will not be permitted to attend the hearing. Following the hearing, the committee shall reach a judgment regarding the charges and the sanctions to be imposed.
    b. The chair of the committee will notify the student of the committee's decision in writing within ten (10) business days. The student will also be informed in writing of the right to file a final written appeal to the Provost (undergraduate students) or Vice Provost (graduate students) within ten (10) business days of receipt of the decision.
11. In the absence of an appeal, the decision of the committee shall be implemented immediately. In the event of an appeal, implementation of the committee decision will be suspended until a decision on the appeal is rendered by the Provost or Vice Provost, as applicable. The Provost or Vice Provost's decision is final.

5

OFFICE OF STUDENT AFFAIRS

The Office of Student Affairs and Student Services is dedicated to providing quality services and support for students on and off campus. The Office advocates for students needs, facilitates student involvement in their learning and personal development, and supports students as they accept responsibilities associated with membership in a campus community. Operating within the framework of total student development, the Office is committed to promoting a caring, cooperative campus environment that values diversity and appreciates the dignity of all people.

5.1 STUDENT LIFE

Students at Khalifa University are encouraged to participate in extracurricular activities. The mission of the Student Life program is to plan, in a student-centered manner, a variety of athletic, cultural and social activities enabling students to develop personal talents and interests. Students are provided with facilities such as meeting rooms, student lounges, activity rooms, TV room, and prayer rooms. In addition, Khalifa University provides on-campus services tailored to the needs of its students such as career counseling and a nurse/health educator. The aim is to promote a campus climate that enhances the educational, physical, social and emotional well-being of students, and creates a collaborative, caring, and participative academic environment.

Housing

University residential halls offer an environment in which students from different parts of the country have the chance to meet and learn from one another. Student accommodation is available at both the Sharjah and Abu Dhabi Campuses. All housing facilities are managed by on-site staff. Based on availability and demand, all student accommodation is subject to priority allocation. In general, housing priority is afforded to students who are UAE Nationals residing beyond reasonable commuting distance to campus. Priorities and costs are subject to change.

The Sharjah Campus provides purpose-built student housing for men, which is located on campus. This makes it convenient for resident students to access the academic buildings as well as other services and recreational facilities.

The Abu Dhabi campus provides leased off-campus accommodation for both male and female students. Transportation is provided to and from the campus.

Emergency services

Campus security and emergency services are provided by the campus security department which operates twenty-four hours daily. These services can be requested by calling or contacting the security office.

Campus Food Services

Food services are available at the Sharjah and Abu Dhabi campuses including full meals and snack items.

Mosque and Prayer Facilities

Khalifa University provides separate prayer rooms for men and women including separate areas for `Wudhu', washing and cleansing.

Recreational Facilities

Recreational facilities including a gymnasium, swimming pool, tennis courts, and playing field, are available at the Sharjah campus. There are no recreational facilities on the Abu Dhabi campus at this time.

5.2 CAREER AND COUNSELING SERVICES

Career Development

- Career services engage students in educationally purposeful experiences resulting in student learning and development, academic success and degree completion. Our aims are to help students identify academic majors, develop career plans and goals, become employment ready and build relationships with employers.
- We offer a University Success Program which includes the following topics: developing effective study habits; discovering how you learn; understanding the importance of managing time; exploring personal values and interests. We also offer students and alumni career counseling and assistance with:
  - Resume and cover letter development
  - Career fairs
  - Preparing for internship and employment
  - Personal Counseling

Counseling

- Special advising and counseling sessions are organized to provide help with personal problems related to academic, time management, financial, personal or health issues. Information concerning counseled students is never conveyed to administrators, professors or others without the permission of the student concerned, except in health or safety situations in which students may pose a risk to themselves or others.

Peer Tutoring

- The Peer Tutoring program seeks to offer academic support as requested by students in all degree disciplines and course levels. Tutoring is provided on a one-to-one basis, however tutoring to small groups can be arranged.
- Peer tutoring is viewed as a means to supplement classroom instruction, foster independent learning, build self-esteem and assist students in improving their academic skills. The program will continue to evolve to provide quality tutoring for the student body of Khalifa University.

Academic Success Program (ASP)

- The aims of Academic Success Program are to help students learn necessary skills and develop the positive attitude to achieve success in their university education. At the end of this program, students who attend regularly and willingly invest time and effort will move successfully through their university courses. Career and Counseling Services (CCS) will continue to support and enhance student learning experience through career guidance, support, mentoring and other interventions. CCS will promote self knowledge to increase motivation towards academics.

5.3 STUDENT AFFAIRS OFFICE

The Student Affairs office at Khalifa University of Science, Technology and Research is dedicated to providing a friendly atmosphere to a multicultural and co-educational student body. The aim is to create a vibrant environment around extra- curricular activities which extends beyond the classroom.

Khalifa University students are encouraged to organize and arrange many events and activities. These activities and programs include: a talent day; UAE National day celebrations and intramural competitions.

The on campus facilities to support these extra-curricular activities are: student lounges and activity rooms (male and female); prayer rooms; kitchens; Cafés and wireless internet access.
Current active clubs are:

- Book Club
- Chess Club
- Culture and Heritage Club
- Debate Club
- Emirati Club
- French Club
- Green Club
- Green Crescent
- Jung Sim Do (Martial arts club)
- Korean Club
- Math Club
- Media Club
- Nippon Club (Japanese)
- Photography
- Sport club
- Student Voice (Student Newsletter)
- Technology Club

There are three established and active engineering professional student chapters on campus. They are: AIAA (American Society of Aeronautics and Astronautics); ASME (American Society of Mechanical Engineers) and IEEE (Institute of Electronics Engineers).

The office of Student Affairs supports the efforts of the active Student Council body on campus. The purpose of the Student Council Khalifa University is to provide the student body with a common platform that aims at promoting interaction among students and the university body. The Student Council works closely with the Office of Student Affairs to foster a spirit of community, understanding, and harmony throughout the campus. The Council also aims to provide students with unique opportunities to develop life skills and leadership qualities by organizing activities and hosting events of interest to the students.

5.4

STUDENT RIGHTS

The University is a community. A community has many different groups and individuals. The community which enhances understanding and appreciation of others is rich in diversity. As a student, you have rights which assist you in taking your place as a member of the community. These are as follows:

1. Every student enjoys within the University all rights and freedoms recognized by the Laws of the United Arab Emirates.

2. Every student has a right to equal treatment by the University. A student has a right to be free from discrimination based on race, color, origin, religion, sex, or personal handicap.

    a. A distinction, exclusion, or preference based on relevant academic or physical aptitudes required and made in good faith is considered to be non-discriminatory.

3. Every student has a right to the safeguard of his or her dignity. This right includes protection by the University against vindictive conduct displayed by a representative of the University acting in an official capacity.

4. Every student has a right to be free from reprisal or threat of reprisal made by a person in a position to offer or deny to the student an academic advantage or opportunity relating to the status of a student.

5. The University has an obligation to ensure that administrative decisions are made, or actions taken, with fair regard for the known and legitimate interests of students.

6. The University has an obligation to maintain safe and suitable conditions of learning and study.

7. The University has an obligation to ensure that adequate measures are taken to protect the security of students on University property.

5.5

NON-ACADEMIC STUDENT CONDUCT REGULATIONS

The Office of Student Affairs is responsible for reviewing all alleged violations of the student conduct regulations and administering disciplinary action when warranted. The University is a community of educated people who have values. The properties and resources provided by the University are meant for all members of the community to enjoy. Non-academic offenses are related to behaviors that disrupt the life of the University community. Non-academic offenses include, but are not limited to, the following categories.

- Disruption of teaching or other University activities including administrative processes.
- Unauthorized entry and/or presence on University property.
- Threat, damage and destruction of University property or the property of other members of the University community.
- Physical abuse, harassment, and dangerous activities.
- Possession of stolen property.
- Unauthorized or fraudulent use of University facilities, equipment or services.
- Misuse of library and information technology resources.

Behaviors deemed to be unacceptable may lead to a variety of sanctions up to and including student dismissal from the University. T*he Khalifa University Student Handbook details University policies and procedures regarding Student Conduct Regulations, hearing procedures and sanctions.*

6

COLLEGE OF ENGINEERING

Aerospace Engineering

Communication Engineering

Computer Engineering

Electronic Engineering

Industrial and Systems Engineering

Mechanical Engineering

Software Engineering

COLLEGE OF ENGINEERING

Introduction

Engineering is a many-faceted profession. Graduate engineers can apply their training to improve the standard of living in an undeveloped area of the world or sit in front of a computer terminal in a high-rise building in a highly-developed city. The common threads connecting those who aspire to be engineers are a curiosity about the physical world, a natural ability in mathematics and science, and a desire to produce or design systems and products that promote human well-being.

Potential engineers must first become very familiar with the language of mathematics and science. Without this competency, communication between technologically oriented people is limited. Once mathematics is understood, the foundation of why things happen in the physical world must be mastered in science courses. Students then begin to blend their basic knowledge and their communication and teamwork skills with practical experience to systematically attack a problem and develop possible solutions.

Most commercial products that you see around you and you use every day were developed by engineers, from a radio to a satellite, from a digital watch to a super computer, from video games to computer software. Many more problems need to be solved, and it will require engineers to solve them. For example, how to design electronic devices to be smaller, faster and consume less power in order to build high-speed portable systems? What new doors can be opened with developments in communication devices and systems? How can computers and information technology systems be designed to perform more tasks in industry and in the home?

The modern engineer must have some understanding of people and their values. They are asked frequently to make decisions affecting the development of society and the direction it will take. They must understand basic economic principles, both national and international, of the problems they are solving. Today's engineers and information scientists are citizens of the world, a fact reflected in the broad scope of their education.

The College of Engineering at Khalifa University is a community of academic teachers, students, scholars and staff members working together to educate the future leaders in science and technology, and to create and disseminate technical knowledge for the benefit of the society.

College Mission

The mission is to enhance the quality of life of all individuals and of the society at large through discovery, technical innovation, education and professional engagement.

College Goal

The goal of the College of Engineering is to become and maintain its role as an indispensable contributor to the fulfillment of the Emirate of Abu Dhabi 2030 Vision as it relates to the creation of the new knowledge-based economy, and to become a peer of the best research-intense engineering colleges and universities in the world. In working together toward the fulfillment of our mission, together with our constituents in the Emirate of Abu Dhabi and in the entire Nation, in partnership with select peer institutions worldwide, we strive to reach our objective to become a national and regional center of academic preeminence in engineering and technology oriented professions for the Emirate of Abu Dhabi and the entire Nation. We work toward realizing this goal through innovation and constant self-improvement in all dimensions of our institutional and professional activities: in teaching at all academic levels, in research, through dissemination of knowledge, and through active engagement for the benefit of the society at large.

College Degree Programs

The undergraduate degree programs offered by the College are:

- Bachelor of Science (B.Sc.) in Aerospace Engineering (only Abu Dhabi campus)
- Bachelor of Science (B.Sc.) in Communication Engineering
- Bachelor of Science (B.Sc.) in Computer Engineering
- Bachelor of Science (B.Sc.) in Electronic Engineering
- Bachelor of Science (B.Sc.) in Industrial and Systems Engineering (only Abu Dhabi campus)
- Bachelor of Science (B.Sc.) in Mechanical Engineering (only Abu Dhabi campus)
- Bachelor of Science (B.Sc.) in Software Engineering (only Abu Dhabi campus)

**The Bachelor of Science (B.Sc.) in Biomedical Engineering and Bachelor of Science (B.Sc.) in Civil Infrastructure and Environmental Engineering are currently subject to accreditation by the Ministry of Higher Education, UAE.

All the engineering programs are designed to be compatible with ABET *(Accreditation Board for Engineering and Technology)* criterion for accreditation and the recommendations of the IEEE/ACM *((The Institute of Electrical and Electronic Engineers/Association for Computing Machinery)* where applicable. The programs effectively have the same structure and are all designed to be flexible with a wide range of concentrations that are supported with a rich set of elective courses. A student may select a concentration within the particular degree program by taking a specific set of advanced courses. In this case the concentration area will be recorded on the student's transcript. Alternatively, a student may select the electives without a concentration in mind. In this case only the basic title of the degree will be recorded on the student's transcript. This approach offers additional flexibility to students and departments, making the programs more adaptable and competitive in the regional market.

Industrial internships or professional training is an integral part of all the engineering programs. A student spends a minimum of six weeks on a structured full-time training program in an appropriate industry/organization. This will expose the student to the practical and professional aspects of their future profession. One credit is assigned to the internship and the student is assessed on a pass/fail basis.

Bachelor of Science (B.Sc.) in AEROSPACE ENGINEERING

This program lays the foundation for the core aerospace engineering discipline while engaging students to study and understand how engineering fits within the overall global aerospace profession and industry. Principles of science and engineering are applied to design and analysis of flight vehicles and related systems in well-designed course sequences to ensure that students gain hands on experience in developing flight vehicles from concept to design, including the fabrication and testing process. Using advanced computer modeling and simulations, as well as hands-on laboratories and real life projects, students will have the tools to contribute immediately to the aerospace industry.

Degree Program Objectives

- Equip students with knowledge of the fundamentals of aerospace engineering with exposure to both analytical techniques and experimentation.
- Provide students with the opportunity to specialize in fields related to aerospace engineering via a list of well-designed, technology- and market-oriented electives.
- Equip students with problem solving skills and to help them develop the ability to solve science and engineering problems by participating in creative design projects.
- Equip students with communication skills and leadership skills within an environment that nurtures ethical behavior.
- Encourage students to pursue self-learning and personal development experiences in a rigorous program and through participation in research opportunities.
- Produce graduates who will contribute substantially in academia, industry, and the community.

Degree Program Outcomes

Students graduating from the Department of Aerospace Engineering degree program will have the following abilities:

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.

d. an ability to function on multi-disciplinary 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. a recognition of the need for the broad education necessary to understand the impact of engineering solutions in a global 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

k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Structure and Requirements

To be recommended for the degree of B.Sc. in Aerospace Engineering, students must satisfactorily complete the courses in the specified categories as set out below. The categories cover an extended set of the University General Education Requirements, General and Aerospace Engineering core and Technical Electives requirements. The normal length of the program is 140 credits.

Summary of Degree Program Requirements:

Category	Credits Required
Mathematics and Science	33
Communication Skills	9
Humanities and Social Sciences	9
Economics and Management	6
Introduction to Computing	3
General Engineering Core	7
Aerospace Engineering Core	64
Aerospace Engineering Technical Electives	9
Total	**140**

DETAILED CURRICULUM REQUIREMENTS AND ELECTIVES

Mathematics and Science Requirement (33 credits)

CHEM 101	General Chemistry I	4 cr.
MATH 105	Calculus I	3 cr.
MATH 106	Calculus II	3 cr.
MATH 201	Calculus III	3 cr.
MATH 204	Linear Algebra	3 cr.
MATH 205	Complex Variables and Transforms	3 cr.
MATH 206	Differential Equations and Applications	3 cr.
MATH 215	Probability and Statistics	3 cr.
PHYS 101	General Physics I	4 cr.
PHYS 102	General Physics II	4 cr.

Communication Skills Requirement (9 credits)

ENGL 101	Academic English I	3 cr.
ENGL 102	Academic English II	3 cr.
ENGL 220	Technical Writing and Communication	3 cr.

Humanities and Social Sciences Requirement (9 credits)

a. Arabic Heritage and Culture (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

b. Humanities and Social Sciences Breadth (3 credits)

Select 3 credits from the list of University General Education Requirements in this category.

Economics and Management Requirement (6 credits)

ECON 120	Engineering Economics	3 cr.
MANG 200	Principles of Management	3 cr.

Introduction to Computing Requirement (3 credits)

CMPE 111	Principles of Computer Programming	3 cr.

General Engineering Core Requirement (7 credits)

ENGR 110	Introduction to Professional Engineering	1 cr.
ENGR 180	Engineering Graphical Design	2 cr.
ENGR 200	Statics	3 cr.
ENGR 390	Engineering Ethics	1 cr.

Aerospace Engineering Core Requirement (64 credits)

AERO 181	Problem Solving in Aerospace Engineering	3 cr.
ELCE 200	Fundamentals of Electronic Systems	4 cr.
AERO 201	Engineering Dynamics	3 cr.
AERO 220	Engineering Materials	3 cr.
AERO 230	Fluid Mechanics I	3 cr.
AERO 320	Mechanics of Solids I	3 cr.
AERO 321	Aircraft Structures I	4 cr.
AERO 330	Low Speed Aerodynamics	4 cr.
AERO 331	High Speed Aerodynamics	3 cr.
AERO 340	Thermodynamics	3 cr.
AERO 350	System Dynamics and Vibration	3 cr.
AERO 351	Feedback Control Systems	4 cr.
AERO 380	Aerospace Vehicle Performance	3 cr.
AERO 385	Aerospace Design and Practice	3 cr.
AERO 399	Engineering Internship	1 cr.
AERO 400	Aeroelasticity	2 cr.
AERO 420	Aerospace Structures II	3 cr.
AERO 440	Aerospace Propulsion	3 cr.
AERO 450	Aerospace Vehicle Stability and Control	3 cr.
AERO 480	Senior Design Project I	3 cr.
AERO 481	Senior Design Project II	3 cr.

Aerospace Engineering Technical Electives (9 credits)

There are a total of 36 credits (12 courses) of technical electives in the Aerospace Engineering Program. The student must select nine (9) credits from the specified courses in their chosen area of concentration.

AERO 425	Design of Aerospace Structures	3 cr.
AERO 426	Designing with Composites	3 cr.
AERO 430	Intermediate Aerodynamics	3 cr.
AERO 431	Viscous Flows	3 cr.
AERO 432	Aerodynamics and Heat Transfer	3 cr.
AERO 433	Intro. Computational Fluid Dynamics	3 cr.
AERO 434	Acoustics and Noise Control	3 cr.
AERO 435	Rotorcraft Aerodynamics and Performance	3 cr.
AERO 461	Aviation Management and Certification	3 cr.
AERO 485	Spacecraft Design	3 cr.
AERO 491	Undergraduate Research Project	3 cr.
ENGR 455	Finite Element Analysis	3 cr.
ENGR 465	Methods of Engineering Analysis	3 cr.

Typical Sequence of Courses for a B.Sc. degree in AEROSPACE ENGINEERING

Year 1
Freshman

Course Code	Course Title	Credits
FALL SEMESTER		
ARBH xxx	Arabic Heritage and Culture Elective 1	3
CMPE 111	Principles of Computer Programming	3
ENGL 101	Academic English I	3
ENGR 110	Introduction to Professional Engineering	1
MATH 105	Calculus I	3
PHYS 101	General Physics I	4
TOTAL		**17**
SPRING SEMESTER		
ARBH xxx	Arabic Heritage and Culture Elective 2	3
ENGL 102	Academic English II	3
AERO 181	Problem solving in Aerospace Engineering	3
ENGR 180	Engineering Graphical Design	2
MATH 106	Calculus II	3
PHYS 102	General Physics II	4
TOTAL		**18**

Year 2
Sophomore

Course Code	Course Title	Credits
FALL SEMESTER		
CHEM 101	General Chemistry I	4
ENGL 220	Technical Writing and Communication	3
ENGR 200	Statics	3
MATH 201	Calculus III	3
ELCE 200	Fundamentals of Electronic Systems	4
TOTAL		**17**
SPRING SEMESTER		
AERO 220	Engineering Materials	3
AERO 201	Engineering Dynamics	3
MATH 204	Linear Algebra	3
MATH 206	Differential Equations and Applications	3
AERO 230	Fluid Mechanics I	3
HUMA/ SOCS xxx	Humanities and Social Sciences Elective	3
TOTAL		**18**

Year 3
Junior

Course Code	Course Title	Credits
FALL SEMESTER		
MATH 205	Complex Variables and Transforms	3
AERO 350	System Dynamics and Vibration	3
AERO 320	Mechanics of Solids I	3
AERO 340	Thermodynamics	3
AERO 330	Low Speed Aerodynamics	4
ENGR 390	Engineering Ethics	1
TOTAL		**17**
SPRING SEMESTER		
AERO 331	High Speed Aerodynamics	3
AERO 321	Aircraft Structures I	4
AERO 385	Aerospace Design and Practice	3
AERO 380	Aerospace Vehicle Performance	3
AERO 351	Feedback Control Systems	4
TOTAL		**17**
SUMMER SESSION		
AERO 399	Engineering Internship	1
TOTAL		**1**

Year 4
Senior

Course Code	Course Title	Credits
FALL SEMESTER		
AERO 480	Senior Design Project I	3
AERO 420	Aerospace Structures II	3
AERO 450	Aerospace Vehicle Stability and Control	3
AERO 400	Aeroelasticity	2
AERO 440	Aerospace Propulsion	3
MATH 215	Probability and Statistics	3
TOTAL		**17**
SPRING SEMESTER		
ECON 120	Engineering Economics	3
AERO 481	Senior Design Project II	3
MANG 200	Principles of Management	3
AERO xxx	Department Technical Elective	3
AERO xxx	Department Technical Elective	3
AERO xxx **OR** AERO 491	Department Technical Elective Undergraduate research project	3
TOTAL		**18**

Bachelor of Science (B.Sc.) in COMMUNICATION ENGINEERING

The continued growth in all areas of communication technology means that communication engineering graduates are highly desired for positions in new product design and innovation, as well as product and systems management. All types of modern communication, from mobile phones and satellites, to digital television and internet, require the skills of communication engineers and provide a platform for rapid career development.

The communication engineering B.Sc. program at Khalifa University offers students excellent quality education needed by highly qualified future communication engineers. The program gives the students the opportunity to select a concentration track within the various promising areas of communication engineering. These concentration tracks include wireless communications, communications signal processing, and broadband telecommunications.

Degree Program Objectives

- To equip students with knowledge of the fundamentals of communication engineering, with exposure to both analytical techniques and experimentation.
- To provide students with the opportunity to specialize in fields related to communication engineering via a list of well-designed, technology- and market-oriented electives.
- To equip students with problem solving skills and to help them develop the ability to solve engineering problems by participating in creative design projects.
- To equip students with communication skills and leadership skills within an environment that nurtures ethical behavior.
- To encourage students to pursue self-learning and personal development experiences in a rigorous program and through participation in research opportunities.

Degree Program Outcomes

Students graduating from the Department of Communication Engineering degree program will have the following abilities:

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

a1. an ability to apply knowledge of probability and statistics, including applications appropriate to the program name and objectives.

a2. an ability to apply knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.

a3. an ability to apply knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

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.

d. an ability to function on multi-disciplinary 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 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.

k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Structure and Requirements

To be recommended for the degree of B.Sc. in Communication Engineering, students must satisfactorily complete the courses in the specified categories as set out below. The categories cover an extended set of the University General Education Requirements, and the Communication Engineering core and Technical Electives requirements. The normal length of the program is 140 credits.

Summary of Degree Program Requirements:

Category	Credits Required
Mathematics and Science	32
Communication Skills	9
Humanities and Social Sciences	12
Economics and Management	6
Introduction to Computing	3
General Engineering Core	2
Communication Engineering Core	58
Communication Engineering Technical Electives	18
Total	**140**

DETAILED CURRICULUM REQUIREMENTS AND ELECTIVES

Mathematics and Science Requirement (32 credits)

MATH 105	Calculus I	3 cr.
MATH 106	Calculus II	3 cr.
MATH 201	Calculus III	3 cr.
MATH 204	Linear Algebra	3 cr.
MATH 205	Complex Variables and Transforms	3 cr.
MATH 206	Differential Equations and Applications	3 cr.
MATH 215	Probability and Statistics	3 cr.
PHYS 101	General Physics I	4 cr.
PHYS 102	General Physics II	4 cr.
PHYS 201	Physical Properties of Solids	3 cr.

Communication Skills Requirement (9 credits)

ENGL 101	Academic English I	3 cr.
ENGL 102	Academic English II	3 cr.
ENGL 220	Technical Writing and Communication	3 cr.

Humanities and Social Sciences Requirement (12 credits)

a. Arabic Heritage and Culture (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

b. Humanities and Social Sciences Breadth (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

Economics and Management Requirement (6 credits)

ECON 120	Engineering Economics	3 cr.
MANG 200	Principles of Management	3 cr.

Introduction to Computing Requirement (3 credits)

CMPE 111	Principles of Computer Programming	3 cr.

General Engineering Core Requirement (2 credits)

ENGR 110	Introduction to Professional Engineering	1 cr.
ENGR 390	Engineering Ethics	1 cr.

Communication Engineering Core Requirement (58 credits)

CMME 300	Communication Systems	3 cr.
CMME 301	Communication Systems Lab	1 cr.
CMME 302	Digital Communications I	3 cr.
CMME 303	Digital Communications Lab	1 cr.
CMME 304	Information Theory	3 cr.
CMME 310	Applied Electromagnetics	3 cr.
CMME 320	Communication Networks	3 cr.
CMME 331	Modeling and Simulation of Communication Systems Lab	1 cr.
CMME 395	Communication Engineering Project Lab	1 cr.
CMME 399	Engineering Internship	1 cr.
CMME 400	Wireless Communications	3 cr.
CMME 410	Antennas and Propagation	3 cr.
CMPE 201	Introduction to Computer Organization	3 cr.
ELCE 210	Electric Circuits I	3 cr.
ELCE 211	Electric Circuits Laboratory	1 cr.
ELCE 212	Electric Circuits II	3 cr.
ELCE 220	Electronic Circuits and Devices I	3 cr.
ELCE 221	Electronic Circuits and Devices I Lab	1 cr.
ELCE 230	Digital Logic Design	3 cr.
ELCE 231	Digital Logic Lab	1 cr.
ELCE 301	Signals and Systems	3 cr.
ELCE 320	Electronic Circuits and Devices II	3 cr.
ELCE 401	Digital Signal Processing	3 cr.
ELCE 402	Signal Processing Lab	1 cr.
CMME 497	Senior Design Project I	2 cr.
	AND	
CMME 498	Senior Design Project II	2 cr.
	OR	
CMME 499	Senior Design Project III	4 cr.

Communication Engineering Technical Electives (18 credits)

There are a total of 18 credits (six courses) of technical electives in the Communication Engineering Program. At least one but at most two elective courses should be taken from another program in the College of Engineering. At most one of the electives may be at 300-level.

A student may specify a concentration track before selecting the technical electives. The concentration tracks supported by the program are: Wireless Communications, Communications Signal Processing, and Broadband Telecommunications. The course sequences that are required by each concentration track are set out below.

Wireless Communications Concentration		
CMME 401	Digital Communications II	3 cr.
CMME 402	Modulation and Coding Techniques	3 cr.
CMME 441	Satellite Communications	3 cr.
CMME xxx	Department Technical Elective 1	3 cr.
… xxx	Cross-Department Elective 1	3 cr.
… xxx	Cross-Department Elective 2	3 cr.
	OR	
CMME xxx	Department Technical Elective 2	

Communications Signal Processing Concentration		
CMME 402	Modulation and Coding Techniques	3 cr.
CMME 403	Signal Processing for Communications	3 cr.
CMME 404	Adaptive Communication Systems	3 cr.
CMME xxx	Department Technical Elective 1	3 cr.
… xxx	Cross-Department Elective 1	3 cr.
… xxx	Cross-Department Elective 2	3 cr.
	OR	
CMME xxx	Department Technical Elective 2	

Broadband Telecommunications Concentration		
CMME 412	Optical Communications	3 cr.
CMME 430	Multimedia Communications	3 cr.
CMME 431	CATV Systems and Networks	3 cr.
CMME xxx	Department Technical Elective 1	3 cr.
… xxx	Cross-Department Elective 1	3 cr.
… xxx	Cross-Department Elective 2	3 cr.
	OR	
CMME xxx	Department Technical Elective 2	

List of Communication Engineering Program Technical Electives		
CMME 401	Digital Communications II	3 cr.
CMME 402	Modulation and Coding Techniques	3 cr.
CMME 403	Signal Processing for Communications	3 cr.
CMME 404	Adaptive Communication Systems	3 cr.
CMME 412	Optical Communications	3 cr.
CMME 420	Switching and Data Networks	3 cr.
CMME 421	Fundamentals of Security Systems	3 cr.
CMME 422	Digital Transmission	3 cr.
CMME 430	Multimedia Communications	3 cr.
CMME 431	CATV Systems and Networks	3 cr.
CMME 441	Satellite Communications	3 cr.
CMME 442	Aerospace Radio and Radar Systems	3 cr.
CMME 495	Selected Topics in Communication Engineering	3 cr.
CMME 496A	Independent Study A	3 cr.
CMME 496B	Independent Study B	2 cr.
CMME 496C	Independent Study C	1 cr.

Typical Sequence of Courses for a B.Sc. degree in COMMUNICATION ENGINEERING

Year 1
Freshman

Course Code	Course Title	Credits
FALL SEMESTER		
ENGL 101	Academic English I	3
MATH 105	Calculus I	3
PHYS 101	General Physics I	4
CMPE 111	Principles of Computer Programming	3
ENGR 110	Intr. to Professional Engineering	1
ARBH xxx	Arabic Heritage and Culture Elective 1	3
TOTAL		**17**
SPRING SEMESTER		
ENGL 102	Academic English II	3
MATH 106	Calculus II	3
PHYS 102	General Physics II	4
CMPE 201	Intr. to Computer Organization	3
ARBH xxx	Arabic Heritage and Culture Elective 2	3
TOTAL		**16**
SUMMER SESSION		
MATH 201	Calculus III	3
HUMA/ SOCS xxx	Humanities /Social Sciences Elective 1	3
TOTAL		**6**

Year 2
Sophomore

Course Code	Course Title	Credits
FALL SEMESTER		
PHYS 201	Physical Properties of Solids	3
MATH 205	Complex Variables and Transforms	3
MATH 204	Linear Algebra	3
ELCE 210	Electric Circuits I	3
ELCE 211	Electric Circuits Laboratory	1
ELCE 230	Digital Logic Design	3
ELCE 231	Digital Logic Laboratory	1
TOTAL		**17**
SPRING SEMESTER		
ELCE 212	Electric Circuits II	3
ELCE 220	Electronic Circuits and Devices I	3
ELCE 221	Electronic Circuits and Devices I Lab.	1
MATH 206	Differential Equations and Applications	3
MATH 215	Probabilities and Statistics	3
ENGL 220	Technical Writing and Communication	3
TOTAL		**16**

Year 3
Junior

Course Code	Course Title	Credits
FALL SEMESTER		
ELCE 301	Signals and Systems	3
ELCE 320	Electronic Circuits and Devices II	3
CMME 300	Communication Systems	3
CMME 301	Communication Systems Lab	1
CMME 310	Applied Electromagnetics	3
HUMA/SOC-Sxxx	Humanities/ Social Sciences Elective 2	3
TOTAL		**16**
SPRING SEMESTER		
CMME 302	Digital Communication I	3
CMME 303	Digital Communication Lab	1
CMME 304	Information Theory	3
CMME 320	Communication Networks	3
CMME 331	Modeling and Sim. of Comm. Sys. Lab	1
CMME 395	Communication Eng. Project Lab	1
ENGR 390	Engineering Ethics	1
ECON 120	Engineering Economics	3
TOTAL		**16**
SUMMER SESSION		
CMME 399	Engineering Internship	1
TOTAL		**1**

Year 4
Senior

Course Code	Course Title	Credits
FALL SEMESTER		
ELCE 401	Digital Signal Processing	3
ELCE 402	Signal Processing Laboratory	1
CMME 400	Wireless Communications	3
CMME 497	Senior Design Project I	2
CMME xxx	Department Technical Elective 1	3
.... xxx	Cross Dept. Technical Elective 1	3
MANG 200	Principles of Management	3
TOTAL		**18**
SPRING SEMESTER		
CMME 498	Senior Design Project II	2
CMME 410	Antennas and Propagation	3
CMME xxx	Department Technical Elective 2	3
CMME xxx	Department Technical Elective 3	3
CMME xxx	Department Technical Elective 4	3
... xxx	Cross Dept. Technical Elective 2	3
	OR	
CMME xxx	Department Technical Elective 5	
TOTAL		**17**

Bachelor of Science (B.Sc.) in COMPUTER ENGINEERING

Computer Engineering is concerned with the design and development of computers and computer-based systems. It involves the study of hardware, software, and networking. A Computer Engineering degree provides a strong understanding of the relationship between computer hardware and software and all related issues. It is the key to many career opportunities in both government and industry sectors. Khalifa University's program also gives students the opportunity to specialize in current hot topics such as information and network security, and networks and distributed systems.

Degree Program Objectives

- To equip students with knowledge of the fundamentals of computer engineering, with exposure to both analytical techniques and experimentation.
- To provide students with the opportunity to specialize in fields related to computer engineering via a list of well-designed, technology- and market-oriented electives.
- To equip students with problem solving skills and to help them develop the ability to solve engineering problems by participating in creative design projects.
- To equip students with communication skills and leadership skills within an environment that nurtures ethical behavior.
- To encourage students to pursue self-learning and personal development experiences in a rigorous program and through participation in research opportunities.

Degree Program Outcomes

Students graduating from the Department of Computer Engineering degree program will have the following abilities:

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

a1. an ability to apply knowledge of probability and statistics, including applications appropriate to the program name and objectives.

a2. an ability to apply knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.

a3. an ability to apply knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

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.

d. an ability to function on multi-disciplinary 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 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.

k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Structure and Requirements

To be recommended for the degree of B.Sc. in Computer Engineering, students must satisfactorily complete the courses in the specified categories as set out below. The categories cover an extended set of the University General Education Requirements, and the Computer Engineering core and Technical Electives requirements. The normal length of the program is 140 credits.

Summary of Degree Program Requirements:

Category	Credits Required
Mathematics and Science	32
Communication Skills	9
Humanities and Social Sciences	12
Economics and Management	6
Introduction to Computing	3
General Engineering Core	1
Computer Engineering Core	62
Computer Engineering Technical Electives	15
Total	**140**

DETAILED CURRICULUM REQUIREMENTS AND ELECTIVES

Mathematics and Science Requirement (32 credits)

MATH 105	Calculus I	3 cr.
MATH 106	Calculus II	3 cr.
MATH 201	Calculus III	3 cr.
MATH 204	Linear Algebra	3 cr.
MATH 205	Complex Variables and Transforms	3 cr.
MATH 206	Differential Equations and Applications	3 cr.
MATH 207	Discrete Mathmatics	3 cr.
MATH 215	Probability and Statistics	3 cr.
PHYS 101	General Physics I	4 cr.
PHYS 102	General Physics II	4cr.

Communication Skills Requirement (9 credits)

ENGL 101	Academic English I	3 cr.
ENGL 102	Academic English II	3 cr.
ENGL 220	Technical Writing and Communication	3 cr.

Humanities and Social Sciences Requirement (12 credits)

a. Arabic Heritage and Culture (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

b. Humanities and Social Sciences Breadth (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

Economics and Management Requirement (6 credits)

ECON 120	Engineering Economics	3 cr.
MANG 200	Principles of Management	3 cr.

Introduction to Computing Requirement (3 credits)

CMPE 111	Principles of Computer Programming	3 cr.

General Engineering Core Requirement (1 credits)

ENGR 110	Introduction to Professional Engineering	1 cr.

Computer Engineering Core Requirement (62 credits)

ELCE 210	Electric Circuits I	3 cr.
ELCE 211	Electric Circuits Laboratory	1 cr.
ELCE 220	Electronic Circuits and Devices I	3 cr.
ELCE 221	Electronic Circuits and Devices 1 Lab	1 cr.
ELCE 230	Digital Logic Design	3 cr.
ELCE 231	Digital Logic Laboratory	1 cr.
ELCE 301	Signals and Systems	3 cr.
ELCE 332	Microprocessor Systems	3 cr.
ELCE 333	Microprocessor Systems Laboratory	1 cr.
ELCE 430	Digital System Design	3 cr.
ELCE 432	Embedded Systems Design and Applications	3 cr.
SOFE 201	Introduction to Software Engineering	3 cr.
CMPE 201	Introduction to Computer Organization	3 cr.
CMPE 211	Object Oriented Programming	3 cr.
CMPE 220	Data Structures and Algorithms	3 cr.
CMPE 311	Java and Network Programming	3 cr.
CMPE 312	Operating Systems	3 cr.
CMPE 321	Data Communications	3 cr.
CMPE 322	Computer Networks	3 cr.
CMPE 323	Computer Networks Lab	1 cr.
CMPE 395	Computer Engineering Project Lab.	1 cr.
CMPE 399	Engineering Internship	1 cr.
CMPE 401	Computer Architecture	3 cr.
CMPE 450	Ethics in Computing	3 cr.
CMPE 497	Senior Design Project I	2 cr.
AND		
CMPE 498	Senior Design Project II	2 cr.
OR		
CMPE 499	Senior Design Project III	4 cr.

Computer Engineering Technical Electives (15 credits)

There are a total of 15 credits (5 courses) electives in the Computer Engineering Program. At least one but at most two elective courses should be taken from another department in the College of Engineering. At most one of the electives may be at 300-level.

The student may specify a concentration track before selecting the technical electives. The concentration tracks supported by the program are: Networks and Distributed Systems, and Information Security. The course sequences that are required by each concentration tracks are set out below.

Networks and Distributed Systems Concentration		
CMPE 421	Introduction to Network Management	3 cr.
CMPE 422	Distributed Systems	3 cr.
CMPE 423	Mobile Computing	3 cr.
… xxx	Cross-Department Elective 1	3 cr.
… xxx	Cross-Department Elective 2	3 cr.
	OR	
CMPE xxx	Department Technical Elective 1	

Information Security Concentration		
CMPE 430	Internet Computing	3 cr.
CMPE 431	Information Security	3 cr.
CMPE 432	Networks and Application Security	3 cr.
… xxx	Cross-Department Elective 1	3 cr.
… xxx	Cross-Department Elective 2	3 cr.
	OR	
CMPE xxx	Department Technical Elective 1	

Technical Electives Offered by the Department of Electrical and Computer Engineering (Abu Dhabi) and Department of Computer Engineering (Sharjah)		

Note: a student may still take one 300-level department course as a department elective if it is not require in his/her program and if he/she meets all prerequisites.

CMPE 421	Introduction to Network Management	3 cr.
CMPE 422	Distributed Systems	3 cr.
CMPE 423	Mobile Computing	3 cr.
CMPE 430	Internet Computing	3 cr.
CMPE 431	Information Security	3 cr.
CMPE 432	Network and Application Security	3 cr.
CMPE 441	Parallel and Distributed Processing	3 cr.
CMPE 451	Computer Graphics	3 cr.
CMPE 452	Artificial Intelligence	3 cr.
CMPE 453	Mobile Robotics	3 cr.
CMPE 454	Image Processing	3 cr.
CMPE 495	Selected Topics in Computer Engineering	3 cr.
CMPE 496A	Independent Study A	3 cr.
CMPE 496B	Independent Study B	2 cr.
CMPE 496C	Independent Study C	1 cr.
SOFE 321	Database Systems	4 cr.
SOFE 405	Software Management and Economics	3 cr.
SOFE 406	Software Evolution	3 cr.
SOFE 407	Software Models for Embedded Systems	3 cr.
SOFE 411	Information Retrieval and Knowledge Discovery	3 cr.
SOFE 495	Selected Topics in Software Engineering	3 cr.
SOFE 496A	Independent Study A	3 cr.
SOFE 496B	Independent Study B	2 cr.
SOFE 496C	Independent Study C	1 cr.

Typical Sequence of Courses for a B.Sc. degree in COMPUTER ENGINEERING

Year 1
Freshman

Course Code	Course Title	Credits
FALL SEMESTER		
ENGL 101	Academic English I	3
MATH 105	Calculus I	3
PHYS 101	General Physics I	4
CMPE 111	Principles of Computer Programming	3
ENGR 110	Intr. to Professional Engineering	1
ARBH xxx	Arabic Heritage and Culture Elective 1	3
TOTAL		**17**
SPRING SEMESTER		
ENGL 102	Academic English II	3
MATH 106	Calculus II	3
PHYS 102	General Physics II	4
CMPE 201	Intr. to Computer Organization	3
ARBH xxx	Arabic Heritage and Culture Elective 2	3
TOTAL		**16**
SPRING SESSION		
MATH 201	Calculus III	3
HUMA/ SOCS xxx	Humanities /Social Sciences Elective 1	3
TOTAL		6

Year 2
Sophomore

Course Code	Course Title	Credits
FALL SEMESTER		
MATH 204	Linear Algebra	3
MATH 207	Discrete Mathematics	3
ELCE 210	Electric Circuits I	3
ELCE 211	Electric Circuits Laboratory	1
ELCE 230	Digital Logic Design	3
ELCE 231	Digital Logic Laboratory	1
CMPE 211	Object - Oriented Programming	3
TOTAL		**17**
SPRING SEMESTER		
MATH 206	Differential Equations and Applications	3
MATH 215	Probability and Statistics	3
MATH 205	Complex Variables and Transforms	3
SOFE 201	Introduction to Software Engineering	3
ELEC 220	Electronic Circuits and Devices I	3
ELCE 221	Electronic Circuits and Devices I Lab.	1
TOTAL		**16**

Year 3
Junior

Course Code	Course Title	Credits
FALL SEMESTER		
CMPE 220	Data Structure and Algorithms	3
CMPE 321	Data Communications	3
ELCE 301	Signals and Systems	3
ELCE 332	Microprocessor Systems	3
ELCE 333	Microprocessor Systems Lab.	1
HUMA/ SOCS xxx	Humanities / Social Sciences Elective 2	3
TOTAL		**16**
SPRING SEMESTER		
CMPE 311	Java and Network Programming	3
CMPE 312	Operating Systems	3
CMPE 322	Computer Networks	3
CMPE 323	Computer Networks Lab.	1
CMPE 395	Computer Engineering Project Lab.	1
ENGL 220	Technical Writing and Communication	3
ECON 120	Engineering Economics	3
TOTAL		**17**
SUMMER SESSION		
CMPE 399	Engineering Internship	1
TOTAL		**1**

Year 4
Senior

Course Code	Course Title	Credits
FALL SEMESTER		
CMPE 401	Computer Architecture	3
ELCE 432	Embedded Sys. Design and Applications	3
CMPE 497	Senior Design Project I	2
.... xxx	Cross Dept. Technical Elective 1	3
CMPE xxx	Department Technical Elective 1	3
CMPE xxx	Department Technical Elective 2	3
TOTAL		**17**
SPRING SEMESTER		
CMPE 498	Senior Design Project II	2
CMPE 450	Ethics in Computing	3
ELCE 430	Digital Systems Design	3
MANG 200	Principles of Management	3
CMPE xxx	Department Technical Elective 3	3
.... xxx/	Cross Dept. Technical Elective 2	3
	OR	
CMPE xxx	Department Technical Elective 4	
TOTAL		**17**

Bachelor of Science (B.Sc.) in ELECTRONIC ENGINEERING

Electronic systems are at the heart of the new industrial revolution and they play a vital role that nearly affects every aspect of our modern daily lives. Mobile phones, computers, televisions, radios, satellites, transmitters, receivers, avionics, digital cameras, exchanges, embedded systems, medical diagnostic equipment, automotive systems, control and instrumentation systems and many others are all based on advanced electronic technologies, and the need for ever increasing performance in these areas is both challenging and rewarding. These systems require professional electronic engineers for their design, development, commissioning and service.

The B.Sc. in Electronic Engineering program at Khalifa University offers students quality education that provides them with the knowledge, techniques and skills that will be needed by the next generation of highly qualified electronic engineers. The program gives the students the opportunity to select a concentration track within the various exciting areas of electronic engineering. These concentration tracks include digital systems, radio frequency electronics, and control engineering.

Degree Program Objectives

- To equip students with knowledge of the fundamentals of electronic engineering, with exposure to both analytical techniques and experimentation.
- To provide students with the opportunity to specialize in fields related to electronic engineering via a list of well-designed, technology- and market-oriented electives.
- To equip students with problem solving skills and to help them develop the ability to solve engineering problems by participating in creative design projects.
- To equip students with communication skills and leadership skills within an environment that nurtures ethical behavior.
- To encourage students to pursue self-learning and personal development experiences in a rigorous program and through participation in research opportunities.

Degree Program Outcomes

Students graduating from the Department of electronic Engineering degree program will have the following abilities:

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

a1. an ability to apply knowledge of probability and statistics, including applications appropriate to the program name and objectives.

a2. an ability to apply knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.

a3. an ability to apply knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

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.

d. an ability to function on multi-disciplinary 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 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.

k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Structure and Requirements

To be recommended for the degree of B.Sc. in Electronic Engineering, students must satisfactorily complete the courses in the specified categories as set out below. The categories cover an extended set of the University General Education Requirements, and the Electronic Engineering core and Technical Electives requirements. The normal length of the program is 140 credits.

Summary of Degree Program Requirements:

Category	Credits Required
Mathematics and Science	32
Communication Skills	9
Humanities and Social Sciences	12
Economics and Management	6
Introduction to Computing	3
General Engineering Core	2
Communication Engineering Core	58
Communication Engineering Technical Electives	18
Total	**140**

DETAILED CURRICULUM REQUIREMENTS AND ELECTIVES

Mathematics and Science Requirement (32 credits)

MATH 105	Calculus I	3 cr.
MATH 106	Calculus II	3 cr.
MATH 201	Calculus III	3 cr.
MATH 204	Linear Algebra	3 cr.
MATH 205	Complex Variables and Transforms	3 cr.
MATH 206	Differential Equations and Applications	3 cr.
MATH 215	Probability and Statistics	3 cr.
PHYS 101	General Physics I	4 cr.
PHYS 102	General Physics II	4 cr.
PHYS 201	Physical Properties of Solids	3 cr.

Communication Skills Requirement (9 credits)

ENGL 101	Academic English I	3 cr.
ENGL 102	Academic English II	3 cr.
ENGL 220	Technical Writing and Communication	3 cr.

Humanities and Social Sciences Requirement (12 credits)

a. Arabic Heritage and Culture (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

b. Humanities and Social Sciences Breadth (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

Economics and Management Requirement (6 credits)

ECON 120	Engineering Economics	3 cr.
MANG 200	Principles of Management	3 cr.

Introduction to Computing Requirement (3 credits)

CMPE 111	Principles of Computer Programming	3 cr.

General Engineering Core Requirement (2 credits)

ENGR 110	Introduction to Professional Engineering	1 cr.
ENGR 390	Engineering Ethics	1 cr.

Communication Engineering Core Requirement (58 credits)

ELCE 210	Electric Circuits I	3 cr.
ELCE 211	Electric Circuits Laboratory	1 cr.
ELCE 212	Electric Circuits II	3 cr.
ELCE 220	Electronic Circuits and Devices I	3 cr.
ELCE 221	Electronic Circuits and Devices I Lab.	1 cr.
ELCE 230	Digital Logic Design	3 cr.
ELCE 231	Digital Logic Laboratory	1 cr.
CMPE 201	Introduction to Computer Organization	3 cr.
ELCE 301	Signals and Systems	3 cr.
ELCE 320	Electronic Circuits and Devices II	3 cr.
ELCE 321	Electronic Circuits and Devices II Lab.	1 cr.
ELCE 323	Instrumentations and Measurements Lab.	2 cr.
ELCE 332	Microprocessor Systems	3 cr.
ELCE 333	Microprocessor Systems Laboratory	1 cr.
ELCE 340	Electromechanical Systems	3 cr.
ELCE 344	Feedback Control Systems	3 cr.
ELCE 395	Electronic Engineering Project Lab.	1 cr.
ELCE 399	Engineering Internship	1 cr.
ELCE 345	Control Systems Laboratory	1 cr.
CMME 300	Communication Systems	3 cr.
CMME 301	Communication Systems Lab.	1 cr.
CMME 310	Applied Electromagnetics	3 cr.
ELCE 401	Digital Signal Processing	3 cr.
ELCE 402	Signal Processing Lab.	1 cr.
ELCE 430	Digital Systems Design	3 cr.
ELCE 497	Senior Design Project I	2 cr.
	AND	
ELCE 498	Senior Design Project II	2 cr.
	OR	
ELCE 499	Senior Design Project III	4 cr.

Electronic Engineering Technical Electives (18 credits)

There are a total of 18 credits (6 courses) technical electives in the Electronic Engineering Program. At least one but at most two elective courses should be taken from another program in the College of Engineering. At most one of the electives may be at 300-level.

The student may specify a concentration track before selecting the technical electives. The concentration tracks supported by the program are: Digital Systems, R.F. (Radio Frequency) Electronics, and Control Systems. The course sequences that are required by each concentration track are set out below.

Digital Systems Concentration		
ELCE 432	Embedded System Design and Applications	3 cr.
ELCE 434	VLSI Systems Design	3 cr.
ELCE 452	Digital Image Processing	3 cr.
ELCE xxx	Department Technical Elective 1	3 cr.
… xxx	Cross-Department Elective 1	3 cr.
… xxx	Cross-Department Elective 2	3 cr.
	OR	
ELCE xxx	Department Technical Elective 2	

Information Security Concentration		
ELCE 421	Filter Synthesis	3 cr.
ELCE 423	RF Circuit Design	3 cr.
ELCE 424	Microwave Circuits and Devices	3 cr.
ELCE xxx	Department Technical Elective 1	3 cr.
… xxx	Cross-Department Elective 1	3 cr.
… xxx	Cross-Department Elective 2	3 cr.
	OR	
ELCE xxx	Department Technical Elective 2	

Control Systems Concentration		
ELEC 432	Embedded Systems Design and Applications	3 cr.
ELEC 444	Digital Control Systems	3 cr.
ELEC 445	Linear Control Theory	3 cr.
ELCE xxx	Department Technical Elective 1	3 cr.
… xxx	Cross-Department Elective 1	3 cr.
…xxx	Cross-Department Elective 2	3 cr.
	OR	
ELCE xxx	Department Technical Elective 2	

Technical Electives Offered by the Department of Electronic Engineering		
ELCE 420	Power Electronics	3 cr.
ELCE 421	Filter Synthesis	3 cr.
ELCE 423	RF Circuit Design	3 cr.
ELCE 424	Microwave Circuits and Devices	3 cr.
ELCE 425	Instrumentation Systems	3 cr.
ELCE 432	Embedded Systems Design and Applications	3 cr.
ELCE 434	VLSI Systems Design	3 cr.
ELCE 436	Analog Integrated Circuits Design	3 cr.
ELCE 444	Digital Control Systems	3 cr.
ELCE 445	Linear Control Theory	3 cr.
ELCE 449	Introduction to Mechatronics	3 cr.
ELCE 452	Digital Image Processing	3 cr.
ELCE 455	Multimedia Systems	3 cr.
ELCE 495	Selected Topics in Electronic Engineering	3 cr.
ELCE 496A	Independent Study A	3 cr.
ELCE 496B	Independent Study B	2 cr.
ELCE 496C	Independent Study C	1 cr.

Typical Sequence of Courses for a B.Sc. degree in ELECTRONIC ENGINEERING

Year 1
Freshman

Course Code	Course Title	Credits
FALL SEMESTER		
ENGL 101	Academic English I	3
MATH 105	Calculus I	3
PHYS 101	General Physics I	4
CMPE 111	Principles of Computer Programming	3
ENGR 110	Intr. to Professional Engineering	1
ARBH xxx	Arabic Heritage and Culture Elective 1	3
TOTAL		**17**
SPRING SEMESTER		
ENGL 102	Academic English II	3
MATH 106	Calculus II	3
PHYS 102	General Physics II	4
CMPE 201	Intr. to Computer Organization	3
ARBH xxx	Arabic Heritage and Culture Elective 2	3
TOTAL		**16**
SUMMER SESSION		
MATH 201	Calculus III	3
HUMA/ SOCS xxx	Humanities /Social Sciences Elective 1	3
TOTAL		6

Year 2
Sophomore

Course Code	Course Title	Credits
FALL SEMESTER		
PHYS 201	Physical Properties of Solids	3
MATH 205	Complex Variables and Transforms	3
MATH 204	Linear Algebra	3
ELCE 210	Electric Circuits I	3
ELCE 211	Electric Circuits Laboratory	1
ELCE 230	Digital Logic Design	3
ELCE 231	Digital Logic Laboratory	1
TOTAL		**17**
SPRING SEMESTER		
ELCE 212	Electric Circuits II	3
ELCE 220	Electronic Circuits and Devices I	3
ELCE 221	Electronic Circuits and Devices I Lab.	1
MATH 206	Differential Equations and Applications	3
MATH 215	Probabilities and Statistics	3
ENGL 220	Technical Writing and Communication	3
TOTAL		**16**

Year 3
Junior

Course Code	Course Title	Credits
FALL SEMESTER		
ELCE 301	Signals and Systems	3
ELCE 320	Electronic Circuits and Devices II	3
ELCE 321	Electronic Circuits and Devices II Lab.	1
ELCE 332	Microprocessor Systems	3
ELCE 333	Microprocessor Systems Lab.	1
CMME 310	Applied Electromagnetics	3
HUMA/SOCS xxx	Humanities / Social Sciences Elective 2	3
TOTAL		**17**
SPRING SEMESTER		
ELCE 323	Instrumentations and Measurements Lab.	2
ELCE 340	Electromechanical Systems	3
ELCE 344	Feedback Control Systems	3
ELCE 345	Control Systems Lab.	1
ELCE 395	Electronic Engineering Project Lab.	1
CMME 300	Communication Systems	3
CMME 301	Communication Sys-tems Lab.	1
ENGR 390	Engineering Ethics	1
ECON 120	Engineering Economics	3
TOTAL		**18**
SUMMER SESSION		
CMPE 399	Engineering Internship	1
TOTAL		**1**

Year 4
Senior

Course Code	Course Title	Credits
FALL SEMESTER		
ELCE 401	Digital Signal Processing	3
ELCE 402	Signal Processing Lab.	1
MANG 200	Principles of Management	3
ELCE 497	Senior Design Project I	2
.... xxx	Cross Dept. Technical Elective 1	3
ELCE xxx	Department Technical Elective 1	3
TOTAL		**15**
SPRING SEMESTER		
ELCE 498	Senior Design Project II	2
ELCE 430	Digital Systems Design	3
ELCE xxx	Department Technical Elective 2	3
ELCE xxx	Department Technical Elective 3	3
ELCE xxx	Department Technical Elective 4	3
.... xxx/	Cross Dept. Technical Elective 2	3
	OR	
ELCE xxx	Department Technical Elective 5	
TOTAL		**17**

Bachelor of Science (B.Sc.) in INDUSTRIAL AND SYSTEMS ENGINEERING

This program lays the foundation for the core industrial and systems engineering discipline while engaging students to study and understand the overall global industrial and systems profession and industry. Principles of science and engineering are applied to the design and analysis of problems in industrial and systems engineering in well-designed course sequences to ensure that students gain hands on and problem-based learning experiences. The mission of the industrial and systems engineering program at Khalifa University is to provide solid high quality education and prepare students for successful careers in this field.

Degree Program Objectives

- To equip students with knowledge of the fundamentals of industrial & systems engineering engineering, with exposure to both analytical techniques and experimentation.
- To provide students with the opportunity to specialize in fields related to industrial & systems engineering via a list of well-designed, technology- and market-oriented electives.
- To equip students with problem solving skills and to help them develop the ability to solve engineering problems by participating in creative design projects.
- To equip students with communication skills and leadership skills within an environment that nurtures ethical behavior.
- To encourage students to pursue self-learning and personal development experiences in a rigorous program and through participation in research opportunities.

Degree Program Outcomes

Students graduating from the Department of Industrial & Systems Engineering degree program will have the following abilities:

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.

d. an ability to function on multi-disciplinary 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 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.

k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Structure and Requirements

To be recommended for the degree of B.Sc. in Industrial and Systems Engineering, students must satisfactorily complete the courses in the specified categories as set out below. The categories cover an extended set of the University General Education Requirements, and the Industrial and Systems Engineering core and Technical Electives requirements. The normal length of the program is 140 credits.

Summary of Degree Program Requirements:

Category	Credits Required
Mathematics and Science	29
Communication Skills	9
Humanities and Social Sciences	12
Economics and Management	6
Introduction to Computing	12
General Engineering Core	2
Industrial & Systems Engineering Core	31
Industrial & Systems Engineering Technical Electives	**39**
Total	**140**

DETAILED CURRICULUM REQUIREMENTS AND ELECTIVES

Mathematics and Science Requirement (29 credits)

MATH 105	Calculus I	3 cr.
MATH 106	Calculus II	3 cr.
MATH 201	Calculus III	3 cr.
MATH 204	Linear Algebra	3 cr.
MATH 205	Complex Variables and Transforms	3 cr.
MATH 206	Differential Equations and Applications	3 cr.
MATH 207	Discrete Mathematics	3 cr.
PHYS 101	General Physics I	4 cr.
PHYS 102	General Physics II	4 cr.

Communication Skills Requirement (9 credits)

ENGL 101	Academic English I	3 cr.
ENGL 102	Academic English II	3 cr.
ENGL 220	Technical Writing and Communication	3 cr.

Humanities and Social Sciences Requirement (12 credits)

a. Arabic Heritage and Culture (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

b. Humanities and Social Sciences Breadth (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

Economics and Management Requirement (6 credits)

ECON 120	Engineering Economics	3 cr.
MANG 200	Principles of Management	3 cr.

Introduction to Computing Requirement (12 credits)

CMPE 111	Principles of Computer Programming	3 cr.
CMPE 201	Introduction to Computer Organization	3 cr.
CMPE 211	Object-Oriented Programming	3 cr.
CMPE 220	Data Structure and Algorithms	3 cr.

General Engineering Core Requirement (5 credits)

ENGR 110	Introduction to Professional Engineering	1 cr.
ENGR 200	Statics	3 cr.
ENGR 390	Engineering Ethics	1 cr.

Industrial and Systems Engineering Core Requirement (31 credits)

ISYE 201	Introduction to Systems Engineering	3 cr.
ISYE 211	Probability with Applications	3 cr.
ISYE 221	Basic Statistical Methods	3 cr.
ISYE 331	Stochastic Processes	3 cr.
ISYE 341	Simulation Analysis and Design	3 cr.
ISYE 351	Linear Programming	3 cr.
ISYE 361	Data and Information Engineering	3 cr.
ISYE 371	Supply Chain Modeling: Logistics	3 cr.
ISYE 399	Engineering Internship	1 cr.
ISYE 497	Senior Design Project I	3 cr.
ISYE 498	Senior Design Project II	3 cr.

Industrial and Systems Engineering Technical Course Electives (39 credits)

There are a total of 39 credits (13 courses) of specialty electives in the Industrial and Systems Engineering Program. The student must select 2 courses from Applied Statistics, 6 from Advanced Topics in OR and 5 courses in Advanced Topics in ISYE.

APPLIED STATISTICS (pick 2)

ISYE 321	Quality Control	3 cr.
ISYE 322	Reliability	3 cr.
ISYE 323	Forecasting and Time Series	3 cr.

ADVANCED TOPICS IN OR (pick 6)

ISYE 411	Advanced Stochastic Processes	3 cr.
ISYE 421	Advanced Statistics	3 cr.
ISYE 441	Advanced Simulation	3 cr.
ISYE 451	Integer Programming	3 cr.
ISYE 452	Advanced Optimization	3 cr.
ISYE 491	Undergraduate Research Project	3 cr.

ADVANCED TOPICS IN ISYE (pick 5)

ISYE 401	Advanced Systems Engineering	3 cr.
ISYE 460	Human Factors	3 cr.
ISYE 461	Design of Human Integrated Systems	3 cr.
ISYE 471	Advanced Supply Chain Logistics	3 cr.
ISYE 472	Manufacturing and Warehousing	3 cr.
ISYE 480	Financial Engineering	3 cr.
ISYE 485	Stochastic Manufacturing and Service Systems	3 cr.
ISYE 495	Healthcare/Service Applications	3 cr.

Typical Sequence of Courses for a B.Sc. degree in INDUSTRIAL AND SYSTEMS ENGINEERING

Year 1
Freshman

Course Code	Course Title	Credits
FALL SEMESTER		
ENGL 101	Academic English I	3
MATH 105	Calculus I	3
PHYS 101	General Physics I	4
CMPE 111	Principles of Computer Programming	3
ENGR 110	Intr. to Professional Engineering	1
ARBH xxx	Arabic Heritage and Culture Elective 1	3
TOTAL		**17**
SPRING SEMESTER		
ENGL 102	Academic English II	3
MATH 106	Calculus II	3
PHYS 102	General Physics II	4
CMPE 201	Intr. to Computer Organization	3
ARBH xxx	Arabic Heritage and Culture Elective 2	3
TOTAL		**16**

Year 2
Sophomore

Course Code	Course Title	Credits
FALL SEMESTER		
ENGR 200	Statics	3
MATH 201	Calculus III	3
MATH 207	Discrete Mathematics	3
CMPE 211	Object-Oriented Programming	3
ISYE 201	Introduction to Systems Engineering	3
ISYE 211	Probability of Applications	3
TOTAL		**18**
SPRING SEMESTER		
CMPE 220	Data Structure and Algorithms	3
MATH 204	Linear Algebra	3
MATH 206	Differential Equations and Applications	3
ISYE 221	Basic Statistical Methods	3
ISYE 331	Stochastic Processes	3
ISYE 351	Linear Programming	3
TOTAL		**18**

Year 3
Junior

Course Code	Course Title	Credits
FALL SEMESTER		
MATH 205	Complex Variables and Transforms	3
ISYE 341	Simulation Analysis and Design	3
ISYE 361	Data and information Engineering	3
ISYE 371	Supply Chain Modeling: Logistics	3
ENGL 220	Technical Writing and Communication	3
ISYE xxx	Department Technical Elective 1	3
TOTAL		**18**
SPRING SEMESTER		
ECON 120	Engineering Economics	3
HUMA/SOCS xxx	Humanities and Social Sciences Elective 1	3
ISYE XXX	Department Technical Elective 2	3
ISYE XXX	Department Technical Elective 3	3
ISYE XXX	Department Technical Elective 4	3
ENGR 390	Engineering Ethics	1
TOTAL		**16**
SUMMER SESSION		
ISYE 399	Engineering Internship	1
TOTAL		**1**

Year 4
Senior

Course Code	Course Title	Credits
FALL SEMESTER		
MANG 200	Principles of Management	3
HUMA/SOCS xxx	Humanities and Social Sciences Elective 2	3
ISYE XXX	Department Technical Elective 5	3
ISYE XXX	Department Technical Elective 6	3
ISYE XXX	Department Technical Elective 7	3
ISYE 497	Senior Design Project I	3
TOTAL		**18**
SPRING SEMESTER		
ISYE XXX	Department Technical Elective 8	3
ISYE XXX	Department Technical Elective 9	3
ISYE XXX	Department Technical Elective 10	3
ISYE XXX	Department Technical Elective 11	3
ISYE XXX	Department Technical Elective 12	3
ISYE 498	Senior Design Project II	3
TOTAL		**18**

Bachelor of Science (B.Sc.) in MECHANICAL ENGINEERING

The mechanical engineering program is designed to provide comprehensive engineering education for students interested in machines, thermo-fluids and energy systems. Complex mechanical systems involve structures, advanced materials, sensors and thermo-fluid systems. Given KUSTAR's mission, the students will be exposed to this core engineering discipline through the study and application of the principles of physics to a broad range of systems, ranging from nanodevices to large scale power plants. Laboratories and industry led projects allow graduates to be ready to create the next generation of ideas and products.

Degree Program Objectives

- To equip students with knowledge of the fundamentals of mechanical engineering engineering, with exposure to both analytical techniques and experimentation.
- To provide students with the opportunity to specialize in fields related to mechanical engineering via a list of well-designed, technology- and market-oriented electives.
- To equip students with problem solving skills and to help them develop the ability to solve engineering problems by participating in creative design projects.
- To equip students with communication skills and leadership skills within an environment that nurtures ethical behavior.
- To encourage students to pursue self-learning and personal development experiences in a rigorous program and through participation in research opportunities.

Degree Program Outcomes

Students graduating from the Department of Mechanical Engineering degree program will have the following abilities:

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.

d. an ability to function on multi-disciplinary 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 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.

k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Structure and Requirements

To be recommended for the degree of B.Sc. in Mechanical Engineering, students must satisfactorily complete the courses in the specified categories as set out below. The categories cover an extended set of the University General Education Requirements, and the Computer Engineering core and Technical Electives requirements. The normal length of the program is 140 credits.

Summary of Degree Program Requirements:

Category	Credits Required
Mathematics and Science	33
Communication Skills	9
Humanities and Social Sciences	9
Economics and Management	6
Introduction to Computing	3
General Engineering Core	7
Mechanical Engineering Core	64
Mechanical Engineering Technical Electives	**9**
Total	**140**

DETAILED CURRICULUM REQUIREMENTS AND ELECTIVES

Mathematics and Science Requirement (33 credits)

CHEM 101	General Chemistry I	4 cr.
MATH 105	Calculus I	3 cr.
MATH 106	Calculus II	3 cr.
MATH 201	Calculus III	3 cr.
MATH 204	Linear Algebra	3 cr.
MATH 205	Complex Variables and Transforms	3 cr.
MATH 206	Differential Equations and Applications	3 cr.
MATH 215	Probability and Statistics	3 cr.
PHYS 101	General Physics I	4 cr.
PHYS 102	General Physics II	4 cr.

Communication Skills Requirement (9 credits)

ENGL 101	Academic English I	3 cr.
ENGL 102	Academic English II	3 cr.
ENGL 220	Technical Writing and Communication	3 cr.

Humanities and Social Sciences Requirement (9 credits)

a. Arabic Heritage and Culture (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

b. Humanities and Social Sciences Breadth (3 credits)

Select 3 credits from the list of University General Education Requirements in this category.

Economics and Management Requirement (6 credits)

ECON 120	Engineering Economics	3 cr.
MANG 200	Principles of Management	3 cr.

Introduction to Computing Requirement (3 credits)

CMPE 111	Principles of Computer Programming	3 cr.

General Engineering Core Requirement (7 credits)

ENGR 110	Introduction to Professional Engineering	1 cr.
ENGR 180	Engineering Graphical Design	2 cr.
ENGR 200	Statics	3 cr.
ENGR 390	Engineering Ethics	1 cr.

Mechanical Engineering Core Requirement (64 credits)

MECH 181	Problem Solving in Mechanical Engineering	3 cr.
ELCE200	Fundamentals of Electronic Systems	4 cr.
MECH 201	Engineering Dynamics	3 cr.
MECH 220	Engineering Materials	3 cr.
MECH 230	Fluid Mechanics I	3 cr.
MECH 301	Machine Dynamics	3 cr.
MECH 320	Mechanics of Solids I	3 cr.
MECH 321	Mechanics of Solids II	4 cr.
MECH 330	Fluid Mechanics II	4 cr.
MECH 340	Thermodynamics	3 cr.
MECH 341	Heat Transfer	3 cr.
MECH 350	System Dynamics and Vibrations	3 cr.
MECH 351	Feedback Control Systems	4 cr.
MECH 385	Machine Design and Practice	3 cr.
MECH 399	Professional Internship	1 cr.
MECH 420	Materials: Strength and Fracture	3 cr.
MECH 440	Thermodynamics & Heat Transfer Laboratory	2 cr.
MECH 450	Vehicle Engineering	3 cr.
MECH 470	Principles of Manufacturing	3 cr.
MECH 480	Mechanical Senior Design Project I	3 cr.
MECH 481	Mechanical Senior Design Project II	3 cr.

Mechanical Engineering Electives (9 credits)

There are a total of 42 credits (14 courses) of technical electives in the Mechanical Engineering Program. The student must select nine (9) credits from the specified courses shown.

AERO 426	Designing with Composites	3 cr.
ENGR 455	Finite Element Analysis	3 cr.
ENGR 465	Methods of Engineering Analysis	3 cr.
MECH 405	Vibration Analysis	3 cr.
MECH 421	Mechanics of Deformable Solids	3 cr.
MECH 422	Fatigue and Fracture Analysis	3 cr.
MECH 435	Fluid Machinery	3 cr.
MECH 441	Applied Thermodynamics	3 cr.
MECH 445	Heating and Air Conditioning	3 cr.
MECH 446	Internal Combustion Engines	3 cr.
MECH 455	Robotics	3 cr.
MECH 465	Bioengineering	3 cr.
MECH 485	Power Plant Systems Design	3 cr.
MECH 491	Undergraduate Research Project	3 cr.

Typical Sequence of Courses for a B.Sc. degree in MECHANICAL ENGINEERING

Year 1
Freshman

Course Code	Course Title	Credits
FALL SEMESTER		
ARBH xxx	Arabic Heritage and Culture Elective 1	3
CMPE 111	Principles of Computer Programming	3
ENGL 101	Academic English I	3
ENGR 101	Introduction to Professional Engineering	1
MATH 105	Calculus I	3
PHYS 101	General Physics I	4
TOTAL		**17**
SPRING SEMESTER		
ARBH xxx	Arabic Heritage and Culture Elective 2	3
ENGL 102	Academic English II	3
MECH 181	Problem Solving in Mechanical Engineering	3
ENGR 180	Engineering Graphical Design	2
MATH 106	Calculus II	3
PHYS 102	General Physics II	4
TOTAL		**18**

Year 2
Sophomore

Course Code	Course Title	Credits
FALL SEMESTER		
CHEM 101	General Chemistry I	4
ENGL 220	Technical Writing and Communication	3
ENGR 200	Statics	3
MATH 201	Calculus III	3
ELCE 200	Fundamentals of Electronic Systems	4
TOTAL		**17**
SPRING SEMESTER		
MECH 201	Engineering Dynamics	3
MECH 220	Engineering Materials	3
MATH 204	Linear Algebra	3
MATH 206	Differential Equations and Applications	3
MECH 230	Fluid Mechanics I	3
HUMA /SOCS xxx	Humanities and Social Sciences Elective 1	3
TOTAL		**18**

Year 3
Junior

Course Code	Course Title	Credits
FALL SEMESTER		
MATH 205	Complex Variables and Transforms	3
MECH 350	System Dynamics and Vibrations	3
MECH 330	Fluid Mechanics II	4
MECH 320	Mechanics of Solids I	3
MECH 340	Thermodynamics	3
ENGR 390	Engineering Ethics	1
TOTAL		**17**
SPRING SEMESTER		
MECH 321	Mechanics of Solids II	4
MECH 351	Feedback Control Systems	4
MECH 341	Heat Transfer	3
MECH 301	Machine Dynamics	3
MECH 385	Machine Design and Practice	3
TOTAL		**17**
SUMMER SESSION		
MECH 399	Engineering Internship	1
TOTAL		**1**

Year 4
Senior

Course Code	Course Title	Credits
FALL SEMESTER		
MATH 215	Probability and Statistics	3
MECH 480	Senior Design Project I	3
MECH 440	Thermodynamics and Heat Transfer Lab	2
MECH 450	Vehicle Engineering	3
MECH 470	Principles of Manufacturing	3
MECH 420	Materials: Strength and Fracture	3
TOTAL		**17**
SPRING SEMESTER		
MANG 200	Principles of Management	3
ECON 120	Engineering Economics	3
MECH 481	Senior Design Project II	3
MECH xxx	Department Technical Elective 1	3
MECH xxx	Department Technical Elective 2	3
MECH xxx	Department Technical Elective 3	3
	OR	
MECH 491	Undergraduate Research Project	
TOTAL		**18**

Bachelor of Science (B.Sc.) in SOFTWARE ENGINEERING

Software Engineering is concerned with the development of large and complex software intensive systems. It focuses on real-world requirements, precise specification of system functionality and behavior, cost-effective and timely implementation of these specifications, and quality assurance to ensure that the specifications have been properly realized, that the requirements have been met, and that they continue to be met during the life-time of the system.

Degree Program Objectives

- To equip students with knowledge of the fundamentals of software engineering, with exposure to both analytical techniques and experimentation.
- To provide students with the opportunity to specialize in fields related to software engineering via a list of well-designed, technology- and market-oriented electives.
- To equip students with problem solving skills and to help them develop the ability to solve engineering problems by participating in creative design projects.
- To equip students with communication skills and leadership skills within an environment that nurtures ethical behavior.
- To encourage students to pursue self-learning and personal development experiences in a rigorous program and through participation in research opportunities.

Degree Program Outcomes

Students graduating from the Department of Software Engineering degree program will have the following abilities:

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

a1. an ability to apply knowledge of probability and statistics, including applications appropriate to the program name and objectives.

a2. an ability to apply knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.

a3. an ability to apply knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

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.

d. an ability to function on multi-disciplinary 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 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.

k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Structure and Requirements

To be recommended for the degree of B.Sc. in Software Engineering, students must satisfactorily complete the courses in the specified categories as set out below. The categories cover an extended set of the University General Education Requirements, and the Software Engineering core and Technical Electives requirements. The normal length of the program is 138 credits.

Summary of Degree Program Requirements:

Category	Credits Required
Mathematics and Science	32
Communication Skills	9
Humanities and Social Sciences	12
Economics and Management	6
Introduction to Computing	3
General Engineering Core	1
Software Engineering Core	60
Software Engineering Technical Electives	15
Total	**138**

DETAILED CURRICULUM REQUIREMENTS AND ELECTIVES

Mathematics and Science Requirement (32 credits)

MATH 105	Calculus I	3 cr.
MATH 106	Calculus II	3 cr.
MATH 201	Calculus III	3 cr.
MATH 204	Linear Algebra	3 cr.
MATH 207	Discrete Mathematics	3 cr.
MATH 215	Probability and Statistics	3 cr.
MATH 310	Simulation and System Modeling	3 cr.
PHYS 101	General Physics I	4 cr.
PHYS 102	General Physics II	4 cr.
… xxx	Math/Science Elective	3 cr.

Communication Skills Requirement (9 credits)

ENGL 101	Academic English I	3 cr.
ENGL 102	Academic English II	3 cr.
ENGL 220	Technical Writing and Communication	3 cr.

Humanities and Social Sciences Requirement (12 credits)

a. Arabic Heritage and Culture (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

b. Humanities and Social Sciences Breadth (6 credits)

Select 6 credits from the list of University General Education Requirements in this category.

Economics and Management Requirement (6 credits)

ECON 120	Engineering Economics	3 cr.
MANG 200	Principles of Management	3 cr.

Introduction to Computing Requirement (3 credits)

CMPE 111	Principles of Computer Programming	3 cr.

General Engineering Core Requirement (1 credits)

ENGR 110	Introduction to Professional Engineering	1 cr.

Software Engineering Core Requirement (60 credits)

ELCE 200	Fundamentals of Electronic Systems	4 cr.
ELCE 230	Digital Logic Design	3 cr.
ELCE 231	Digital Logic Lab	1 cr.
CMPE 211	Object-Oriented Programming	3 cr.
CMPE 201	Introduction to Computer Organization	3 cr.
CMPE 220	Data Structure and Algorithms	3 cr.
CMPE 311	Java and Network Programming	3 cr.
CMPE 321	Data Communications	3 cr.
CMPE 312	Operating Systems	3 cr.
CMPE 422	Distributed Systems	3 cr.
CMPE 450	Ethics in Computing	3 cr.
SOFE 201	Introduction to Software Engineering	3 cr.
SOFE 301	System Analysis and Design	3 cr.
SOFE 302	Introduction to Human Computer Interfaces	3 cr.
SOFE 321	Database Systems	4 cr.
SOFE 351	Software Testing and Quality Assurance	3 cr.
SOFE 399	Engineering Internship	1 cr.
SOFE 401	Formal Methods in Software Engineering	4 cr.
SOFE 403	Software Architecture	3 cr.
SOFE 497	Senior Design Project I	2 cr.
SOFE 498	Senior Design Project II	2 cr.

Software Engineering Technical Electives (15 credits)

There are a total of 15 credits (5 courses) of electives in the Software Engineering Program. At least one but at most two elective courses should be taken from another Department. At most one of the electives may be at 300-level.

Technical Electives Offered by the Department of Electrical and Computer Engineering (Abu Dhabi) and Department of Computer Engineering (Sharjah)

Note: a student may still take one 300-level department course as a department
elective if it is not require in his/her program and if he/she meets all prerequisites.

CMPE 421	Introduction to Network Management	3 cr.
CMPE 422	Distributed Systems	3 cr.
CMPE 423	Mobile Computing	3 cr.
CMPE 430	Internet Computing	3 cr.
CMPE 431	Information Security	3 cr.
CMPE 432	Network and Application Security	3 cr.
CMPE 441	Parallel and Distributed Processing	3 cr.
CMPE 451	Computer Graphics	3 cr.
CMPE 452	Artificial Intelligence	3 cr.
CMPE 453	Mobile Robotics	3 cr.
CMPE 454	Image Processing	3 cr.
CMPE 495	Selected Topics in Computer Engineering	3 cr.
CMPE 496A	Independent Study A	3 cr.
CMPE 496B	Independent Study B	2 cr.
CMPE 496C	Independent Study C	1 cr.

SOFE 321	Database Systems	4 cr.
SOFE 405	Software Management and Economics	3 cr.
SOFE 406	Software Evolution	3 cr.
SOFE 407	Software Models for Embedded Systems	3 cr.
SOFE 411	Information Retrieval and Knowledge Discovery	3 cr.
SOFE 495	Selected Topics in Software Engineering	3 cr.
SOFE 496A	Independent Study A	3 cr.
SOFE 496B	Independent Study B	2 cr.
SOFE 496C	Independent Study C	1 cr.

Typical Sequence of Courses for a B.Sc. degree in SOFTWARE ENGINEERING

Year 1
Freshman

Course Code	Course Title	Credits
FALL SEMESTER		
ENGL 101	Academic English I	3
MATH 105	Calculus I	3
PHYS 101	General Physics I	4
CMPE 111	Principles of Computer Programming	3
ENGR 110	Intr. to Professional Engineering	1
ARBH xxx	Arabic Heritage and Culture Elective 1	3
TOTAL		**17**
SPRING SEMESTER		
ENGL 102	Academic English II	3
MATH 106	Calculus II	3
PHYS 102	General Physics II	4
CMPE 201	Intr. to Computer Organization	3
ARBH xxx	Arabic Heritage and Culture Elective 2	3
TOTAL		**16**
SUMMER SESSION		
MATH 201	Calculus III	3
HUMA/ SOCS xxx	Humanities /Social Sciences Elective 1	3
TOTAL		6

Year 2
Sophomore

Course Code	Course Title	Credits
FALL SEMESTER		
MATH 207	Discrete Mathematics	3
ELCE 200	Fundamentals of Electronic Systems	4
ELCE 230	Digital Logic Design	3
ELCE 231	Digital Logic Laboratory	1
CMPE 211	Object- Oriented Programming	3
HUMA/ SOCS xxx	Humanities /Social Sciences Elective 2	3
TOTAL		**17**
SPRING SEMESTER		
MATH 204	Linear Algebra	3
MATH 215	Probability and Statistics	3
CMPE 220	Data Structure and Algorithms	3
SOFE 201	Introduction to Software Engineering	3
… xxx	Math/Science Elective	3
ENGL 220	Technical Writing and Communication	3
TOTAL		**18**

Year 3
Junior

Course Code	Course Title	Credits
FALL SEMESTER		
ECON 120	Engineering Economics	3
CMPE 321	Data Communications	3
SOFE 301	System Analysis & Design	3
SOFE 302	Intr. to Human Computer Interfaces	3
MATH 310	Simulation and System Modeling	3
TOTAL		**15**
SPRING SEMESTER		
CMPE 311	Java and Network Programming	3
CMPE 312	Operating Systems	3
SOFE 351	Software Testing and Quality Assurance	3
SOFE 321	Database Systems	4
MANG 200	Principles of Management	3
TOTAL		**16**
SPRING SESSION		
SOFE 399	Engineering Internship	1
TOTAL		**1**

Year 4
Senior

Course Code	Course Title	Credits
FALL SEMESTER		
SOFE 401	Formal Methods in Software Eng.	4
SOFE 497	Senior Design Project I	2
.... xxx	Cross Dept. Technical Elective 1	3
SOFE xxx	Department Technical Elective 1	3
.... xxx	Cross Dept. Technical Elective 2	3
TOTAL		**15**
SPRING SEMESTER		
SOFE 403	Software Architecture	3
SOFE 498	Senior Design Project II	2
CMPE 422	Distributed Systems	3
CMPE 450	Ethics in Computing	3
SOFE xxx	Department Technical Elective 2	
.... xxx/	Cross Dept. Technical Elective 3	
	OR	
SOFE xxx	Department Technical Elective 3	3
TOTAL		**17**

GENERAL STUDIES

The Department of General Studies is part of the College of Engineering. This Department does not offer undergraduate degree programs at present; however, it runs courses that support degree programs across the University. The general areas and the courses offered are listed below:

Business Courses		
ECON 120	Engineering Economics	3 cr.
MANG 200	Principles of Management	3 cr.

English Language Courses		
ENGL 101	Academic English I	3 cr.
ENGL 102	Academic English II	3 cr.
ENGL 220	Technical Writing and Communication	3 cr.

Humanities and Social Sciences Courses		
Arabic Heritage and Culture		
ARBH 101	Arabic Language	3 cr.
ARBH 102	Islamic Culture	3 cr.
ARBH 105	Emirates Society	3 cr.
ARBH 106	Gulf Region Economic and Social Outlook	3 cr.
Humanities		
HUMA 110	Middle East Studies	3 cr.
HUMA 111	Islamic History	3 cr.
HUMA 112	Sciences in Islam	3 cr.
HUMA 130	Introduction to Linguistics	3 cr.
Social Sciences		
SOCS 105	Science, Technology, and Society	3 cr.
SOCS 130	Mass Media and Society	3 cr.
SOCS 140	Critical Thinking	3 cr.
SOCS 150	Comparative Cultural Studies	3 cr.
SOCS 200	Introduction to Politics: Theories of History and Civil Society	3 cr.

Mathematics and Science Courses		
Mathematics and Quantitative Reasoning		
MATH 105	Calculus I	3 cr.
MATH 106	Calculus II	3 cr.
MATH 201	Calculus III	3 cr.
MATH 204	Linear Algebra	3 cr.
MATH 205	Complex Variables and Transforms	3 cr.
MATH 206	Differential Equations and Applications	3 cr.
MATH 207	Discrete Mathematics	3 cr.
MATH 215	Probability and Statistics	3 cr.
MATH 310	Simulation and Modeling	3 cr.
Natural and Physical Sciences		
CHEM 101	General Chemistry I	4 cr.
CHEM 102	General Chemistry II	4 cr.
GSCI 101	Earth Science	3 cr.
GSCI 105	General Astronomy	3 cr.
PHYS 101	General Physics I	4 cr.
PHYS 102	General Physics II	4 cr.
PHYS 201	Physical Properties of Solids	3 cr.

PREPARATORY PROGRAM

As English is the medium of instruction in all Kahlifa University degree programs, students must have a working knowledge of academic and scientific English; be able to use mathematics to solve abstract problems and describe observable phenomena; and possess necessary computing skills for the study of professional engineering. Students who lack these skills but show promise of success in Khalifa's professional engineering degree programs may be conditionally admitted to the Preparatory Program.

The Preparatory Program consists of a full-time program of intensive study in English, Mathematics, Physics, Computer Technology, and necessary Study Skills. Students are regularly assessed to determine if they meet program requirements for continued study in the Preparatory Program or for full admission to the degree program.

Based on an assessment of a student's overall achievement in the Preparatory Program, a student with required English proficiency may be allowed to take appropriate degree courses to a limit of 15 credits.

To be fully admitted to the degree program, a Preparatory student must achieve a minimum composite score of 6.0 on the IELTS examination and demonstrate sufficient progress in mathematics, physics and computing.

Curriculum

Based on the results of placement testing, students are enrolled in coursework appropriate to the level of their academic achievement. Students will be admitted to the 1 year or 6 month program.

English Language Courses		
ENGL 001	Preparatory English I	9 cr.
ENGL 002	Preparatory English II	9 cr.

Computing Courses		
CMPE 001	IT Skills	1 cr.
CMPE 002	Introduction to Information Technology	2 cr.

Mathematics and Science Courses		
Mathematics and Quantitative Reasoning		
MATH 001	Preparatory Mathematics I	3 cr.
MATH 002	Preparatory Mathematics II	4 cr.
Natural and Physical Sciences		
PHYS 001	Preparatory Physics I	2 cr.
PHYS 002	Preparatory Physics II	3 cr.

Study Skills		
STSK 001	Study Skills I	1 cr.
STSK 002	Study Skills II	1 cr.

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COURSE DESCRIPTIONS

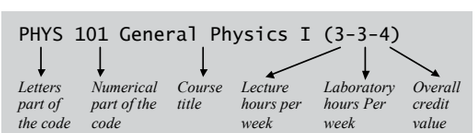
Course Title, Code and Credit Value

Each course offered at the University has a unique code, a title and a credit value.
The course code consists of four letters that reflect its discipline or field of study, followed by a three-digit number that indicates its level. The title of the course gives an indication of its content.

The credit value of the course has three numbers:

- The first one gives the number of lecture hours per week,
- The second shows the number of laboratory or problem solving hours per week,
- The third one gives the overall credit value of the course which will contribute to the particular degree requirements.

The example below further explains the course code and value information:



AEROSPACE ENGINEERING

AERO 181 **Problem Solving in Aerospace Engineering (2-3-3)**
Prerequisite: CMPE 111
Co-requisite: ENGR 180

Introduction to engineering including design, fabrication, and visual communication conveyed via lectures and laboratory experiences. The lecture portion of the course starts with an introduction to mechanical and aeronautical engineering, engineering design and manufacturing. The course continues with topics covering the design process, creativity, teamwork, project skills and reverse engineering. Students will utilize graphics and modeling fundamentals for engineering design (e.g. freehand sketching, computer modeling of solid geometry and generation of engineering drawings). Application of the design process and problem solving through individual and team projects are emphasized.

AERO 201 **Engineering Dynamics (3-0-3)**
Prerequisite: ENGR 200

Review of kinematics and kinetics of particles: rectilinear and curvilinear motions; Newton's second law; energy and momentum methods. Kinematics and kinetics of rigid bodies: plane motion of rigid bodies; forces and accelerations; energy and momentum methods.

AERO 220 **Engineering Materials (3-0-3)**
Prerequisites: CHEM 101, MATH 105, PHYS 101

Materials (metals, alloys, polymers) in engineering service; relationship of inter-atomic bonding, crystal structure and defect structure (vacancies, dislocations) to material properties; polymers, phase diagrams and alloys; microstructure control (heat treatment) and mechanical properties; material failure; corrosion.

AERO 230 **Fluid Mechanics I (3-0-3)**
Prerequisites: PHYS 101, MATH 201

Fluid properties. Units. Kinematics, dynamics of fluid motion: concepts of streamline, control volume, steady and one-dimensional flows; continuity, Euler, Bernoulli, steady flow energy, momentum, moment of momentum equations; applications. Fluid statics; pressure distribution in fluid at rest; hydrostatic forces on plane and curved surfaces; buoyancy.

AERO 320 **Mechanics of Solids I (3-0-3)**
Prerequisites: ENGR 200, PHYS 101

Review of Principles of Statics; friction problems; Concepts of stress and strain at a point; statically determinate and indeterminate stress systems; torsion of circular sections; bending moment and shear force diagrams; stresses and deflections in bending; stress and strain transformations.

AERO 321 **Aircraft Structures I (3-3-4)**
Prerequisites: AERO 220, AERO 320

Course covers the design/failure criteria for aerospace structures, advanced strength of materials analysis of elastic structures, materials selection, structural assemblies, vibration and bending of plates and beams and analysis of aircraft skin structures.

AERO 330 **Low Speed Aerodynamics (3-3-4)**
Prerequisites: MATH 201, AERO 230 or MECH 230
Co-requisite: MATH 205

Explores the fundamental principles of fluid dynamics, theory of inviscid incompressible flow, thin airfoils, high aspect ratio wings, delta wings, vortex panel and vortex lattice methods, turbulence and its effects.

AERO 331 **High Speed Aerodynamics (3-0-3)**
Prerequisites: AERO 330, AERO 340

Compressible potential flow; method of characteristics; Compressibility effects on airfoils and wing aerodynamics; transonic aerodynamics; boundary layer effects on aircraft performance

AERO 340 **Thermodynamics (3-0-3)**
Prerequisites: CHEM 101, PHYS 101, MATH 201

Basic concepts of thermodynamics: temperature, work, heat, internal energy and enthalpy. First law of thermodynamics for closed and

steady-flow open systems. Thermodynamic properties of pure substances; changes of phase; equation of state. Second law of thermodynamics: concept of entropy. Simple power and refrigeration cycles. Introduction to heat transfer: conduction, convection and radiation.

AERO 350 **System Dynamics and Vibration (3-0-3)**
Prerequisites: AERO 201, MATH 204, MATH 206

Dynamic modeling and response analysis of systems with mechanical, hydraulic, electrical, and/or thermal elements, free and forced response, vibration absorbers and vibration isolators, state space modeling of dynamic systems.

AERO 351 **Feedback Control Systems (3-3-4)**
Prerequisite: AERO 350

Feedback control system block diagrams, control system performance and specifications, classical methods of feedback control system design and analysis, introduction to modern control and digital control.

AERO 380 **Aerospace Vehicle Performance (3-0-3)**
Prerequisite: AERO 330
Co-requisite: AERO 331

Morphology of aircraft and spacecraft. Performance analysis of fixed wing aircraft: drag estimation, propulsion, take-off, climb and landing, endurance, payload/range, maneuvers; operational economics. Performance analysis of rotor craft: rotor-blade motion, hovering and vertical ascent, forward flight, and autorotation. Rocket propulsion; escape velocity; orbital dynamics.

AERO 385 **Aerospace Design and Practice (2-3-3)**
Prerequisites: ENGR 180, AERO 181

Design approach and phases. Design integration. Influence of mission and other requirements on vehicle configuration. Trade-off studies, sizing and configuration layout. Flight vehicle loads, velocity-load factor diagram. Structural design: overall philosophy, role in design process, methods. Students relate theory and practice and develop experience with modern engineering equipment, measurement techniques and design methodology. Good reporting practice is emphasized.

AERO 399 **Engineering Internship (0-0-1)**
Prerequisites: Junior standing and approval of department

Students are required to spend a minimum of 6 continuous weeks on an approved industrial internship program. The internship provides students with practical, on-the-job experience which allows them to integrate theory with "real world" situations. It is academically supervised by a faculty member and professionally supervised by the company's internship supervisor who provides feedback to the university about the student's progress. A formal report, that documents the work undertaken during the internship period, must be submitted to the Department within the first two weeks of the semester following the internship. The report and the complete course activities are graded on Pass/Fail basis.

AERO 400 **Aeroelasticity (2-0-2)**
Prerequisites: AERO 201, AERO 321, AERO 330, AERO 350, MATH 205

Review of beam analysis. Structural dynamics of one-dimensional systems. Analysis of static aeroelastic phenomena, introduction to unsteady aerodynamics and flutter.

AERO 420 **Aircraft Structures II (3-0-3)**
Prerequisite: AERO 321

Covers the work and energy principles; analysis of indeterminate structures by classical virtual work and finite elements; introduction to elastic stability of columns; application of energy methods to determine stresses, strains and displacements in typical aircraft structures; design considerations in aircraft structures.

AERO 425 **Design of Aerospace Structures (3-0-3)**
Prerequisite: AERO 321

This course provides the basics of the elements of aircraft structural analysis using an applications-oriented approach. Topics to be covered include landing gear analysis, tapered wing beams, frame cutouts, and composite materials.

AERO 426 **Designing with Composites (3-0-3)**
Prerequisite: AERO 321

Reinforcing mechanisms in composite materials; material properties. Strength and elastic constants of unidirectional composites; failure criteria. Analysis of laminated plates; bending and eigenvalue problems. Environmental effects and durability. Damage tolerance. Design of composite structures.

AERO 430 **Intermediate Aerodynamics (3-0-3)**
Prerequisite: AERO 331

Fundamentals of the 1st and 2nd laws of thermodynamics applied to aerodynamic systems and control volumes. Applications of gas dynamics to incompressible and compressible flows through nozzles, diffusers, and airfoils. Isentropic flows to include Prandtl-Meyer expansions, and non-isentropic flows to include normal and oblique shocks, and flows with simple friction and heat transfer.

AERO 431 **Viscous Flows (3-0-3)**
Prerequisite: AERO 331

Viscous incompressible fluid flows. Topics include derivation of equations governing viscous compressible fluid motion; specializations to simple flows; boundary-layer theory; similarity solutions; introduction to turbulence and Reynolds stresses.

AERO 432 **Aerodynamics and Heat Transfer (3-0-3)**
Prerequisites: AERO 340, AERO 330

Differential equations of motion. Viscous and inviscid regions. Potential flow: superposition; thin airfoils; finite wings; compressibility corrections. Viscous flow: thin shear layer approximation; laminar layers; transition; turbulence modeling. Convective heat transfer: free versus forced convection; energy and energy integral equations; turbulent diffusion.

AERO 433 **Introduction to Computational Fluid Dynamics (3-0-3)**
Prerequisite: AERO 330

Introduction to the governing equations of fluid dynamics and to computational fluid dynamics. The student will learn the physical meaning of the equations and develop flow models; apply basic finite element methods to the flow models; learn basic CFD techniques; then use the CFD techniques to solve some real applications.

AERO 434 **Acoustics and Noise Control (3-0-3)**
Prerequisite: AERO 331

Behaviour of compressible fluids, sound waves and properties of sound sources; measurement of sound; human perception of sound; prediction methods based on energy considerations; sound propagation in realistic environments: outdoors, rooms, ducts; absorption and transmission loss, noise control; case studies.

AERO 435 **Rotorcraft Aerodynamics and Performance (3-0-3)**
Prerequisites: AERO 330, AERO 380

Rotorcraft history and fundamentals. Momentum theory: hover, axial climb and descent, autorotation, forward flight, momentum theory for coaxial and tandem rotors. Blade element analysis. Rotor airfoil aerodynamics. Rotor blade dynamics and trim. Helicopter performance, height-velocity curves, conceptual design. High-speed rotorcraft.

AERO 440 **Aerospace Propulsion (3-0-3)**
Prerequisites: AERO 331, AERO 340

Propulsion requirements, effects of Mach Number, altitude, and application; basic propeller theory; propeller, turboshaft, turbojet, turbofan and rocket; cycle analysis and optimization for gas turbine power plant; inter-relations between thermodynamic, aerodynamic and mechanical designs; rocket propulsion; selection of aeroengines.

AERO 450 **Aerospace Vehicle Stability and Control (3-0-3)**
Prerequisites: AERO 330, AERO 351

Static stability and control: equilibrium requirements; longitudinal stability requirements; neutral points; maneuvering flight; control forces and control requirements; lateral static stability certification requirements. Dynamic stability: axis systems; governing equations; phugoid and short period modes; lateral dynamic modes. Closed-loop control.

AERO 461 **Aviation Management and Certification (3-0-3)**
Prerequisite: Senior standing

Product development, quality control. Strategic organizational analysis and design. Airworthiness, type certification and planning, delegation of authority, airplane flight manual. Aerospace system design and safety.

AERO 480 **Senior Design Project I (2-3-3)**
Prerequisites: AERO 380, AERO 385, AERO 321
Co-requisites: AERO 450, AERO 440

First of the two senior level design courses requiring students to perform a team-based aircraft design. The course work requires application of the education and skills developed in the aeronautical engineering curriculum. Aircraft mission requirements include engine cycle selection and airframe/engine integration, performance, stability and control, structures, avionics, sensors, and manufacturing processes. The teams present oral and written reports on their designs.

AERO 481 **Senior Design Project II (0-9-3)**
Prerequisite: AERO 480

(see AERO 480)

AERO 485 **Spacecraft Design (2-3-3)**
Prerequisites: AERO 201, AERO 385

Types of spacecraft. Fundamentals of orbital mechanics. The design of spacecraft and spacecraft subsystems with emphasis on mission requirements and current design methods: spacecraft configuration, payload, structural, propulsion, attitude control, thermal, power, communication and other related subsystems. Spacecraft integration and testing.

AERO 491 **Undergraduate Research Project (Variable course credits from 1 to 3)**
Prerequisite: Approval of the department

Independent research conducted under the guidance of a faculty member.

ARBH ARABIC HERITAGE AND CULTURE

ARBH 101 **Arabic Language (3-0-3)**
Prerequisite: None

This course aims at developing the ability of students in acquiring skills and competencies in Arabic language. For the most part, it will teach the students procedural techniques regarding the functional text structure either in Classical or in Standard Arabic. Therefore, focus will be on linking students with both their academic specialization and their Arab and Islamic environment. The ultimate objective is to develop the students' communication skills using the Arabic language.

ARBH 102 **Islamic Culture (3-0-3)**
Prerequisite: None

The course aims at keeping the student in touch with their Islamic culture by taking them through the civilization established by prominent scholars and men. The students are expected to compare this culture with the existing ones. The course consists of a general review of Islam as a religion and an approach to life. This course is delivered in Arabic.

ARBH 105 **Emirates Society (3-0-3)**
Co-requisite: ENGL 101

This course focuses on basic knowledge related to the nature of the UAE society and its political, geographical, cultural, demographical and social aspects. It also studies the perspective view of the Emirates Society in highlighting the contemporary international changes.

ARBH 106 **Gulf Region Economic and Social Outlook (3-0-3)**
Co-requisite: ENGL 101

The course explores the economic structure and the social conditions of the Gulf region. It focuses on the economic and social factors governing the Gulf communities and the impact of these factors at the regional and the global levels.

CHEM CHEMISTRY

CHEM 101 **General Chemistry I (3-3-4)**
Prerequisite: MATH 105

This is an introductory course in chemistry. It covers stoichiometry, atomic structure, periodic table properties, molecular geometry, gaseous, liquid, and solid matter, ionic and covalent bonding, descriptive chemistry of metallic and non-metallic elements, thermochemistry, and basic organic chemistry.

CHEM 102 **General Chemistry II (3-3-4)**
Prerequisites: MATH 106, PHYS 102, CHEM 101

This course provides the transition from introductory general chemistry into applied engineering chemistry. It covers introductory concepts in analytical chemistry, and addresses major spectroscopy techniques, including rotational, vibronic, and electron spectroscopy. Topics also include phase transitions, entropy and enthalpy, electrochemistry in context of engineering applications, as well as the basics of quantum science underpinning some modern chemical engineering concepts and developments.

CMME COMMUNICATION ENGINEERING

CMME 300 Communication Systems (3-0-3)
Prerequisite: MATH 205
Co-requisite: ELCE 301

Introduction: Classification of signals, Review of Fourier series and transforms, Introduction to modulation, Linear and non-linear modulation: DSB-AM, DSB-SC, SSB-SC, FM, PM, Base-band transmission: PCM, PAM, Noise effects in analogue & pulse modulations, Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Principles of operations of telephony and television.

CMME 301 Communication Systems Lab (0-3-1)
Co-requisite: CMME 300

Experimental work to understand the principles and study the performance of different analog modulation schemes, baseband transmission techniques, and telephony and TV systems.

CMME 302 Digital Communications I (3-0-3)
Prerequisite: CMME 300

Waveform Coding: PCM, DPCM and DM. Baseband Digital Signals: NRZ and RZ signals and line coding, baseband pulse shaping for ISI-free transmission, eye diagrams and equalization. Bandpass Digital Modulation: ASK, FSK, PSK and DPSK, power spectral densities, statistical decision theory and the optimum receiver for digital modulation schemes. Carrier and timing recovery. Introduction to Channel Coding.

CMME 303 Digital Communications Laboratory (0-3-1)
Co-requisite: CMME 302

Experimental work to understand the principles and study the performance of different digital modulation schemes.

CMME 304 Information Theory (3-0-3)
Prerequisite: CMME 300
History of information theory, Information measure, Entropy, Information rate, Memoryless sources, Sources with memory, Information transmission on discrete channels (mutual information, discrete channel capacity), Continuous channel, Channel capacity, Shannon theory, Coding applications (Huffman coding), Fundamentals of information security systems.

CMME 310 Applied Electromagnetics (3-0-3)
Prerequisites: PHYS 102; MATH 206

Time-varying fields and Maxwell's equations, Wave equation and its solution, Plane waves in lossless media, Flow of electromagnetic power, Plane waves in conducting media, Reflection and refraction at a planar interface, Transmission line parameters and equations, Smith chart techniques, Impedance matching and transformation, Quarter-wave transformers, Single-stub tuners, Rectangular waveguides, Propagating and evanescent modes.

CMME 320 Communication Networks (3-0-3)
Prerequisite: CMME 300

Basic data and telecommunication networks, OSI Model, Network configuration, Circuit switching, packet switching, Basic switch design, Space and time division switching, Traffic fundamentals, Erlang capacity, Basic traffic models, Signaling systems, SS7 standard, Multiplexing, FDM, TDM, CDM, WDM, Medium access control, Framing and digital carrier systems, SDH, ATM protocols and standards, ISDN, xDSL, X25, IP based networks.

CMME 331 Modeling and Simulation of Communication Systems Lab (0-3-1)
Prerequisite: CMME 300
Co-requisite: CMME 302

Background: discrete time representation of lowpass and bandpass signals and systems, lowpass equivalent models of communication systems. Performance evaluation of communication systems using Matlab/Simulink and other simulation tools, communication channels, signal-to-noise ratio, error rate calculation. Monte Carlo simulation using Matlab/Simulink: statistical methods of performance evaluation. Modeling and simulation of communication systems using Matlab/Simulink: Analog modulation, A/D conversion, baseband and bandpass digital transmission.

CMME 395 Communication Engineering Project Laboratory (0-3-1)
Prerequisite: Junior standing

In this project laboratory the students will be guided through a series of structured laboratory sessions to design, implement and test a communication system or sub-system. All the students will work on a common communication system design problem. At the end of the course each student documents the complete design in a formal report.

CMME 399 Engineering Internship (0-0-1)
Prerequisites: Junior standing and approval of department

Students are required to spend a minimum of 6 continuous weeks on an approved industrial internship program. The internship provides students with practical, on-the-job experience which allows them to integrate theory with "real world" situations. It is academically supervised by a faculty member and professionally supervised by the company's internship supervisor who provides feedback to the university about the student's progress. A formal report, that documents the work undertaken during the internship period, must be submitted to the Department within the first two weeks of the semester following the internship. The report and the complete course activities are graded on Pass/Fail basis by a faculty member.

CMME 400 Wireless Communications (3-0-3)
Prerequisite: CMME 302

Introduction to modern wireless communications. Cellular radio fundamentals, Cellular design concepts, Interference and capacity, Trunking and traffic models and evaluation, Air interface, Propagation models and mechanisms, Modulation, Coding, Multiple access techniques, Diversity techniques, Wireless network structure and management, Standard wireless security protocols and mechanisms, Common wireless standards.

CMME 401 Digital Communications II (3-0-3)
Prerequisite: CMME 302

Introduction to 2G and 3G wireless communications, Communication Channel Models: AWGN, multipath fading, delay spread, Doppler spread, Equalization Methods: decision feedback equalization, linear and non-linear equalization, Maximum likelihood sequence estimator, minimum-mean-square error methods, adaptive equalization, Spread Spectrum Techniques: CDMA, direct sequence and frequency hopping methods, OFDM, Smart Antenna Systems.

CMME 402 Modulation and Coding Techniques (3-0-3)
Prerequisite: CMME 302

Advanced Modulation Techniques: M-ary orthogonal and non-orthogonal signals with coherent and noncoherent detection. Design Trade-Offs: The bandwidth efficiency plane, the error probability planes. Advanced Channel Coding Techniques: Cyclic and convolutional codes, Interleaving, Turbo codes, Puncturing, block and trellis coded modulation, space-time coding.

CMME 403 Signal Processing for Communications (3-0-3)
Prerequisite: CMME 302

Modeling of multiuser communication channels using signal processing techniques, Non-dispersive and dispersive time-varying channels, Multiuser narrowband and wide-band CDMA systems, Interference suppression techniques, OFDM and signal processing perspective, Channel estimation, equalization, and carrier synchronization, Transmit and receive diversity techniques for time-varying or fading channels, Mitigation of rapidly fading wireless channels.

CMME 404 Adaptive Communication Systems (3-0-3)
Prerequisite: CMME 302

Introduction to Adaptive Digital Filters and Their Applications in Communications: Finite Impulse Response and Infinite Impulse Response filters, Adaptive Equalization: linear and decision feedback equalizers, Fundamental Concepts of Adaptive Algorithms: Least Mean Square, Recursive Least Square, Kalman and Wiener filtering, Adaptive Differential Pulse Code Modula

tion, Adaptive Echo and Noise Cancellation.

CMME 410 Antennas and Propagation (3-0-3)
Prerequisite: CMME 310

Antenna fundamentals, Radiation from a short current dipole, Far field approximation, Radiation pattern, Radiation resistance. Radiation integral approach, dipole and monopole antennas, Image techniques, Antenna arrays, Broadside and end-fire arrays, Pattern multiplication, Pattern synthesis, Binomial and Chebyschev arrays, Aperture antennas, Fourier-transform method, Field equivalence principle, Sky-wave and space-wave propagation, line-of-sight microwave links.

CMME 412 Optical Communications (3-0-3)
Prerequisite: CMME 310

Elements of optical communication systems; Slab and multi-layer planar waveguides, Optical fibers, Step-index and graded-index fibers, Single-mode and multi-mode fibers, Fiber attenuation and dispersion, Optical sources and transmitters, Light-emitting diodes, Semiconductor laser diodes, Optical detectors and receivers, Photodiodes, Optical system design, Types of noises and system impairments, Power budget, Power penalty; Dispersion compensation.

CMME 420 Switching and Data Networks (3-0-3)
Prerequisite: CMME 320

Principles of design and analysis of communications networks, Basic switching theory, Switching fabrics theory, design of Space and time division switching, Hybrid switching, Traffic theory and engineering, M/M/1 and M/G/1 queuing theory and its applications, Delay and blocking, Planning, Capacity and performance, Flow control, Routing functions, Transport Protocols, Contemporary standards, PSTN, IP, Wireless.

CMME 421 Fundamentals of Security Systems (3-0-3)
Prerequisite: CMME 304

Introduction to Cryptography, Secrecy and authentication, Basic number theory, modular arithmetic, finite fields, Secret-key systems, Basic design concepts, Standard block-ciphers and stream-ciphers. Public-key security systems, Design principles and security measures, Message and user authentication, Hash functions, Cryptographic privacy and identification protocols. Security applications: IP, Wireless and e-commerce security.

CMME 422 Digital Transmission (3-0-3)
Prerequisite: CMME 320

Voice digitization: PCM, companding, ADPCM and LPC coding techniques. Video: predictive coding, MPEG. Traffic sources: comparison of different traffic sources; voice, video and data. Time division multiplexing: synchronous, asynchronous and pointer based (SONET/SDH) systems. Voice and video transmission over packet networks. Digital cable system. Fiber optic transmission. Modems: standard transmission rates, xDSL.

CMME 430 Multimedia Communications (3-0-3)
Prerequisite: CMME 400

Fundamentals: Definitions, sampling, and quantization. Audio: speech coding. Video: Digitization and formats. Fundamentals of source Coding. Still-image (intraframe) coding: Predictive, transform. Motion estimation and Interframe Coding: motion-vectors. Video coding standards: JPEG, H.26x, and MPEGx series. Networking issues: Scalability, VBR and CBR, transcoding. Error resilience. Applications.

CMME 431 CATV Systems and Networks (3-0-3)
Prerequisite: CMME 320

Traditional Cable Networks, Two way Hybrid Fiber/Coax Cable (HFC) Access Networks, Cable Modems, IP telephony, Competing Access Technologies, Optical Transmitters, Optical Receivers, Optical Amplifiers, Performance Analysis and Design of the Forward and Reverse Links, Cable Data Transport, SONET/SDH and RPR Systems.

CMME 441 Satellite Communications (3-0-3)
Prerequisite: CMME 302

Overview of Satellite Services, Orbital Mechanics, transmission losses, the link budget power equation, system noise, carrier to noise ratio, the uplink, the downlink, the combined uplink and downlink carrier to noise, possible modes of interference, interference between the different satellite circuits, Satellite Access Techniques, VSAT, Direct Broadcast Satellite Services.

CMME 442 Aerospace Radio and Radar Systems (3-0-3)
Prerequisites: CMME 300, CMME 410

Aerospace Radio: Introduction to Radio Communication System, Application of Radio Communication in the Aviation and Spaceborne Environment, Wave Propagation Modeling Fundamentals, Path Design. Radar Systems: The Nature of Radars, Radar Antennas, Radar Equation, Radar Cross Section, Pulsed Doppler Radars, CW and FM-CW Radars, Moving Target Indicator (MTI) and Pulse Doppler Radars, Tracking Radars, Radars for Remote Sensing.

CMME 495 Selected Topics in Communication Engineering (3-0-3)
Prerequisite: Topic specific

This course mainly deals with new trends in Communication Engineering and emerging technologies.

CMME 496A Independent Study A (0-9-3)
Prerequisites: Senior standing and approval of department

Study of computer engineering topics relating to the interest of individual student.

CMME 496B Independent Study B (0-6-2)
Prerequisites: Senior standing and approval of department

Study of computer engineering topics relating to the interest of individual student.

CMME 496C Independent Study C (0-3-1)
Prerequisites: Senior standing and approval of department

Study of computer engineering topics relating to the interest of individual student.

CMME 497 Senior Design Project I (0-6-2)
Prerequisite: ENGL 220, senior standing and approval of department

Students will pursue an in-depth project of significance in communication engineering by going from concept to working prototype. Some of the proposed design projects may involve interaction with industry. The students normally work in teams under faculty supervision. The project fosters teamwork between group members and allows students to develop their project management, technical writing, and technical presentation skills. Formal interim and final reports and presentations are required from each group.

CMME 498 Senior Design Project II (0-6-2)
Prerequisite: CMME 497

Continuation of CMME 497

CMME 499 Senior Design Project III (0-12-4)
Prerequisites: ENGL 220, senior standing and approval of department

Students will pursue an in-depth project of significance in communication engineering by going from concept to working prototype. Some of the proposed design projects may involve interaction with industry. The students normally work in teams under faculty supervision. The project fosters teamwork between group members and allows students to develop their project management, technical writing, and technical presentation skills. Formal interim and final reports and presentations are required from each group.

CMPE COMPUTER ENGINEERING

CMPE 001 IT Skills (0-2-1)
Prerequisite: None

Computers and computer literacy. Computer hardware (input, output, system and storage devices). System software (Windows operating system and utility programs). Application software (MS-Word, Excel and PowerPoint). Communication and internet services (searching, e-mails, e-library and e-learning).

CMPE 002 Introduction to Information Technology (1-2-2)
Prerequisite: None

History and Types of computers. Overview of application software and utility programs. Operating systems. Computer Architecture. Information system and programming languages. Problem solving and simple programming concepts.

CMPE 111 Principles of Computer Programming (2-3-3)
Prerequisite: None

Introduction to computer systems. Programming environment: operating system, tools, compiling, debugging, libraries, linking, software development life cycle. Imperative programming: data types, conditional expressions and statements, repetitive structures, arithmetic and logic operators, functions, arrays, strings, pointers, structures, file I/O.

CMPE 201 Introduction to Computer Organization (3-0-3)
Prerequisite: CMPE 111

Functional organization of computers. Data representations and basic computer arithmetic. Elements of machine and assembly languages. Instructions types and formats, operations, addressing modes, stacks. Register-level description of program execution and instructions processing. Microprogramming. Interrupt handling.

CMPE 211 Object-Oriented Programming (2-3-3)
Prerequisite: CMPE 111

Concepts of OO programming, classes and structures, encapsulation and data hiding, methods, member access control, constructors, destructors, operator overloading, friend functions, copy constructors, shallow and deep copies, inheritance, virtual functions, polymorphism, templates, and exceptions.

CMPE 220 Data Structures and Algorithms (3-0-3)
Prerequisites: CMPE 211, MATH 207

Review of object-oriented design. Analysis of algorithm complexity. Fundamental data structures: Concept of Abstract Data Types (ADTs), Queues, Stacks, Lists, Trees. Fundamental computing algorithms: binary search trees, hash tables, heaps, balanced trees, sorting algorithms, searching algorithms.

CMPE 311 Java and Network Programming (3-0-3)
Prerequisite: CMPE 211

Java basics, exception handling, I/O. Java Graphics: applets, AWT, Swing, Graphics, listeners. Java OO features: inheritance, abstract classes, polymorphism, interfaces, inner classes, anonymous classes. Basics of network programming. Java network programming: multithreading, URLs, sockets, RMI. Emerging Java applications.

CMPE 312 Operating Systems (3-0-3)
Prerequisites: CMPE 201, CMPE 211

Historical perspective of operating systems. Operating system concepts, functions and structure. Processes, threads, process synchronization, interprocess communication, process scheduling. Memory management and virtual memory. Device management. File management.

CMPE 321 Data Communications (3-0-3)
Prerequisite: MATH 215

Introduction to data and computer communications. OSI model. Data transmission and transmission media. Information theory concepts, Nyquist's, Shannon's and sampling theorems. Analog and digital modulation techniques, Pulse Code Modulation (PCM). Communication systems circuits and devices. Data encoding. Physical layer and data link protocols. Multiplexing. Wireless networks.

CMPE 322 Computer Networks (3-0-3)
Prerequisite: CMPE 321

Fundamentals of computer networks theory, design, implementation, protocols, analysis and operation. Overview of OSI and TCP/IP models. Local and wide area networks, switching techniques, routing, congestion control, quality of service. Wireless LANs. Network applications. Introduction to network security.

CMPE 323 Computer Networks Lab (0-3-1)
Co-requisite: CMPE 322

Design issues of network topologies and characteristics. Implementation, analysis and testing of various versions of the transport protocol.

CMPE 395 Computer Engineering Project Laboratory (0-3-1)
Prerequisite: Junior standing

In this project laboratory the students will be guided through a series of structured laboratory sessions to design, implement and test a computer system or sub-system. All the students will work on a common computing system design problem. At the end of the course each student documents the complete design in a formal report.

CMPE 399 Engineering Internship (0-0-1)
Prerequisite: Junior standing and approval of department

Students are required to spend a minimum of 6 continuous weeks on an approved industrial internship program. The internship provides students with practical, on-the-job experience which allows them to integrate theory with "real world" situations. It is academically supervised by a faculty member and professionally supervised by the company's internship supervisor who provides feedback to the university about the student's progress. A formal report, that documents the work undertaken during the internship period, must be submitted to the Department within the first two weeks of the semester following the internship. The report and the complete course activities are graded on Pass/Fail basis by a faculty member.

CMPE 401 Computer Architecture (3-0-3)
Prerequisite: CMPE 312

Fundamentals of computer system design. Measuring and reporting performance. Classifying instruction set architecture. Review of integer and floating-point representations. Computer arithmetic, ALU design. Pipelining, instruction pipelining, hazards, pipeline performance. Memory system hierarchy design and cache memory. I/O fundamentals and operations. Introduction to parallel computers and alternative architectures.

CMPE 421 Introduction to Network Management (3-0-3)
Prerequisite: CMPE 322

Introduction to network management, standards, organization, functions, architectures, information and communication. Network management protocols such as SNMP. Management applications and tools. Network monitoring, network performance evaluation, teletraffic engineering and network simulation.

CMPE 422 Distributed Systems (3-0-3)
Prerequisite: CMPE 312

Characterization of distributed systems. Software layers, models of distribution, interprocess communication, client-server. Middleware, remote procedure calls, interface specification languages, remote method invocation. Distributed object-based systems. Operating systems support, multiprocessing vs. multithreading, load sharing, synchronization. Distributed File and name services. Fault tolerance. Security requirements and mechanisms.

CMPE 423 Mobile Computing (3-0-3)
Prerequisites: CMPE 312, CMPE 322

Introduction to wireless communications and mobile computing. Mobile information management. Location-independent and location-Dependent computing models. Mobile applications and services. Mobile ad-hoc networks and wireless IP networks. Mobile agent performance, functionality and security issues.

CMPE 430 Internet Computing (3-0-3)
Prerequisites: CMPE 311

The Internet, its services, protocols, and architecture. The World Wide Web, building web applications. Multimedia. Search techniques. Introduction to Internet & Web security. User profiling and online privacy issues.

CMPE 431 Information Security (3-0-3)
Prerequisites: CMPE 220

Fundamentals of Information Security. Classical encryption techniques. Key management. Stream and block ciphers. Public key cryptosystems. Message and entity authentication/identification. Hash algorithms. Digital signatures. Public key infrastructures. Advanced encryption standard. Quantum cryptography and quantum computing.

CMPE 432 Networks and Application Security (3-0-3)
Prerequisites: CMPE 431, CMPE 322

Basic threats and vulnerabilities in distributed systems. Access control. Secure credential services and role-based authorization, mobile code security, security of agent-based systems, electronic payment systems, secure time stamping and notarization. Wireless IP security. Web and application security. Malicious software. Security architectures, multilevel systems, and security management and monitoring.

CMPE 441 Parallel and Distributed Processing (3-0-3)
Prerequisites: CMPE 401, CMPE 220

Overview of parallel and distributed architectures. Distributed processing, concurrency, synchronization, cooperation. Parallel processing, vectorization. Parallel algorithms and parallel programming. Complexity and performance measures. Case studies.

CMPE 450 Ethics in Computing (3-0-3)
Prerequisite: Senior Standing

History of Computing. Social context of computing. Methods and tools of analysis. Professional and ethical responsibilities. Risks and liabilities of computer-based systems. Intellectual property. Privacy and civil-liberties. Computer crime. Economic issues in computing. Philosophical frameworks.

CMPE 451 Computer Graphics (3-0-3)
Prerequisites: CMPE 220, MATH 204

Graphic systems. Fundamental techniques in graphics. Graphical algorithms. Principles of human-computer interaction. Graphical user-interface design. Graphical user-interface programming. Computer animation. Multimedia techniques.

CMPE 452 Artificial Intelligence (3-0-3)
Prerequisite: CMPE 220

Study of basic concepts and methods in artificial intelligence. History and applications of AI. Intelligent agents. Search and constraint satisfaction. Knowledge representation and reasoning. Expert systems. Machine learning and neural networks. Planning systems. Visual perception and robotics.

CMPE 453 Mobile Robotics (3-0-3)
Prerequisites: MATH 204, MATH 215, CMPE 452

Overview: state-of-the-art robot systems, planning vs. reactive control, uncertainty in control, sensing, world models. Configuration space. Planning. Sensing. Robot programming. Navigation and control.

CMPE 454 Image Processing (3-0-3)
Prerequisites: MATH 204, MATH 215

Introduction to image processing; digital image fundamentals; space-domain image enhancement; frequency-domain image enhancement; image restoration, colour image processing; image compression.

CMPE 495 Selected Topics in Computer Engineering (3-0-3)
Prerequisites: Topic specific

Selected topics in computer software, hardware, and networks. It mainly deals with new trends in computer engineering and emerging technologies.

CMPE 496A Independent Study A (0-9-3)
Prerequisites: Senior standing and approval of department

This course gives an undergraduate student the opportunity to participate in an individual or group oriented research project under direction of a faculty member. A formal report and an oral presentation are required.

CMPE 496B Independent Study B (0-6-2)
Prerequisites: Senior Standing and approval of department

This course gives an undergraduate student the opportunity to participate in an individual or group oriented research project under direction of a faculty member. A formal report and an oral presentation are required.

CMPE 496C Independent Study C (0-3-1)
Prerequisites: Senior Standing and approval of department

This course gives an undergraduate student the opportunity to participate in an individual or group oriented research project under direction of a faculty member. A formal report and an oral presentation are required.

CMPE 497 Senior Design Project I (0-6-2)
Prerequisites: ENGL 220, senior standing and approval of department

Students will pursue an in-depth project of significance in computer engineering by going from concept to working prototype. Some of the proposed design projects may involve interaction with industry. The students normally work in teams under faculty supervision. The project fosters teamwork between group members and allows students to develop their project management, technical writing, and technical presentation skills. Formal interim and final reports and presentations are required from each group.

CMPE 498 Senior Design Project II (0-6-2)
Prerequisites: CMPE 497

Continuation of CMPE 497

CMPE 499 Senior Design Project III (0-12-4)
Prerequisites: ENGL 220, senior standing and approval of department

Students will pursue an in-depth project of significance in computer engineering by going from concept to working prototype. Some of the proposed design projects may involve interaction with industry. The students normally work in teams under faculty supervision. The project fosters teamwork between group members and allows students to develop their project management, technical writing, and technical presentation skills. Formal interim and final reports and presentations are required from each group.

ECON ECONOMICS

ECON 120 **Engineering Economics (3-0-3)**
Prerequisite: Junior standing

This course introduces microeconomic concepts and analysis and provides an overview of macroeconomic issues. Topics studied include: the nature and dimensions of competition, the concepts of demand and supply, theories of the firm and individual behavior, market structure, competition and monopoly, costs and incentives, wage determination, and employment, the determination of output, employment, unemployment, interest rates, and inflation. Monetary and fiscal policies are discussed.

ELCE ELECTRONIC ENGINEERING

ELCE 200 **Fundamentals of Electronic Systems (3-3-4)**
Prerequisite: PHYS 102
Restrictions: *Students majoring in Electronic, Communication, or Computer Engineering are not allowed to take this course for credits.*

This course introduces some of the fundamental concepts of electric and electrical circuits, linear analog electronic circuits and devices, and digital logic circuits. Topics covered include Voltage source, Current Source, Energy Sources, Electrical Motor and Generator basic principle, Ohm's Law, KVL and KCLcircuits. DC steady state analysis of Resistive, RC, RL, and RLC circuit, Basic circuit theory nodal, mesh and source transformation. Transient analysis of simple electric circuits RC, and RL and some application. Basic operation of semiconductor devices. Diode, BJT and its application. Description of Small signal amplifier circuits and operational amplifiers. Binary system and basic logic gates. Design of simple combinational and sequential logic circuits. Basic structure of a central processing unit and a microcomputer system.

ELCE 210 **Electric Circuits I (3-0-3)**
Prerequisite: PHYS 102

Voltage and current independent and dependant sources. Ohm's law. Kirchoff's laws. Series-parallel resistive circuits, voltage and current divisions. Circuit theorems: superposition, Nodal and Mesh analysis, superposition and source transformation, Thevenin, Norton and maximum power transfer theorem. Series-parallel capacitors and inductors combination. Transient response of first-order RC and RL circuits. AC sources: sinusoids, RMS values and phasor representation of sinusoidal signals and impedance. The AC analysis of series and parallel circuits. Frequency response. AC resonance. Sinusoidal-steady state power calculations, power factor and maximum power transfer calculations. Introduction to operational amplifiers.

ELCE 211 **Electric Circuits Laboratory (0-3-1)**
Co-requisite: ELCE 210

Introductory experiments to the design, construction and analysis of electric circuits. The scope of the experiments covers virtually every basic aspect of passive electrical components and power sources.

ELCE 212 **Electric Circuits II (3-0-3)**
Prerequisite: ELCE 210

Analysis Methods. Transient Response. Frequency Response and Resonance. Transfer function, Simple RLC filter. Bode plot. Time-domain Analysis. Two-Port Networks. Using computer techniques in circuit analysis and simulation.

ELCE 220 **Electronic Circuits and Devices I (3-0-3)**
Prerequisite: ELCE 210

Introduction to semiconductors. Operation of pn-junction and its applications as rectifiers, clippers, and voltage regulators. Diode model and measurements of model parameters. Operation of bipolar junction transistors (BJT) and field effect transistors (FET). Introduction to CMOS technology. Small signal modeling of BJTs and FETs. Use of BJTs and FETs as single stage amplifiers. Operational amplifiers: principles and applications.

ELCE 221 **Electronic Circuits and De vices I Laboratory (0-3-1)**
Co-requisite: ELCE 220

Experimental work to understand the performance characteristics, design, construction analysis and simulation of diodes, transistors and operational amplifiers in circuits.

ELCE 230 **Digital Logic Design (3-0-3)**
Co-requisite: ELCE 210 or ELCE 200

Data representation in digital computers. Boolean algebra. Minimization and implementation of logic functions. Design of combinational circuits. Programmable devices, multiplexers, decoders, memory and tri-state devices. Basic ALU design. Elements of sequential circuits: latches, flip-flops and counters. Design of synchronous sequential machines. Transistor-level design of basic logic gates. Introduction to CAD tools and hardware description languages.

ELCE 231 **Digital Logic Laboratory (0-3-1)**
Co-requisite: ELCE 230

Laboratory experiments that provide hands-on experience in the simulation, implementation and testing of combinational and sequential logic circuits.

ELCE 301 **Signals and Systems (3-0-3)**
Prerequisites: ELCE 210, MATH 205; MATH 206

Time-domain analysis of signals: basic signals, properties and operations, sampling and reconstruction. Time-domain analysis of systems: block diagrams, properties, differential/ difference equations, impulse and step response, convolution integral/sum. Frequency domain analysis of signals and systems: Fourier series and transform, frequency response, Bode plots, stability analysis. Applications of Laplace transform and z-transform. State-space representation of systems. Filters.

ELCE 320 **Electronic Circuits and Devices II (3-0-3)**
Prerequisite: ELCE 220

BJT differential amplifier. MOSFET and JFET differential amplifiers. Feedback and stability. Multistage and power amplifiers. Nonlinear analogue circuits. Practical operational amplifier circuits. Noise in operational amplifiers. CMOS and BiCMOS technologies and circuits. Implementation of electronic devices in integrated circuits (IC).

ELCE 321 **Electronic Circuits and Devices II Laboratory (0-3-1)**
Co-requisite: ELCE 320

Experimental work to understand the performance characteristics, design, construction analysis and simulation of advanced analog electronic circuits and systems.

ELCE 323 **Instrumentations and Measurements Laboratory (1-3-2)**
Perquisites: ELCE 221, ELCE 231

Digital Measurement systems and sampling heads. Z, y, abcd and s-parameters. Microwave measuring equipment such as spectrum and network analyzers. Types and descriptions of

data acquisition systems. Techniques of noise measurements.

ELCE 332 Microprocessor Systems (3-0-3)
Prerequisites: ELCE 230, CMPE 111

Introduction to current microprocessor, microcontroller and microcomputer systems: basic components, memory map, organization and processor architecture. Hardware and software models of microprocessor and microcontroller systems. Processor instructions and assembly language programming. Exception handling: interrupts, traps and exception processing. Memory decoding, input/output interfaces and programming peripheral devices.

ELCE 333 Microprocessor Systems Laboratory (0-3-1)
Co-requisite: ELCE 332

Laboratory experiments that provide hands-on experience in the use of cross-assemblers, simulators and actual microprocessor/microcontroller hardware.

ELCE 340 Electromechanical Systems (3-0-3)
Prerequisites: ELCE 212, MATH 201

Introduction to the concept of real, reactive and apparent power. Introduction to the principal types of electromechanical energy conversion device (d.c. machine, induction motor, synchronous machine, stepper motors, servomotors) as well as to the transmission and distribution of a three-phase power system.

ELCE 344 Feedback Control Systems (3-0-3)
Prerequisite: ELCE 301

Modeling of mechanical and electro-mechanical systems. Principles of feedback. Open loop response, and time domain specifications. Stability analysis and Routh's criterion. Root locus construction. Lead/lag compensator design using root locus. Bode plots and stability (gain and phase) margins. Lead/lag and PID controller design and PID tuning. State variable approach, stability analysis and pole placement.

ELCE 345 Control Systems Laboratory (0-3-1)
Co-requisite: ELCE 344

Laboratory experiments covering various aspects of control systems.

ELCE 395 Electronic Engineering Project Laboratory (0-3-1)
Prerequisite: Junior standing

In this project laboratory the students will be guided through a series of structured laboratory sessions to design, implement and test an electronic system or sub-system. All the students will work on a common electronic system design problem. At the end of the course each student documents the complete design in a formal report.

ELCE 399 Engineering Internship (0-0-1)
Prerequisite: Junior standing and approval of department

Students are required to spend a minimum of 6 continuous weeks on an approved industrial internship program. The internship provides students with practical, on-the-job experience which allows them to integrate theory with "real world" situations. It is academically supervised by a faculty member and professionally supervised by the company's internship supervisor who provides feedback to the university about the student's progress. A formal report, that documents the work undertaken during the internship period, must be submitted to the Department within the first two weeks of the semester following the internship. The report and the complete course activities are graded on Pass/Fail basis by a faculty member.

ELCE 401 Digital Signal Processing (3-0-3)
Prerequisite: ELCE 301

Basic Concepts: Sampling, Aliasing, Quantization. Digital Filters: Design and Analysis of FIR and IIR Filters, Complex Filters, State Space Representation, Adaptive Filters, Optimal Filters, Non-Linear Filters. Fourier Analysis and Processing: DFT, FFT, DCT, Spectral Analysis, FFT Processing, Signal Segmentation. DSP Implementation: Coefficients Truncation, Integer and Floating Point DSP Systems, DSP Chips. DSP Applications.

ELCE 402 Signal Processing Laboratory (0-3-1)
Co-requisite: ELCE 401

Laboratory experiments covering various aspects of analog and digital signal processing.

ELCE 420 Power Electronics (3-0-3)
Pre-requisite: ELCE 320

Introduction to the concept of power electronics, power electronics semiconductor devices, their physics, working principles and their applications. Analysis of power electronic circuits driving different loads. Analysis and design different thyristor firing circuits. Design of DC chopper, inverters, AC voltage controllers. Analysis of switched mode power supply.

ELCE 421 Filter synthesis (3-0-3)
Prerequisite: ELCE 301

Design of passive filters: Approximation theory, network synthesis and frequency transformation. Delay filters. Continuous-time active filters: single and multiple-amplifier filters using operational and operational-transconductance amplifies, second and high-order sections. Switched-capacitor filters. Overview of surface-wave and microwave filters.

ELCE 423 RF Circuit Design (3-0-3)
Prerequisites: ELCE 320, CMME 310

Transmission line analysis, s-parameters and smith chart graphical representation. Single and multiple networks. RF transistor amplifiers design. Oscillators. Noise and stability consideration of RF circuits.

ELCE 424 Microwave Circuits and Devices (2-3-3)
Prerequisites: ELCE 320, CMME 310

Type of transmission lines suitable for low and high frequency applications. Components, connectors, attenuators, cavities, dielectric resonators, terminations, couplers, T-junction, isolators and impedance transformers. Signal amplification using Klystrons and traveling wave tubes. Microwave devices, diodes, bipolar and FET transistors. Operation of single and double balanced mixers.

ELCE 425 Instrumentation Systems (2-3-3)
Prerequisite: ELCE 323

Definition of dynamic range and sensitivity of measuring equipment. Performing advanced measurements using spectrum and network analyzers, impulse response, time delays, and noise measurements. Compliance measurements (Eye diagram and bit error rate) and time domain reflectometer using digital communication analyzer. Comparison between simulation and practical results. System validation. Laboratory includes conducting various measurements on real circuits. Analysis and evaluation of test results.

ELCE 430 Digital Systems Design (3-0-3)
Prerequisites: ELCE 230, ELCE 231, CMPE 111

Advanced techniques in the design of digital systems. Models of clocked synchronous finite state machines, algorithmic state machines (ASM) optimization and synthesis. Application of hardware description languages, particularly Verilog and VHDL, in the design, simulation and synthesis of digital systems. Implementation using reconfigurable logic devices, such as FPGAs.

ELCE 432 Embedded Systems Design and Applications (3-0-3)
Prerequisites: ELCE 332, ELCE 333

Introduce the main hardware and software elements of an embedded system. Fundamental concepts and design techniques of embedded systems. Architecture and programming of embedded processors. Basic services provided by real-time operating system ("RTOS") kernels. Design and development of multitasking code and application software. Interfacing, device drivers and input/output devices. Applications of embedded systems in consumer electronics, mobile, automotive, aerospace, digital control and other real time systems.

ELCE 434 VLSI Systems Design (3-0-3)
Prerequisites: ELCE 220, ELCE 230

Introduction to the fabrication of digital VLSI (Very Large Scale Integrated Circuits) systems. Design and layout of VLSI circuits for complex digital systems. CMOS technology using standard-cell-based design flow. Circuit characteriza-

tion and performance. Interconnect, timing and synchronization issues. Low-power and deep submicron designs. Fault models and design for testability techniques. VLSI design methodologies. Commercial CAD simulation and synthesis tools.

ELCE 436 Analog Integrated Circuits Design (3-0-3)
Co-requisite: ELCE 320

CMOS analogue circuit modeling. CMOS device characterization. Basic MOS building blocks. Two-stage CMOS amplifiers. High-performance op-amps. Switched-Capacitor Circuits. Sigma-Delta data converters. CAD simulation software tools for analog circuit design.

ELCE 444 Digital Control Systems (3-0-3)
Prerequisite: ELCE 344

Discrete-time systems and Z-transform, Sampling and reconstruction, Open and Closed-loop Discrete-Time Systems, Time Response Characteristics, Stability Analysis Techniques, Digital Control Design, Pole-placement and state estimation. Microprocessor Controller design.

ELCE 445 Linear Control Theory (3-0-3)
Prerequisite: ELCE 344

Introduction to state-space, Controllability and observability, State estimation, state-feedback, model approximation, Lyapunov stability, Optimization and LQR and LQG problems, H state feedback and estimation, Output feedback and Robust control.

ELCE 449 Introduction to Mechatronics (3-0-3)
Prerequisites: ELCE 332, ELCE 344

Introduction to Mechatronics and Measurements. Electronic Circuits and Components. D/A, A/D converters. Semiconductor Electronics. System Response. Analog Signal Processing Using Operational Amplifiers. Digital Circuits and Systems. Data Acquisition. Sensors. Actuators. Mechatronic Control Systems.

ELCE 452 Digital Image Processing (3-0-3)
Prerequisite: ELCE 401

Human visual system, Digital Images, Monochrome and Color Images, Image Capturing Devices, Image Output Devices. Image Representations: Spatial and Frequency Domain Representations, Image Manipulation, 2D-FFT, 2D-DCT. 2D-Filters: Smoothing Filters, Sharpening Filters, Edge detectors, FIR Filters, IIR Filters. Image Processing Techniques: Enhancement, Restoration and Segmentation Techniques, Image Synthesis: Fractals. Compression Techniques: JPEG and JPEG2000.

ELCE 455 Multimedia Systems (3-0-3)
Prerequisite: ELCE 401

Basic concepts: Multimedia Definition, Enabling Technologies, Hardware and Software. Digital Audio & Video: Audio and Midi Files, Digital Video, Editing Software. Multimedia Protection: Copyright Issues, Information Hiding and Watermarking. Multimedia Production: Production Stages. Internet: WWW, HTML, JAVA, Internet Security. Applications.

ELCE 495 Selected Topics in Electronic Engineering (3-0-3)
Prerequisite: Topic specific

This course mainly deals with new trends in Electronic Engineering and emerging technologies.

ELCE 496A Independent Study A (0-9-3)
Prerequisites: Senior standing and approval of department

This course gives an undergraduate student the opportunity to participate in an individual or group oriented research project under direction of a faculty member. A formal report and an oral presentation are required.

ELCE 496B Independent Study B (0-6-2)
Prerequisites: Senior standing and approval of department

This course gives an undergraduate student the opportunity to participate in an individual or group oriented research project under direction of a faculty member. A formal report and an oral presentation are required.

ELCE 496C Independent Study C (0-3-1)
Prerequisites: Senior standing and approval of department

This course gives an undergraduate student the opportunity to participate in an individual or group oriented research project under direction of a faculty member. A formal report and an oral presentation are required.

ELCE 497 Senior Design Project I (0-6-2)
Prerequisites: ENGL 220, senior standing and approval of department

Students will pursue an in-depth project of significance in electronic engineering by going from concept to working prototype. Some of the proposed design projects may involve interaction with industry. The students normally work in teams under faculty supervision. The project fosters teamwork between group members and allows students to develop their project management, technical writing, and technical presentation skills. Formal interim and final reports and presentations are required from each group.

ELCE 498 Senior Design Project II (0-6-2)
Prerequisite: ELCE 497

Continuation of ELCE 497

ELCE 499 Senior Design Project III (0-12-4)
Prerequisite: ENGL 220, senior standing and approval of department

Students will pursue an in-depth project of significance in electronic engineering by going from concept to working prototype. Some of the proposed design projects may involve interaction with industry. The students normally work in teams under faculty supervision. The project fosters teamwork between group members and allows students to develop their project management, technical writing, and technical presentation skills. Formal interim and final reports and presentations are required from each group.

ENGL ENGLISH LANGUAGE

ENGL 001 Preparatory English 1 (18-0-9)
Prerequisite: Satisfactory score in Oxford Placement Test or IELTS

Study skills for academic purposes. Sentence structure and grammatical accuracy. Oral communication. Written communication, pre-writing skills, paragraph and process writing and short essay composition. Reading skills for academic purposes, skimming, scanning, inference and main idea. Vocabulary building, paraphrasing and spelling. Listening for main ideas, supporting ideas and specific information. Understanding data and statistics. This program runs for 18 hours/week for a complete semester.

ENGL 002 Preparatory English 2 (18-0-9)
Prerequisite: ENGL 001 or placement examination

Study skills and independent study techniques for tertiary education. Oral communication including extending, speculating and hypothesizing. Discursive essays and written description of visual information, reviewing and editing, improving accuracy in written expression. Reading extended academic texts on a wide variety of subjects to find relevant information. General purpose and academic vocabulary building. Listening to extended academic lectures and social dialogues. This program runs for 18 hours/week for a complete semester.

ENGL 101 Academic English I (3-0-3)
Prerequisite: English language admissions requirement

A communicative skills course focusing on the use of standard rhetorical styles to write short reports based on information gathered from printed or Internet sources. Emphasis is placed on the research process, including note-taking and correctly acknowledging other people's work. Throughout the course, the writing process serves as the basis of approach for developing professional and academic communication skills, both written and oral.

ENGL 102 **Academic English II (3-0-3)**
Prerequisite: ENGL 101

A continuation of ENGL 101, the course focuses on more advanced forms and styles of writing, including the standard rhetorical patterns for the academic essay such as classification & division cause & effect, process and argumentation. Students will produce an extended report based on formal research. As a complement to written research, this course includes individual and group oral presentations that will give students the opportunity to develop their skills in cooperative learning and team work.

ENGL 220 **Technical Writing and Communication (3-0-3)**
Prerequisite: ENGL 102

This course focuses on technical writing genres and style, and presentation techniques using appropriate information technology tools. Students will practice communicating technical information ethically for specialist, educated and general audiences using appropriate formats in order to achieve purposes such as informing, instructing and persuading. Oral presentation skills will enhance and develop techniques covered in ENG 102, including delivery, adapting presentations to audience, question answering techniques, and using multimedia aids effectively. Students will be required to prepare a range of reports and other technical genres for print and online media and make an oral presentation.

ENGR ENGINEERING

ENGR 110 **Introduction to Professional Engineering (1-0-1)**
Prerequisite: None

This course is an overview of professional engineering. Topics covered included the various branches of engineering, career paths, engineering education requirements, and an overview of engineering roles and processes. In addition, this course surveys the role of engineering in business and society and the ethical issues that engineers face such as international concerns, risk, safety, environmental issues, liability, professional responsibility are introduced.

ENGR 180 **Engineering Graphical Design (1-3-2)**
Prerequisite: None

The course introduces students to key concepts, techniques and applications of a Computer Aided Design (CAD) 3D Solid Modeling system. An introduction of visualization techniques, including hand sketching, is followed by an exploration of the parametric solid modeling environment, sketching, features, and CAE applications. The lectures are reinforced by the 'hands on' approach with students performing a number of projects and exercises to build Solid Models of a variety of components.

ENGR 200 **Statics (3-0-3)**
Prerequisite: PHYS 101

A vector treatment of force systems and their resultants: equilibrium of trusses, beams, frames, and machines, including internal forces and three-dimensional configurations, static friction, properties of areas, and distributed loads and hydrostatics.

ENGR 390 **Engineering Ethics (1-0-1)**
Prerequisites: Junior standing, ENGL 102, ENGR 110

Ethical issues in the practice of engineering: safety and liability, professional responsibility to clients and employers, personal rights, conflicts of interest, professional autonomy, whistle blowing, risk assessment, intellectual property, computers and their impact on ethics, sustainable development, legal obligations and the place and the purpose of engineering codes of ethics, codes and the environment, obligations to environment.

ENGR 440 **Design Support Analysis (2–0–2)**
Prerequisite: MATH 215

This course is designed to teach students the elements of product support and the analysis of design as related to the manufacturability, maintainability and supportability of aerospace products. The students will be expected to conduct a life cycle cost analysis and logistics plan for a design.

ENGR 455 **Finite Element Analysis (3-0-3)**
Prerequisite: MATH 204

Students learn the basic theory of finite element analysis (FEA) applied to stress analysis and design of mechanical components. Various FEA software packages will be utilized.

ENGR 465 **Methods of Engineering Analysis (3-0-3)**
Prerequisite: MATH 206

Selected topics from math analysis with engineering application. Topics include Vector calculus, ordinary differential equations, partial differential equations, and calculus of variations.

GSCI GENERAL SCIENCE

GSCI 101 **Earth Science (3-0-3)**
Prerequisite: None

Basic geographical principles and processes in physical geography and the earth sciences: geographic locational methods, earth-sun relationships, earth radiation balance, atmospheric temperature and pressure, interpretation and simple forecasting of weather from mapped data, interpretation of soil-moisture and evapotranspiration balances, soil, climate systems, and biomes. Geomorphic and ecological provinces.

GSCI 105 **General Astronomy (3-0-3)**
Prerequisite: None

An introduction to the concepts of modern astronomy. The solar system, the sun and stars, the Milky Way and other galaxies, current theories of the origin, evolution and fate of the universe.

HUMA HUMANITIES

HUMA 110 Middle East Studies (3-0-3)
Co-requisite: ENGL 101

The course defines the term Middle East geographically and politically. The course discusses the current and most important political, economic and social changes in the Middle East. The course covers the historical interaction between the Middle East and the neighboring civilizations.

HUMA 111 Islamic History (3-0-3)
Co-requisite: ENGL 101

The course provides a comprehensive overview of the Islamic history from the pre-Islamic to the contemporary Islamic World. The course focuses on major events that represent turning points in the history of the Islamic Nations. The course stresses the factors and reason that led to the rise and fall of Islamic regimes.

HUMA 112 Sciences in Islam (3-0-3)
Co-requisite: ENGL 101

The birth of science and innovation in the Islamic World; the contribution of scientists in different areas of science like medicine, astronomy, mathematics, how the Western civilization benefited from the Islamic civilization will be addressed.

HUMA 130 Introduction to Linguistic (3-0-3)
Prerequisite: ENGL 101

An introduction to the study of language as an object in the mind, as a phenomenon in society, and as a component of computer technology. The constituents of language (morphology, phonetics, syntax) will be examined as well as the role of language in society (sociolinguistics, register, written and spoken language, power) and the application of computers to linguistics (computational linguistics, corpora, computer languages as language). The course should provide a useful grounding for students whose degree involves the analysis and application of natural or invented languages.

ISYE INDUSTRIAL AND SYSTEMS ENGINEERING

ISYE 201 Introduction to Systems Engineering (2-3-3)
Prerequisites: MATH 106; CMPE 111
Co-requisite: ISYE 211

This course introduces students to problems in the IE domain through case studies and site visits where appropriate. Coverage included projects involving information collection, data acquisition, analysis, and presentation as well as the motivation and use of analytical, algorithmic, conceptual, and computational models. Financial analysis of potential problem solutions is also stressed.

ISYE 211 Probabilities with Applications (3-0-3)
Prerequisite: MATH 106
Co-requisite: MATH 201

Topics include probability, conditional probability, density and distribution functions from engineering, expectation, conditional expectation, laws of large numbers, and the central limit theorem.

ISYE 221 Basic Statistical Methods (3-0-3)
Prerequisite: ISYE 211

Point and interval estimation of systems parameters, statistical decision making about differences in system parameters, analysis and modeling of relationships between variables.

ISYE 321 Quality Control (3-0-3)
Prerequisite: ISYE 221

Topics include quality system requirements, designed experiments, process capability analysis, measurement capability, statistical process control, and acceptance sampling plans.

ISYE 322 Reliability (3-0-3)
Prerequisite: ISYE 221

Topics include hazard functions, life distributions, censoring, life tables, nonparametric and parametric estimation and inference, accelerated life testing, structure functions, reliability and maintenance systems, replacement theory.

ISYE 323 Forecasting and Time Series (3-1-3)
Prerequisites: MATH 201, ISYE 221

Topics include hazard functions, life distributions, censoring, life tables, nonparametric and parametric estimation and inference, accelerated life testing, structure functions, reliability and maintenance systems, replacement theory.

ISYE 331 Stochastic Processes (3-0-3)
Prerequisite: ISYE 211

Learn techniques for modeling stochastic systems and introduce methods for using these models in solving engineering design problems.

ISYE 341 Simulation analysis and design (3-0-3)
Prerequisites: ISYE 221; ISYE 331

Discrete event simulation methodology emphasizing the statistical basis for simulation modeling and analysis. Overview of computer languages and simulation design.
Applications include a variety of industrial situations, including manufacturing and logistic simulations.

ISYE 351 Linear Programming (3-0-3)
Prerequisites: MATH 204; MATH 207, ISYE 211, CMPE 111; CMPE 201

Topics include mathematical modeling of engineering applications; network and graphical interpretations; linear, nonlinear, and integer programming; general solution strategies; and utilization of modeling languages and solvers for computer solution.

ISYE 361 Data and Information Engineering (3-0-3)
Prerequisites: CMPE 111; CMPE 201; ISYE 351

Concepts in modeling data for engineering applications. Design and implement robust databases for a variety of general industrial problems. Query databases to obtain relevant information; Global Enterprise Resource Planning.

ISYE 371 Supply Chain and Logistics (3-0-3)
Prerequisites: ISYE 351, ISYE 331

Topics include pricing models; revenue management; gaming and equilibrium; principal agent models; auctions; supply chain coordination strategies; and value of information.

ISYE 399 Engineering Internship (0-0-1)
Prerequisites: Junior standing and approval of department

Students are required to spend a minimum of 6 continuous weeks on an approved industrial internship program. The internship provides students with practical, on-the-job experience which allows them to integrate theory with "real world" situations. It is academically supervised by a faculty member and professionally supervised by the company's internship supervisor who provides feedback to the university about the student's progress. A formal report, that documents the work undertaken during the internship period, must be submitted to the Department within the first two weeks of the semester following the internship. The report and the complete course activities are graded on Pass/Fail basis by a faculty member.

ISYE 401 Advanced Systems Engineering (3-0-3)
Prerequisite: Senior Standing

An integrated introduction to systems methodology, design, and management. An overview of systems engineering as a professional and intellectual discipline, and its relation to other disciplines, such as operations, research, management science, and economics. An introduction to selected techniques in systems and decision sciences, including mathematical modeling, decision analysis, risk analysis, and simulation modeling. Elements of systems management, including decision styles, human information processing, organizational decision processes, and information system design for planning and decision support. Emphasizes relating theory of practice via written analyses and oral presentations of individual and group case studies.

ISYE 411 Advanced Stochastic Processes (3-0-3)
Prerequisite: ISYE 331

Learn techniques for modeling and analyzing

more-sophisticated stochastic processes.

ISYE 421 Advanced Statistics (3-0-3)
Prerequisite: ISYE 221

Involving a variety of topics such as design of experiments, nonparametric statistics, Bayesian statistics. Use of statistics-oriented programming language such as R or SAS.

ISYE 441 Advanced Simulation (3-0-3)
Prerequisites: ISYE 211; ISYE 331

Discrete event simulation methodology emphasizing the statistical basis for simulation modeling and analysis. Overview of computer languages and simulation design applied to various industrial situations.

ISYE 451 Integer Programming (3-0-3)
Prerequisite: ISYE 351

Emphasizing optimization problems with integer variables and constraints. Appropriate software will also be used to solve a variety of practical problems.

ISYE 452 Advanced Optimization (3-0-3)
Prerequisite: ISYE 451

Emphasizing advanced optimization problems: nonlinear programming, dynamic programming, stochastic optimization.

ISYE 460 Human Factors (3-0-3)
Prerequisite: ISYE 201

Introduction to Human factors. Topics involve the incorporation of the human element into systems and product design; how to communicate critical information to human users; ergonomics and workplace design.

ISYE 461 Design Of Human-Integrated Systems (3-1-3)
Prerequisites: ISYE 221; CMPE 111

Introduction to the effective design of information technology to support human activity in the workplace. Topics include general cognitive systems engineering concepts and principles and specific concepts and principles of interface design, task analysis, prototyping, and empirical usability evaluation methods. Case studies and individual and group design projects help students apply the concepts and principles in domains such as service, management, manufacturing, transportation and control systems.

ISYE 471 Advanced Supply Chain Logistics (3-0-3)
Prerequisites: ISYE 331; ISYE 351; ISYE 371

Courses in special topics of timely interest to the profession, conducted by resident or visiting faculty.

ISYE 472 Manufacturing And Warehousing (3-0-3)
Prerequisites: ISYE 221; ISYE 331

Design and operation of manufacturing, service and warehousing facilities.

ISYE 480 Financial Engineering (3-0-3)
Prerequisite: None

Methods of economic analysis in engineering, including time value of money, equivalence, economic measures of worth, selection rules for alternatives, income taxes and equipment depreciation, inflation, and uncertainty.

ISYE 485 Stochastic Manufacturing And Service Systems (3-0-3)
Prerequisite: ISYE 331

Models for describing stochastic movements of parts and material in manufacturing facilities, supply chains, inventory systems, and equipment maintenance networks. Analysis of congestion, delays, machine usage, line balancing, equipment availability, inventory ordering policies, and system crashes. Basics of Markov Chains and queueing theory.

ISYE 491 Undergraduate Research Project (3-0-3)
Prerequisite: Senior Standing

Student or small group of students will team with a professor to engage in a meaningful Research study in an industrial engineering or operations topic. Students are expected to read relevant literature on a general research area, propose a specific research topic, and work together to produce a technical report that is of publishable quality.

ISYE 495 Healthcare/Service Applications (3-0-3)
Prerequisites: ISYE 331; ISYE 341; ISYE 351

Study a variety of topic areas and industrial engineering-based methodologies used in today's healthcare industry. Major project involving healthcare provider.

ISYE 497 Senior Design Project I (0-12-3)
Prerequisites: Senior Standing and approval from department

Senior design project requiring student groups to formulate a project plan with a business enterprise. Includes specific milestones, targets, and evaluation criteria.

ISYE 498 Senior Design Project II (0-12-3)
Prerequisite: ISYE 497

Continuation of ISYE 497

MANG MANAGEMENT

MANG 200 Principles of Management (3-0-3)
Prerequisite: Junior Standing

This course aims to provide an overview of the theories and practices of management in organizational contexts. Specific issues covered include the history of management thought, management roles, management functions, planning and strategy, leadership, organization structure and design, control, and change issues in organizations.

MATH MATHEMATICS

MATH 001 Preparatory Mathematics (2-1-3)
Prerequisite: None

Factoring and Inequalities, Rational Expressions and Equations, Area and volume of geometric figures by using formulas, Coordinate geometry, Functions and Their Graphs

MATH 002 Preparatory Mathematics (3-1-4)
Prerequisite: MATH 001 or Exemption from MATH 001

System of Linear Equations, Polynomials, exponential and logarithmic functions, Trigonometry, Vectors, Sequences and Series, and brief introduction to differentiation and integration of functions.

MATH 105 Calculus I (3-0-3)
Prerequisite: MATH 002 or Placement test

Review: functions and their graphs, graphing with calculators. Limits and Continuity: the precise definition of a limit, one-sided limits and limits at infinity, infinite limits and vertical asymptotes. Differentiation: derivative techniques and theory of differentiation, derivatives of functions, chain rule, implicit differentiation. Applications of Derivatives: rate of change, maxima and minima, graphing, optimization, L'Hopital's rule, Newton's method. Integration: estimating with finite sums, definite integral, fundamental theorem of Calculus, indefinite integrals and the substitution rule, area between curves.

MATH 106 Calculus II (3-0-3)
Prerequisite: MATH 105

Review Integration, Applications of Definite Integrals: area, volume and applications. Integrals of Transcendental Functions: logarithms and exponentials, inverse trigonometric functions. Techniques of Integration: integration by parts, trigonometric integrals, partial fractions, improper integrals. Parametric Equations and Polar Coordinates. Numerical Integration Techniques. Infinite Sequences and Series: numerical sequences, series and tests, convergence, power series, Taylor and Maclaurin series.

MATH 201 Calculus III (3-0-3)
Prerequisite: MATH 106

Vectors and Analytic Geometry: Operations with vectors, Dot and Cross products, Lines and Planes. Curves: Speed, Velocity, and Acceleration, Length of Curve. Functions of several variables: Derivatives, gradient, chain rules, Maximal and minima of functions of several variables. Vector fields: Curl and Divergence of a Vector Field. Integration, Line Integrals and Work, Double and Triple Integrals, Cylindrical and Spherical Coordinates, Change of variables, Surfaces and Volume integrals. Divergence Theorem, Stokes' and Green's Theorems.

MATH 204 Linear Algebra (3-0-3)
Prerequisite: MATH 106

System of linear equations: Gauss-Jordan elimination method. Matrices and determinants: Basic properties, Inverse of Matrices, Iterative methods, Singular Value Decomposition. Spaces and Transformations: Vector space, Linear Combinations, Linear Independence, Matrix Transformations, Subspaces, Basis, Dimension of Subspaces, Rank of Matrices, Nullity, Linear Transformations. Eigenvalues and Eigenvectors. Inner Products: Inner Product and Length, Orthogonal Vectors and Orthogonal Spaces.

MATH 205 Complex Variables and Transforms (3-0-3)
Prerequisite: MATH 106

Complex numbers and variables. Analytic functions : Taylor's Series and MacLauren Series. Singularities of complex functions. Elements of Residue theory. Fourier series. Fourier transform, its properties and its inverse. Laplace transform and its properties. Inverse Laplace Transform. Application of Laplace transforms. Z-transform and properties, inverse Z-transform.

MATH 206 Differential Equations and Applications (3-0-3)
Prerequisite: MATH 106
Co-requisite: MATH 204

First and Second Order ODEs, Higher Order ODEs, Laplace Transform Methods, Linear and Nonlinear Systems, Numerical Approximations and Modelling.

MATH 207 Discrete Mathematics (3-0-3)
Prerequisite: MATH 106

Prepositional and predicate calculus, sets, mathematical induction, recursive equations of first and second order equations, counting, relations, graphs, trees and algorithms for graphs network. Applications to computer engineering.

MATH 215 Probability and Statistics (3-0-3)
Prerequisite: MATH 106

Probability and Statistics offer mathematical theories and methods for modeling uncertainty in the real world. The course will cover: basic elements of set theory, permutations and combinations, foundations of probability, conditional probability. Random variables and processes. Standard discrete and continuous distributions: binomial, Poisson, uniform, exponential and Gaussian distribution. Statistical inference: estimation, confidence intervals, hypothesis testing and linear regression

MATH 310 Simulation and System Modeling (3-0-3)
Prerequisite: MATH 204

Basic concepts of modeling and simulation, description and formulation of problems as optimization problems, simplex methods and duality, sensitivity analysis, transportation problems and their solution. Nonlinear optimization.

MECH MECHANICAL ENGINEERING

MECH 181 Problem Solving in Mechanical Engineering (2-3-3)
Prerequisite: CMPE 111
Co-requisite: ENGR 180

Introduction to engineering including design, fabrication, and visual communication conveyed via lectures and laboratory experiences. The lecture portion of the course starts with an introduction to mechanical and aeronautical engineering, engineering design and manufacturing. The course continues with topics covering the design process, creativity, teamwork, project skills and reverse engineering. Students will utilize graphics and modeling fundamentals for engineering design (e.g. freehand sketching, computer modeling of solid geometry and generation of engineering drawings). Application of the design process and problem solving through individual and team projects are emphasized.

MECH 201 Engineering Dynamics (3-0-3)
Prerequisite: ENGR 200

Review of kinematics and kinetics of particles: rectilinear and curvilinear motions; Newton's second law; energy and momentum methods. Kinematics and kinetics of rigid bodies: plane motion of rigid bodies; forces and accelerations; energy and momentum methods.

MECH 220 Engineering Materials (3-0-3)
Prerequisites: CHEM 101, MATH 105, PHYS 101

Materials (metals, alloys, polymers) in engineering service; relationship of inter-atomic bonding, crystal structure and defect structure (vacancies, dislocations) to material properties; polymers, phase diagrams and alloys; microstructure control (heat treatment) and mechanical properties; material failure; corrosion.

MECH 230 Fluid Mechanics I (3-0-3)
Prerequisites: PHYS 101, MATH 201

Fluid properties. Units. Kinematics, dynamics of fluid motion: concepts of streamline, control volume, steady and one-dimensional flows;

continuity, Euler, Bernoulli, steady flow energy, momentum, moment of momentum equations; applications. Fluid statics; pressure distribution in fluid at rest; hydrostatic forces on plane and curved surfaces; buoyancy.

MECH 301 Machine Dynamics (3-0-3)
Prerequisite: MECH 201

Kinematic and dynamic analysis of mechanisms and machines. Mechanism force analysis. Static and dynamic balancing. Kinematic and dynamic analysis of cams. Free and forced vibration of single-degree-of-freedom systems. Introduction to multi-body dynamics.

MECH 320 Mechanics of Solids I (3-0-3)
Prerequisites: ENGR 200, PHYS 101

Review of Principles of Statics; friction problems; Concepts of stress and strain at a point; statically determinate and indeterminate stress systems; torsion of circular sections; bending moment and shear force diagrams; stresses and deflections in bending; stress and strain transformations.

MECH 321 Mechanics of Solids II (3-3-4)
Prerequisite: MECH 320

Buckling instability: torsion of non-circular sections; unsymmetric bending and shear centre; energy methods; complex stresses and criteria of yielding; elementary theory of elasticity; axisymmetric deformations.

MECH 330 Fluid Mechanics II (3-3-4)
Prerequisite: MECH 230

Review of control volume analysis. Dimensional analysis and similitude. Compressible flow: isentropic flow relations, flow in ducts and nozzles, effects of friction and heat transfer, normal and oblique shocks, two-dimensional isentropic expansion. Viscous flow theory: hydrodynamic lubrication and introduction to boundary layers.

MECH 340 Thermodynamics (3-0-3)
Prerequisites: CHEM 101, MATH 201, PHYS 101

Basic concepts of thermodynamics: temperature, work, heat, internal energy and enthalpy. First law of thermodynamics for closed and steady-flow open systems. Thermodynamic properties of pure substances; changes of phase; equation of state. Second law of thermodynamics: concept of entropy. Simple power and refrigeration cycles. Introduction to heat transfer: conduction, convection and radiation.

MECH 341 Heat Transfer (3-0-3)
Prerequisites: MECH 340, MECH 330

Mechanisms of heat transfer: fundamentals and solutions. Steady and transient conduction: solution and numerical and electrical analog techniques. Convective heat transfer: free and forced convection for laminar and turbulent flows; heat exchangers. Heat transfer between black and grey surfaces, radiation shields, gas radiation, radiation interchange.

MECH 350 System Dynamics and Vibration (3-0-3)
Prerequisites: MECH 201, MATH 204, MATH 206

Dynamic modeling and response analysis of systems with mechanical, hydraulic, electrical, and/or thermal elements, free and forced response, vibration absorbers and vibration isolators, state space modeling of dynamic systems

MECH 351 Feedback Control Systems (3-3-4)
Prerequisite: MECH 350

Feedback control system block diagrams, control system performance and specifications, classical methods of feedback control system design and analysis, introduction to modern control and digital control.

MECH 385 Machine Design and Practice (2-3-3)
Prerequisites: ENGR 180, MECH 181

The design of mechanical machine elements is studied from theoretical and practical points of view. Topics covered include: design factors, fatigue, and discrete machine elements. Problem analysis emphasizes the application to practical mechanical engineering problems. Students relate theory and practice and develop experience with modern engineering equipment, measurement techniques and design methodology. Good reporting practice is emphasized.

MECH 399 Engineering Internship (0-0-1)
Prerequisites: Junior standing and approval of department

Students are required to spend a minimum of 6 continuous weeks on an approved industrial internship program. The internship provides students with practical, on-the-job experience which allows them to integrate theory with "real world" situations. It is academically supervised by a faculty member and professionally supervised by the company's internship supervisor who provides feedback to the university about the student's progress. A formal report, that documents the work undertaken during the internship period, must be submitted to the Department within the first two weeks of the semester following the internship. The report and the complete course activities are graded on Pass/Fail basis by a faculty member.

MECH 405 Vibration Analysis (3-0-3)
Prerequisite: MECH 350

Free and forced vibrations of one and two degree-of-freedom systems. Vibration measurement and isolation. Numerical methods for multi-degree-of-freedom systems. Modal analysis techniques. Dynamic vibration absorbers. Shaft whirling. Vibration of continuous systems: bars, plates, beams and shafts. Energy methods. Holzer method.

MECH 420 Materials: Strength and Fracture (3-0-3)
Prerequisite: MECH 220

Analysis and prevention of failures in metals and composite materials; plasticity analysis and plastic collapse; micro-mechanisms of fracture, conditions leading to crack growth and transition temperature effects, fracture mechanics, fatigue, environmentally assisted cracking, non-destructive evaluation and testing. Mechanical properties of structural composites.

MECH 421 Mechanics of Deformable Solids (3-0-3)
Prerequisites: MECH 321, MECH 420

Course extends the student's ability in design and stress analysis. Topics include: introductory continuum mechanics, theory of elasticity, stress function approach, Lamé and Mitchell problems, stress concentrations, thermoelasticity and plasticity.

MECH 422 Fatigue and Fracture Analysis (3-0-3)
Prerequisites: MECH 321, MECH 420

Elastic and elasto-plastic fracture mechanics. Fatigue design methods, fatigue crack initiation and growth Paris law and strain-life methods. Fatigue testing, scatter, mean stress effects and notches. Welded and built up structures, real load histories and corrosion fatigue. Damage tolerant design and fracture control plans.

MECH 435 Fluid Machinery (3-0-3)
Prerequisite: MECH 330

Types of machines. Similarity: performance parameters; characteristics; cavitation. Velocity triangles. Euler equation: impulse and reaction. Radial pumps and compressors: analysis, design and operation. Axial pumps and compressors: cascade and blade-element methods; staging; off-design performance; stall and surge. Axial turbines. Current design practice.

MECH 440 Thermodynamics & Heat Transfer Lab (1-3-2)
Prerequisite: MECH 341

Laboratory experiments on topics in thermodynamics and heat transfer.

MECH 441 Applied Thermodynamics (3-0-3)
Prerequisite: MECH 340

Gas and vapour power cycles: reheat, regeneration, combined gas/vapour cycles, cogeneration. Heat pump and refrigeration cycles: vapour compression cycles, absorption refrigeration and gas refrigeration. Mixtures of perfect gases and vapours: stoichiometry and combustion. Principles of turbomachinery.

MECH 445 Heating and Air Conditioning (3-0-3)
Prerequisite: MECH 340

Environmental demands for residential, com-

mercial and industrial systems. Methods of altering and controlling environment. Air distribution. Refrigeration methods, equipment and controls. Integrated year-round air-conditioning and heating systems; heat pumps. Cooling load and air-conditioning calculations. Thermal radiation control. Component matching. System analysis and design.

MECH 446 Internal Combustion Engines (3-0-3)
Prerequisite: MECH 340

In this course, students will obtain an understanding of internal combustion engines that will allow them to perform analysis of combustion thermodynamics and cycles including heat addition, heat loss, air/fuel flow, and basic engine design parameters.

MECH 450 Vehicle Engineering (3-0-3)
Prerequisites: MECH 301, MECH 350

The course emphasizes the engineering and design principles of road transport vehicles. Topics to be covered include: performance characteristics, handling behaviour and ride quality of road vehicles.

MECH 455 Robotics (3-0-3)
Prerequisites: MATH 204, MATH 206, MECH 351

This course is an introduction to kinematics, dynamics, and control of robot manipulators. Emphasis is placed on computer use in control of actual robots and in simulation of mathematical models of robots.

MECH 465 Bioengineering (3-0-3)
Prerequisite: MECH 340

Bioengineering is an introduction to material, energy, charge and momentum balances in biological systems. Steady-state and transient conservation equations for mass, energy, charge and momentum will be derived and applied using basic mathematical principles, physical laws, and thermodynamic properties.

MECH 470 Principles of Manufacturing (3-0-3)
Prerequisite: MECH 220

Manufacturing processes, materials. Casting: solidification and heat flow theory, defect formation, casting design. Metal forming: elementary plasticity theory, plastic failure criteria, force and work calculations. Bulk and sheet forming. Joining: heat flow and defect formation theory, residual stresses. Machining theory and methods. Hardening: diffusion, wear resistance.

MECH 480 Senior Design Project I (2-3-3)
Prerequisite: MECH 385
Co-requisite: MECH 450

This is the first of the two senior level team projects dealing with design and development of a vehicle or system. One or more such projects will be undertaken each year. Opportunities to exercise initiative, engineering judgment, self-reliance and creativity, in a team environment similar to industry.

MECH 481 Senior Design Project II(0-9-3)
Prerequisite: MECH 480

MECH 485 Power Plant Systems Design (3-0-3)
Prerequisite: MECH 440

This course covers a detailed engineering analysis and design of a thermal power plant, including heat balance, selection of equipment (boiler, turbines, heat exchangers, pumps, cooling tower), performance evaluation, economic evaluation and feasibility studies.

MECH 491 Undergraduate Research Project (Variable course credits from 1 to 3)
Prerequisite: Approval of department

Independent research conducted under the guidance of a faculty member.

PHYS PHYSICS

PHYS 001 Preparatory Physics I (2-0-2)
Co-requisite: MATH 001

Motion, forces, work and energy, levers and machines, electric charge, electric circuit, domestic electricity and electromagnetic effects.

PHYS 002 Preparatory Physics 11 (2-1-3)
Prerequisite: PHYS 001
Co-requisite: MATH 002

Measurements, units, equations, dimensional analysis, vectors and interpreting graphs. Forces and Newton's laws of motion. Kinetic and potential energy, work and power. Electrostatics, passive components d.c. electric circuits and magnetic fields.

PHYS 101 General Physics I (3-3-4)
Co-requisite: MATH 105

Units and Measurement, Forces and Motion, Work and Energy, Collisions and Conservation Laws, Rotations, Torque, Angular Momentum, Equilibrium, Circular Motion, Oscillations and Mechanical Waves. The course includes laboratory experiments that cover the concepts discussed in the course.

PHYS 102 General Physics II (3-3-4)
Prerequisites: PHYS 101, MATH 105

Electric Charge and Electrostatic fields, Coulomb's Law and Electric Potential, Electric Currents and Magnetic Fields, Ampere's Law and Faraday's Law of Induction, Basic Electric Components and Circuits, Electromagnetic Waves, Geometric and Physical Optics. The course includes laboratory experiments that cover the concepts discussed in the course.

PHYS 201 Physical Properties of Solids (3-0-3)
Prerequisites: PHYS 102, MATH 106

Quantum Effects, Atoms and Bonding, Crystals and Defects, Electrons in Solids, Mechanical Properties of Solids, Thermal Properties, Electrical Properties, Optical Properties, Magnetic Properties, Piezoelectric Effect, Superconductivity, Applications to Devices.

SOCS SOCIAL SCIENCES

SOCS 105 Science, Technology, and Society (3-0-3)
Co-requisite: ENGL 102

The role of science and technology in society. The appreciation and understanding of science and the public policy issues related to science and technology. Issues such as science vs. pseudo-science, the ethics of science and technology, the methods of the sciences, the importance of major scientific discoveries, and public expectations of the sciences. Cases of technological innovation and implementation, such as electronic communications and bar-coding, will be analyzed for the impact they have at the level of the individual, the organization and society.

SOCS 130 Mass Media and Society (3-0-3)
Prerequisite: ENGL 102

An examination of the significant role the mass media play in our society. The course considers the relationship of mass media to economics, politics and government and the impact mass communication has on daily life.

SOCS 140 Critical Thinking (3-0-3)
Prerequisite: ENGL 102

This course provides students opportunities for analysis, synthesis, prescription, and application of critical thinking and decision making within the organization. Concepts covered include deduction and induction, definition, fallacies, justification of judgments and textural analysis. Emphasis is placed on preparing managers who can deal clearly, rationally, and creatively with a diverse workforce and a dynamic workplace. This course equips students with concrete skills in critical thinking and decision making that will allow them to identify and solve organizational problems, as well as provide strategic direction.

SOCS 150 Comparative Cultural Studies (3-0-3)
Prerequisite: ENGL 102
Co-requisite: ECON 120

Beginning with an analysis of dominant region-

al cultural, social and philosophical trends this course will examine the phenomena of globalization and its effect on cultural formations and business practices in the region and across the world, considering the forces behind the expansion of corporate business and the reasons for resisting these pressures. Issues such as the export of mass media and the economic consequences of free trade will be examined.

SOCS 200 **Introduction to Politics: Theories of History and Civil Society (3-0-3)**
Prerequisite: ENGL 102

There are many ways to approach the subject of politics (law, institutions, society, international relations, etc). This course focuses on critical themes, such as human rights and civil society, to explain the evolution of politics from the emergence of the modern nation-state, to the era of decolonization, and finally to globalization. It will review major historical questions that continue to animate contemporary debates, including debates within the Middle East, and focuses on evolving political institutions and systems, which grew out of these debates.

SOFE SOFTWARE ENGINEERING

SOFE 201 **Introduction to Software Engineering (3-0-3)**
Prerequisite: CMPE 211

Introduction to Software Engineering; The Software Process; Project Management Concepts; Software Requirements Engineering Using Unified Modeling Language (UML) Use-Cases; System Models; Architectural Design; Object-Oriented Software Design; Testing and Maintenance; Emerging software development methods.

SOFE 301 **System Analysis and Design (3-0-3)**
Prerequisite: SOFE 201

Design principles, patterns, notations and methodologies with focus on object-oriented and scenario-based design. From requirements to design to implementation; Reconcile the models; Refining and verifying the models; Domain partitioning; Object design; Model-driven design and Unified Modeling Language (UML). Structural and behavioral design descriptions and specifications; Adding software behavior; Introduction to software architecture (styles and view models); Test-driven development; User interfaces.

SOFE 302 **Introduction to Human Computer Interfaces (3-0-3)**
Prerequisite: SOFE 201

Human Factors of Interactive Software; HCI Theories Principles and Guidelines; HCI Design; Principles of user interface design, development, and programming; HCI Development Tools; Expert Reviews; Usability Testing; User interface evaluation; Web based user interfaces.

SOFE 321 **Database Systems (3-2-4)**
Prerequisite: CMPE 211

Introduction to the theory, design and implementation of database systems; Data models; Entity-relationship model; Relational model; SQL query language; Data integrity; Normalization; Storage access.

SOFE 351 **Software Testing and Quality Assurance (3-0-3)**
Prerequisite: SOFE 301

Overview of the maintenance and testing activities within the software life cycle; Software Maintenance: Major maintenance activities. Estimating maintenance costs and productivity; Quality Assurance: Examination of various quality/complexity metrics; Software availability; Measurement and prediction of software reliability; Non-execution based testing; Testing in the Small; Testing in the Large; Test suites.

SOFE 399 **Engineering Internship (0-0-1)**
Prerequisites: Junior standing and approval of the department

Students are required to spend a minimum of 6 continuous weeks on an approved industrial internship program. This program is intended to complement and enrich the academic program with professional work experience in the field of Software Engineering. A formal report, that documents the work undertaken during the internship period, must be submitted to the Department of Computer Engineering within the first two weeks of the semester/term following the professional training. The report and the complete course activities are graded on Pass/Fail basis by a faculty member from the Department of Computer Engineering.

SOFE 401 **Formal methods in Soft ware Engineering (3-2-4)**
Prerequisite: SOFE 301

Models, methods and their application in all phases of software engineering process with a focus on object oriented software; operational, algebraic, model-based, property-based specification methods; verification of consistency, completeness of specifications; verification of software properties; exercises in specification construction, verification using method-based tools.

SOFE 403 **Software Architecture (3-0-3)**
Prerequisite: SOFE 302

Introduction to Software Architecture; Architecture Descriptions: Architecture Description Languages, Architecture Styles, A Model of software Architecture; Repository Model; Layered Model; Client-Server Model; Inter-Process Communication: Remote Procedure Call (RPC) versus Object Request Broker (ORB); N-Tiered Client-Server; Design Patterns; Specialized Software Architectures; Techniques and criteria used for the evaluation of software architecture.

SOFE 405 **Software Management and Economics (3-0-3)**
Prerequisite: SOFE 301

Software management and economics goals and issues; Value Based software Engineering; Competing on schedule, cost and quality; Software Schedule-Cost-Quality Tradeoffs; Model-Based System Architecting and Software Engineering (MBASE) Fundamentals; Risk Management Principles and Practices; COCOMO II Suite of Software Cost Estimation Models: Economic Analysis of Software Projects; COTS and Supplier Management.

SOFE 406 **Software Evolution (3-0-3)**
Prerequisite: SOFE 301

Changes to software over long periods of time; Methods, techniques, and tools employed by software engineers when developing and maintaining evolving software; Reverse engineering, reengineering, and migration approaches which involve capturing, preserving, and extending knowledge about software; Analyzing and understanding software; Static and dynamic source code analysis; Software visualization and program transformation tools.

SOFE 407 **Software Models for Embedded Systems (3-0-3)**
Prerequisite: SOFE 301

Characteristics and design of embedded systems; Formal models and specification languages for capturing system behavior; Techniques for specification, exploration and refinement; System partitioning and hardware/software co-design; Tools for validation, verification, and simulation; Quality and performance metrics.

SOFE 411 **Information Retrieval and Knowledge Discovery (3-0-3)**
Prerequisite: CMPE 220

Information retrieval (IR) and filtering; Data mining and knowledge discovery (KD); Information extraction; Question answering; Text processing.

SOFE 495 **Selected Topics in Software Engineering (3-0-3)**
Prerequisite: Topic Specific

This course mainly deals with new trends in Software Engineering and emerging technologies.

SOFE 496A **Independent Study A (0-9-3)**
Prerequisites: Senior standing and approval of department

This course gives an undergraduate student the opportunity to participate in an individual or group oriented research project under direction of a faculty member. A formal report and an oral presentation are required.

SOFE 496B **Independent Study B (0-6-2)**
Prerequisites: Senior standing and approval of department

This course gives an undergraduate student the opportunity to participate in an individual or group oriented research project under direction of a faculty member. A formal report and an oral presentation are required.

SOFE 496C **Independent Study C (0-3-1)**
Prerequisites: Senior standing and approval of department

This course gives an undergraduate student the opportunity to participate in an individual or group oriented research project under direction of a faculty member. A formal report and an oral presentation are required.

SOFE 497 **Senior Design Project I (0-6-2)**
Prerequisites: ENGL 220, senior standing and approval of department

Students will pursue an in-depth large software project by going from concept to working prototype. Some of the proposed design projects may involve interaction with industry. The students normally work in teams under faculty supervision. The project fosters teamwork between group members and allows students to develop their project management, technical writing, and technical presentation skills. Formal interim and final reports and presentations are required from each group.

SOFE 498 **Senior Design Project II (0-6-2)**
Prerequisite: SOFE 497

Continuation of SOFE 497

STSK STUDY SKILLS

STSK 001 **Study Skills I (1-0-1)**
Prerequisite: None

Study skills for academic purposes including setting academic goals, time management, study habits, learning styles, independent learning, memory techniques, study groups, exam preparation and lecture note-taking.

STSK 002 **Study Skills II (1-0-1)**
Prerequisite: None

Study Skills for academic purposes with emphasis on setting goals, time management, learning preparation, communication with academics, SQ3R Study Method, remembering information, the Cornell note-taking system and personal development plan.

8

FACULTY

A

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