



جامعة الملك فهد للبترول والمعادن  
King Fahd University of Petroleum & Minerals

# Undergraduate BULLETIN



2015

## **About this Bulletin**

The Undergraduate Bulletin of King Fahd University of Petroleum and Minerals (KFUPM) is an official publication issued by the Office of the Vice Rector for Academic Affairs.

Undergraduate programs are revised periodically and new ones are introduced. This updated Bulletin is part of a regular exercise carried out by the University to document these changes and make them available to students, faculty, and the public. It provides information on faculty, services, academic programs and requirements, and academic regulations. In addition to the hard documents of the Bulletin, a continuously updated soft version is available on the University website at <http://regweb.kfupm.edu.sa>.

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September 2015

## **ACKNOWLEDGEMENTS**

The editor acknowledges the generous support provided by the Vice Rector for Academic Affairs of the University, Dr. Mohammad S. Al-Homoud. The editor also expresses his appreciation to the former Vice Rector for Academic Affairs, Dr. Abdulaziz Al-Suwaiyan under whose supervision this task was first started. This assignment could not have been accomplished without the cooperation received from the University Deans and Chairmen, the Registrar, and all other Departments involved. Mr. Mohammed Abdul Azeem Siddiqui is thanked for providing the relevant University Council decisions and coordination with various departments at KFUPM. The production of this Bulletin in its final form is the work of KFUPM Press.

## FOREWORD

King Fahd University of Petroleum & Minerals (KFUPM) is pleased to present the new Undergraduate Bulletin, which reflects its commitment to continuously update its academic programs to cope with global changes and respond to the needs of the Kingdom of Saudi Arabia. The Bulletin gives description of the academic programs being offered at the University. It includes the degree plans, degree requirements, course descriptions and graduation requirements. In addition, it lays out the policies, procedures and student services at the University in effect at the time of publication. It serves as a firsthand source of information for undergraduate students, faculty and administrators. Prospective students and stakeholders can also benefit from the Bulletin to gain an understanding of the University's academic programs and policies.

The Bulletin also reveals the adoption of various accreditations of the programs being offered at KFUPM by national and international accrediting agencies to ensure quality education. At the time of this publication, KFUPM is proud that all its undergraduate programs are accredited or in the final stages of accreditation. The programs accredited by the Accreditation Board of Engineering & Technology (ABET) <http://www.abet.org/> are as follows:

### Engineering Accreditation Commission

- Aerospace Engineering (BS)
- Applied Aerospace Engineering (BS)
- Applied Chemical Engineering (BS)
- Applied Civil Engineering (BS)
- Applied Electrical Engineering (BS)
- Applied Mechanical Engineering (BS)
- Architectural Engineering (BS)
- Chemical Engineering (BS)
- Civil Engineering (BS)
- Computer Engineering (BS)
- Control and Instrumentation Systems Engineering (BS)
- Electrical Engineering (BS)
- Industrial and Systems Engineering (BS)
- Mechanical Engineering (BS)
- Petroleum Engineering (BS)
- Software Engineering (BS)
- Construction Engineering and Management (MEng)
- Construction Engineering and Management (MSc)

## **Computer Accreditation Commission**

- **Computer Science (BS)**

The programs of the College of Industrial Management (CIM) are accredited by the Association to Advance Collegiate Schools of Business (AACSB). Other programs are in the final stages of accreditation by the National Commission for Academic Accreditation & Assessment (NCAAA)

Our academic programs are designed and updated not only to respond to global changes and local needs, but also to be pro-active in preparing future generations of leaders. We ensure that students come out of their academic experience at KFUPM equipped with all the knowledge, skills, attitudes and values that will make them successful leaders and good global citizens.

KFUPM continues the support and engagement of faculty and students in research activities through the various units and grants available at KFUPM including Colleges, Centers of Excellence, and Research groups. The recent development of the University includes its newly forged links with industries through the growth of Dhahran Techno Valley (DTV). This link with industry will support Saudi Arabia's ambition to improve technology transfer and establish a knowledge-based economy.

The University also continues its commitment to community service through various formal and informal activities, but with the new dimension of implanting the culture of community service in our students through various programs established for this purpose.

I take this opportunity to extend my thanks and appreciation to the efforts of all those involved in successfully launching this Bulletin. My special thanks are due to Dr. Rajai Alassar and Dr. Ahmed Shawky Ibrahim for carefully revising this version of the Undergraduate Bulletin. Also, thanks are due to H.E. the Rector for his leadership and continuous support to all academic activities, and to all University Deans, Department Chairmen, Faculty, Support Units, and individuals who contributed to the development of this Bulletin. I would like to dedicate this version of the Bulletin to them, as they laid the path to the success achieved by the University.

As changes are likely to occur after publication of the Bulletin, updates may be viewed through the online version at <http://regweb.kfupm.edu.sa>.

Dr. Mohammad Saad Al-Homoud

Vice Rector for Academic Affairs

1<sup>st</sup> September, 2015



## **GENERAL INFORMATION**

## **HISTORY AND PHILOSOPHY OF THE UNIVERSITY**

King Fahd University of Petroleum & Minerals (KFUPM) was officially established by a Royal Decree on 5 Jumada I, 1383 (23 September 1963). The first students were admitted a year later on 23 September 1964 when 67 young men enrolled in what was then named the College of Petroleum & Minerals (CPM). Since that time, the University's enrollment has grown to about 9,340 students during the 2013-2014 academic years.

The University's growth has been marked by two significant events. The first of these was when the University conferred its first engineering degrees in 1971/1972. In that year, four men received Baccalaureate Degrees. By the end of the academic year 2013/2014, 29,898 degrees have been awarded including 3,193 Master's and 198 PhD degrees. The second milestone was the official change in both name and status from a College to a University, which occurred in 1975, leading to the name University of Petroleum & Minerals. Later on, in the year 1986, the name was changed to King Fahd University of Petroleum & Minerals (KFUPM).

The rapid growth of KFUPM is related to the rapid economic and technical development of Saudi Arabia. It also reflects the rising expectations of the people of Saudi Arabia, the expanding opportunities for the country's young men, and the increasing importance of Saudi Arabia as a major source of the world's energy.

The vast petroleum and mineral resources of Saudi Arabia pose a complex and exciting challenge for scientific, technical and management education. To meet this challenge, the University has as its goals the advanced training of students in the fields of science, engineering and management for service and leadership in the Kingdom's petroleum and minerals industries, and the promotion of research resulting in contributions to knowledge in these fields. In addition, because it derives a distinctive character from its being a technological university in the land of Islam, the University is unreservedly committed to deepening and broadening the faith of its Muslim students and to instilling in them an appreciation of the major contributions of their people to the world of mathematics and science. All areas of KFUPM—facilities, faculty, students and programs—are directed to the attainment of these goals.

## **ORGANIZATION**

KFUPM is one of the 24 universities operated in the Kingdom by the Ministry of Higher Education, and regulated by the Council of Higher Education. It is an institution operating under a University Board, headed by the Minister of Higher Education. The Board has the responsibility for policy and control. It assigns to the Chief Executive Officer - the Rector of the University - the principal responsibility for the implementation of policy and the administration of the University. The Rector is assisted by two Vice Rectors (for Academic Affairs, and for Applied Research). He is also assisted by a General Supervisor for Services and several advisory standing committees.

## **LOCATION**

The University is located in Dhahran, near the headquarters of the Saudi Aramco Oil Company (SAUDI ARAMCO) in the Eastern Province of Saudi Arabia. The campus is situated near the Arabian Gulf at a distance of about 6 kilometers from the town of Khobar,

and 15 kilometers from the city of Dammam. The academic buildings are located on a hill (*jebel*) which is 35 meters above the surrounding desert. The University overlooks the Arabian Gulf, and is about 25 kilometers away from the island of Bahrain which can be seen from the roofs of the academic buildings in clear weather.

The University is easily accessible by road or airline from any point in the Kingdom, or by air, sea and road routes from Europe, Asia, Africa, or other Middle Eastern countries. The highway distance to Riyadh is about 400 kilometers and that to Jeddah is about 1,300 kilometers. A network of paved roads leads to various distant points, such as Najran, Abha, and Jaizan in the far south, to Buraydah and Hail northwest of Riyadh, to the lovely mountain resort of Taif near Makkah and Jeddah, and to Qaiysumah, Turaif, and Tabuk along the northern frontier. King Fahd International Airport is about 40 kilometers from the University Campus, and a regular airline service exists to all domestic and many international terminals.

## **FACILITIES**

The campus of the University features a physical plan of exceptional beauty and size. Constructed on *Jebel Dhahran*, the buildings are both architecturally imaginative and educationally sound and viable. Their exterior design combines the stark color and raggedness of the landscape with the graceful lines of the Islamic arch, dome, and minaret. Interiors feature laboratories, lecture halls, classrooms, seminar rooms, offices and a variety of special facilities including computer terminals, closed circuit television outlets, and other amenities. All buildings are centrally air-conditioned.

The academic complex consists of 37 major buildings. The facilities available include: faculty/staff offices; workshops and laboratory buildings, which include the heavy equipment laboratory building and the energy research laboratory building; the Information Technology Center; classrooms; the administration building; the Library; the faculty/student center, which includes the faculty dining hall, the post office, and the stationery shop; the auditorium which seats 850 people and is equipped for simultaneous translation in three languages; the gymnasium; a mosque; the Research Institute; the stadium, which seats 10,000 people; the Medical Center; the conference center; and multi-story parking garages. The facilities also include a natural exterior amphitheater, playing fields and indoor courts for intercollegiate and intramural sports, and the distinctive KFUPM water tower with circulatory water systems.

To the north of the *Jebel* there are: student housing including the student reception center, the student cafeteria, mosques, student clubs and services; a student commercial Center; the projects & maintenance complex; the University storehouse; the Security & Safety department; the transportation department; the garage for maintenance department vehicles; and the Preparatory Year campus, consisting of the Preparatory Year faculty office building, two classroom buildings, and various laboratories and service buildings. A new academic complex consists of two classroom buildings, a faculty office building, an auditorium for 700 persons and a mosque. The buildings are equipped with high-tech facilities.

To the south of the *Jebel*, there is the faculty & staff housing including the Community Center and the coop store. The telephone exchange, the University Press building, the Bookstore, the University nursery and kindergarten schools, and the sweet water tanks are located on the southeast of the University campus.

## **Conference Center**

The Center is adjacent to the main University concourse and car park, and has extensive modern facilities for hosting international-level conferences. Its main oval-shaped auditorium can accommodate about 98 people while the other four independent briefing and committee rooms each have a 30-seat capacity. There is also an auditorium with 128 seats.

Conference meetings are supported by the latest audio-visual equipment, Community Antenna Television (CATV), connecting with all parts of the KFUPM campus, and its own typing facility.

## **Medical Center**

The KFUPM Medical Center provides the community with the following services:

- Primary health care.
- Laboratory and X-ray facility in parallel to the available medical facilities.
- Referrals to the local governmental hospitals for further diagnosis, consultations, and hospitalization.
- Multi-specialty clinics in Internal Medicine, Pediatrics, Gynecology & Obstetrics, Ophthalmology, Psychiatry, Dermatology, and Dentistry.
- Vaccinations, which include primary (essential) vaccinations for children, as well as participation in the national preventive campaigns.
- 24-hour first-aid service for management of emergency cases.
- 24-hour ambulance service to attend emergency cases.
- 24-hour nursing service which includes giving injections, dressing and all possible nursing assistance such as checking blood pressure and vision tests, etc.
- Facility for observation inside the Medical Center, resulting in either discharging the patients or referring them to hospitals.
- Issuance of medical reports for residence permits (Iqama), sick leave, etc.
- Provision of medicines according to University policy.
- General dental clinics for dental care and oral hygiene.
- Check-up service for new employees, including staff & faculty, laborers of KFUPM food services on a regular, three-monthly basis, housemaids and drivers working for staff & faculty, and KFUPM school children before registration and before frequent short activities.

## **Student Housing**

The University provides housing for the total student enrollment in keeping with its policy of being an entirely residential institution. The undergraduate student dormitories, which constitute the majority of student housing at this time, are in three-storey air-conditioned buildings, containing furnished rooms, with two beds per room, bathrooms zones (toilets, showers, and hygienic facilities), study rooms, and facilities for the handicapped. These units are located in the student compound (*Al-Falah District*), in the north sector of the campus and have been modernized. As part of the program to provide newer facilities of modern design, consistent with the

architecture of the University, most of the multi-story buildings are now completed and occupied.

### **Cafeteria**

The student cafeteria—a large, spacious building— is situated adjacent to the student dormitories. It can accommodate more than 1500 students at a time. Students are provided with subsidized meals comprising breakfast, lunch and dinner.

The food preparation is handled by a well-qualified professional team in the central kitchen, fully furnished with modern equipment. The food services department makes sure that the food offered to students consists of a balanced diet conforming to the Saudi Standards (SASO).

Apart from the student cafeteria, there are a number of coffee shops located in different academic buildings and student dormitories.

### **Bookstore**

The Bookstore is located near the KFUPM Press. Textbooks are issued to students and faculty free of charge. As a large number of specialized textbooks are needed for different University programs, a comprehensive textbook acquisition system is followed to ensure that the latest editions of books are used, as far as possible.

### **Sports and Recreation Facilities**

The stadium, a major facility, is located near the main entrance to the University. It is designed to seat 10,000 spectators. The open stadium has flood lights, facilities for VIP seating, a press box, and TV booths. It is consistent with the construction style of all other permanent buildings within the academic complex.

Other available facilities are: swimming pools, changing rooms, soccer fields, tennis courts, athletics track, basketball and volleyball courts, handball courts, squash courts, athletic support facilities, and physiotherapy.

### **RESEARCH INSTITUTE**

Research at the University can be classified into three categories: personal, sponsored, and client-funded. Historically, the first two categories involved faculty members in academic departments who followed their personal interests or participated in research sponsored by the University or other funding agencies. However, with the establishment of the Centers of Research Excellence by the Ministry of Higher Education and the receipt of funding for research from King Abdulaziz City for Science and Technology (KACST), King Abdullah University of Science and Technology (KAUST), and others, the Research Institute (RI) is now also heavily involved in conducting sponsored research. Both client-funded research and the sponsored research conducted in the RI are administered by the Vice Rector for Applied Research. The RI remains the focus of client-funded research at the University. However, full-time RI researchers together with faculty members with the appropriate expertise also form teams to undertake both types of research projects.



The mission of the RI is “to serve the nation by conducting applied research and development utilizing University resources.” Among its objectives are: to serve the nation as a professional problem solver; adapt imported technologies to the Saudi environment; serve the research and development needs of government organizations, local industry, and businesses; develop local expertise and be a part of the Kingdom’s quest to become a knowledge-based society; support graduate and undergraduate programs at KFUPM; and contribute to the high-quality education and training of students.

The first step in the process of client-funded research is often a technical memorandum submitted to the prospective client(s) describing the University’s applied research capabilities and a brief description of the proposed research. The client may follow-up by requesting a formal proposal. In other cases, an organization may directly approach the RI to seek help in dealing with a problem it is facing. Alternatively, the RI may receive a request for a proposal (RFP) to submit a proposal or to make a competitive bid and undertake applied research work. The response in all cases will be a proposal prepared by the relevant host unit describing the approach, scope, duration, and cost, with milestones and deliverables noted.

Clients normally award contracts for very specific studies. In all cases, a project team is formed consisting of full-time RI researchers and faculty members with the required expertise, appropriate background and experience. This arrangement ensures the optimum utilization of the manpower pool available for applied research.

The technical expertise for applied research available in the RI is concentrated in its six centers encompassing broad subject areas, the five Centers of Research Excellence, the KAUST Center in Development in Refining and Petrochemicals, and the Center for Strategic Studies & Planning, the expertise of which is focused in each specific area of research.

Applied research support for the whole University is provided by the RI’s Center for Research Support through its Contract Administration Unit and Finance & Personnel Unit.

Typically, 70 to 100 client-funded projects are active at any time, and over 100 project reports are produced annually. Several hundred laboratory services are completed each year, and the number of clients served in a year is about 150. In addition, RI researchers produce over 100 publications in the open literature annually. Several patents have been granted for the inventions of RI researchers and several are pending at any given time.

The manpower of the RI as of the end of 2010 included 244 full-time employees, of which 62 held PhD degrees, 71 held MS degrees, 45 held BS degrees, and 66 held other credentials. Project teams are typically comprise 35% full-time RI researchers, 25% faculty members, 10% students, and 30% support staff.

The research activities at the RI encompass the following:

- Studies in the areas of communication and signal processing, computer networking and information security, database and web applications, e-business and enterprise resource planning, computer applications and smart systems;
- Strategic planning, e-government implementation, e-business, and e-health, cost, economics, financial analysis and business modeling;

- Studies in the areas of mechanical, civil, and electrical engineering such as corrosion, traffic planning, pavement research, electric power, simulation of engineering systems, and materials characterization;
- Atmospheric pollution monitoring, landfill waste disposal and groundwater quality, marine water quality, water resources, and irrigation system analysis and modeling;
- Optimization of the production of oil and gas via appropriate drilling and extraction techniques, maximization of knowledge of oil- and gas-bearing formations, enhancement of oil exploration through remote sensing, and mineral resource studies;
- Development and improvement of catalysts, processes and products, improvement of polymer production processes, and enhancement of the use of polymers and plastics;
- Research and development in the utilization of solar energy and wind energy for power generation; and
- Nanoscience- and nanotechnology-based research in areas of strategic importance for the Kingdom.

The Research Institute is composed of the following centers:

- Center for Communications & Information Technology Research
- Center for Economics & Management
- Center for Engineering Research
- Center for Environment & Water
- Center for Petroleum & Minerals
- Center for Refining & Petrochemicals
- Center for Strategic Studies & Planning
- Center for Research Support

Within the last few years several Centers of Research Excellence (CoREs), which are housed in the RI, were established with funding of over SR100 million. While the funding for the Center of Research Excellence in Nanotechnology was received directly from the Custodian of the Two Holy Mosques, the other CoREs were established with funding from the Ministry of Higher Education. The CoREs are as follows:

- Center of Research Excellence in Corrosion
- Center of Research Excellence in Islamic Banking and Finance
- Center of Research Excellence in Nanotechnology
- Center of Research Excellence in Petroleum Refining and Petrochemicals
- Center of Research Excellence in Renewable Energy

One of the KAUST Centers-in-Development was awarded to KFUPM under the KAUST Global Research Partnership (GRP) program at the conclusion of a very competitive selection process. KFUPM is the recipient of one of only seven centers established worldwide under the GRP program, and the only one in the Middle East, chosen from proposals submitted by more than 60 prestigious institutions. The other recipients are Cornell University, the University of Oxford, Stanford University, Texas A&M University, National Taiwan University, and Utrecht University. The Center-in-Development on Transformative Research in Petrochemicals and Polymers was established at KFUPM in 2008 with funding of \$4.5 million over three years.

## **DEANSHIP OF SCIENTIFIC RESEARCH**

The Deanship of Scientific Research (DSR) at the University was originally established as part of the Deanship of Graduate Studies in the year 2000, and then became an independent deanship in September 2005. The DSR is responsible for the planning, management, promotion and support of research activities that are carried out by the academic departments through internal and external funding. The Deanship is managed by the Dean of Scientific Research. The functional responsibilities of the DSR include research activities such as funded projects, professional conference attendance, sabbatical leaves, release time, research scholarship programs and research awards. In addition, the Deanship manages a central workshop that serves the research needs of KFUPM faculty. The Deanship manages and plans research and other scholarly activities through the Scientific Research Council, which is a regulatory body chaired by the Dean of Scientific Research with its members selected from various academic departments. The research committee is an executive body composed of 11 members who represent the different University Colleges and the Research Institute. The Arabic research committee concentrates on the review and support of Arabic book authoring and translation in addition to Arabic research projects and studies. The conference committee is dedicated to the evaluation of applications submitted by faculty to attend regional and international scientific and professional conferences and meetings. All committees are chaired by the Dean of Scientific Research with members selected/elected from the different academic departments of the university.

**Vision:** To establish a conducive research environment and provide effective support to enable KFUPM to assume an international leadership role in innovative and quality research in cutting-edge knowledge and technologies found in key areas with a significant socio-economic impact.

**Mission:** To provide a stimulating environment and continuous support that empowers KFUPM faculty and researchers to enhance its national, regional and international leadership in quality research and scholarly activities in science, engineering, management and other related fields of significant importance to the Kingdom and worldwide.

### **Research Programs**

- Research Groups Grants
- Internal Research Grants
- SABIC & Fast-Track Research Grants
- Book Writing/Translation Grants
- Junior Faculty Research Grant
- Societal Studies Grants
- Sabbatical/Release Time

### **Conference Attendance Support**

Faculty members are eligible for a total of up to three conferences per year based on their activities on research.

## **DHAHRAN TECHNO-VALLEY**

King Fahd University of Petroleum and Minerals, through the growth of Dhahran Techno-Valley (DTV), has accelerated its links with industry and with those who create, develop, and use new technology in Saudi Arabia. The mission of DTV is to support Saudi Arabia's ambition to improve technology transfer and establish a knowledge-based economy in the Kingdom. DTV is envisioned to be the Middle East's most prestigious research and technology development nucleus with comprehensive business support. Interaction between world-class researchers from multinational companies and the university community (faculty, researchers and students) in an easily accessible facility is being strongly promoted to tackle the emerging challenges of presented by society and technology.

**Mission:** Providing total business environments that Inspire people to excel and make available a focal point for technical innovation to benefit business in the Kingdom and region.

### **Organization of DTV**

DTV is more than a Research Park it consists of six entities under one umbrella:

1. King Abdullah Bin Abdulaziz Science Park (KASP).
2. Innovation Center
3. Business Incubator
4. Consultancy Services Center (CSC)
5. Liaison Office
6. Sultan Bin Abdulaziz Science and Technology Center (SciTech)

Its design is similar to the leading international facilities in Singapore, Hong Kong, Cambridge, Oxford, Aston, Warwick, Sheffield, Aberdeen, New York, North Carolina and Silicon Valley. Simply, it could be said that DTV has "**a local mission with a global vision**".

### **King Abdullah Bin Abdulaziz Science Park (KASP)**

King Abdullah Bin Abdulaziz Science Park (KASP) was established in 2002, located on a 35-hectare site to the north of the main KFUPM campus. With its proximity to science and engineering colleges, this location provides for considerable interaction between tenant firms, their personnel, University scientists and student engineers. KASP houses a range of firms, mainly those involved in the regional petroleum and chemical industry, and the IT sector and is further targeting industries specialized in water technologies and renewable energy.

#### ***Services:***

- Space (both land and offices) for companies to perform technology development, technology solutions and technology transfer.
- Conducive environment for research and technology development.
- Lateral interaction with other technology companies in the Science Park.
- Access to university resources such as laboratories, equipment, and man-power (faculty, students and researchers).

## **Innovation Center (IC)**

The Dhahran Techno-Valley structure for innovation includes all the necessary entities that can deal with the different modes of innovation, accommodating a diverse range of ideas. Both the Innovation Center (IC) and the Business Incubator (BI) entities work harmoniously to manage a wide spectrum of technology exploitation. The KFUPM Roadmap for Innovation facilitates the flow of technology from University laboratories and research centers to the knowledge base and technology marketplace. The IC supports new concepts from the idea-generation stage, through the prototyping steps, and until they reach the proof of concept stage including intellectual property protection.

***Mission:*** Inspiring and growing INNOVATIONS of the University community into highly financial superior quality technology products and business projects, in addition to promoting excellence in entrepreneurial performance, which will invigorate and impact the society of the Kingdom.

### ***Services:***

- Initial assessment of invention
- Confidentiality agreements
- Searches for prior art
- Managing patenting & protecting
- Training courses on IP issues
- Training on product development
- Project management & planning
- Proof-of-concept fund, Patent (IP) marketing

## **Business Incubator (BI)**

The Business Incubator (BI) provides an ideal set of logistical, strategic, and operational support for start-up KSA technology companies and entrepreneurs to help increase the odds of success of their companies and consequently to grow and support the KSA technology industry. BI provides strategic support services in the form of business advice and mentoring, including strategic planning, financial planning, product and service development, partnership development, business contacts, and interim management resources. In addition to the strategic support services, BI also provides office support services.

### ***Services:***

- Business plan guiding
- Market research
- Financial guiding
- Logistics
- IP protection & legal advising
- World class office space & furniture



- Conferencing (rooms & video)
- Secretarial & reception services
- Educational unit (Computer & Science Labs)
- Internet access
- Library services (KFUPM)
- Funding from KFUPM & KACST

### **Consulting Services Center (CSC)**

The Consulting Services Center (CSC) under Dhahran Techno-Valley aims to facilitate the consulting services of the university faculty to enable them to serve the industrial community in the Kingdom by resolving problems which require a strong intellect and a sound technological background. It is expected that such university-industry interaction will contribute to both the professional development of the faculty members and to the university thereby improving the quality of research and design projects, and providing more training and employment opportunities for students. Such activities result in the development of the local economy and the nationalization of expertise.

#### ***Objectives:***

- Achieving KFUPM's vision of serving as an education hub of the region, driving forward the economic and social development of Kingdom of Saudi Arabia
- Enriching Intellectual capability
- Consulting services could generate much needed revenue for the university and diversify the sources of income that could possibly be utilized for the funding of research projects involving students

### **Liaison Office (LO)**

KFUPM Liaison Office under the umbrella of Dhahran Techno-Valley is the main link between industry and the research resources and technological opportunities of KFUPM. The interaction between the University and industry is very valuable for both sides. As part of DTV, the Liaison Office enables industry to draw upon KFUPM expertise to improve its own technology strategies, and at the same time helps faculty members stay abreast of the latest developments in industrial practices.

***Mission:*** Facilitate and promote the University capabilities, expertise and services, and to be the focal point of contact with the industry/business community.

#### ***Objectives:***

- Serve as central point of contact with industry thereby providing industry/business community an access to KFUPM faculty and researchers and vice versa
- Facilitate sponsored and collaborative research
- Market KFUPM research and expertise through web & social media, newsletters, brochures and special events
- Facilitate internships and students employment in industry
- Help university community gain access to industry facilities and personnel

## **Sultan Bin Abdulaziz Science and Technology Center (SCITECH)**

The Center aims to cultivate members of Saudi society, especially teenagers, to inform them about the principles of science, their application, and explanation; it simplifies them by presenting them in an interactive and interesting way. The Center is located on the Corniche near Al-Khobar. It consists of seven main show halls showcasing different sciences and technologies. There are more than 350 scientific pieces on exhibition, and it houses the IMAX scientific dome (the only IMAX theater in Saudi Arabia), the Astronomic Observatory, Educational Unit, Conference Hall, Temporary Exhibitions Hall, and administrative and service Facilities.

### ***Objectives:***

- Simplifying the scientific ideas and making them interesting and enjoyable to the visitors of the center.
- Developing the curiosity to read and discover the scientific aspects in daily life.
- Development of awareness among visitors and their appreciation for the role of science and technology in their daily life.
- Organize exhibitions and seminars in the domains of science and technology to make the visitors aware of the activities within DTV and how they are important in today's world.

## **INFORMATION TECHNOLOGY CENTER**

The Information Technology Center (ITC) is the primary computing facility at King Fahd University of Petroleum & Minerals. It was established in 1964. It provides computing support for education, research, and the administration at the University. It also provides specialized IT services to government and industrial agencies in the Kingdom.

**Mission:** The ITC is committed to providing high-quality information services that foster a productive academic and research environment for students, faculty, staff, and management at KFUPM.

### **Services Provided by ITC:**

ITC services are provided to all academic, research and administrative sectors. These services include, but are not limited to, the following:

- Student technical support, providing personal computing systems, anti-virus support, and services related to student examinations and teaching evaluations.
- Supporting and operating the computing resources with their various operating systems and databases.
- Supporting and operating networks that exceed 17,000 network points, while providing security to the information exchanged. Providing cable and network connectivity to support e-mail and the Internet, and administering the portal.

- Operating administrative and academic applications.
- Supporting and operating more than 50 computer laboratories. .
- Services that are provided to outside customers (Government and public sectors), and various IT-related courses and tutorials.

## **Organization**

The ITC consists of the following departments/units:

### ***1. Computing Services Department (CSS)***

The CSS department serves the University faculty, students, staff and the Research Institute with extensive computing services in addition to comprehensive examination generation and grading services and the maintenance of hardware equipment.

### ***2. Academic Information System (ACIS)***

The ACIS department maintains the University registration and learning systems and also has a section that provides technical support to the University libraries and their automation systems and services.

### ***3. Administrative Information Systems (ADIS)***

The ADIS department maintains administrative applications such as payroll, personnel, financial accounting systems and material management.

### ***4. Network Services Department (NETS)***

The NETS department provides the support for and operation of computer networks and the network infrastructure, network monitoring and network security.

### ***5. Systems Operations and Support (SOS)***

The SOS department provides systems and operational support to different operating system platforms.

### ***6. IT Security***

The ITC provides security to the various parts of the network and e-mail service, using high-end intrusion detection systems, firewalls, anti-virus applications, including a security layer against hackers.

### **7. *Project Management Office (PMO)***

The PMO supports information technology projects by monitoring and facilitating, across the ITC, the use of PM phases such as initiating, planning, executing, controlling and closing IT projects.

### **8. *Business Support Department (BSD)***

The BSD plays a strategic, support role by facilitating all business-related and administrative tasks of the ITC departments through the best practice models in IT.

### **The University Intranet**

The KFUPM ITC envisions a world-class Information Technology Center that maintains the highest standards in delivering IT services to the KFUPM community and beyond. In effect, it envisages a “Campus of the Future” providing the foundation for a digital campus in terms of infrastructure, enterprise applications and portal. One of the main objectives of the ITC is to provide the KFUPM community with a centralized and personalized access to all campus information, services and communities. The KFUPM portal interface is a secure, single sign-on point of interaction offering access to diverse information, business policies and people, all personalized to a user’s needs and responsibilities. In addition, it creates a shared environment whereby students, faculty and staff can collaborate and communicate with each other.

The University networking facilities, maintained by the ITC, comprise a fiber optic Gigabit / Ethernet backbone, with some sites also connected with Copper cables, serving more than 17,000 fast-Ethernet wired network points across the campus that are controlled by more than 500 switches. A Wireless Network (Wi-Fi) is implemented in all academic buildings and connected with the University Enterprise Network.

### **Operating Systems and Storage**

The ITC provides various operating systems that work with high-end file systems, especially with scientific applications. It provides e-mail services through the Web along with an anti-virus and vulnerability detection system. High Performance Computing (HPC) is provided to faculty, researchers and students.

Storage services are provided to staff, faculty and students in the form of the KFUPM-Filer, which can be accessed from anywhere in the Internet. The Filer is protected by anti-virus and backup facilities.

### **Computer Laboratories and Equipment**

Computer Labs, installed for the benefit of staff, faculty and students, are well equipped with technology to enable classes and lectures to be held in them.

The Center has state-of-the-art printers together with various applications covering Programming Languages, Word Processors, Drawing applications, data base applications, and simulators for various academic needs, in addition to multiple applications that are used for academic purposes. The Center lately has received a developer license for computer

applications, such as the Microsoft license with which it will be possible to update and develop the applications of these companies and utilize them within the network.

## **Enterprise Systems at KFUPM**

The University's major IT requirements are served by the RAED systems supported by two major Enterprise Resource Planning (ERP) platforms. These include the Student Banner System for academic processes and the Oracle e-Business Systems for administrative/business processes. Other major enterprise systems include the University Learning System on the WebCT platform, the University Library Portal running on the Symphony platform, and a multi-tier Business Intelligence suite (using the Oracle warehousing tools, the Cognos suite for information analysis/reporting, dashboards, KPIs, etc., and SAS for advanced analytics). Several satellite systems, such as the in-house developed MedCare system, are also supported. All the software systems are connected through a KFUPM portal deployed on the Sungard Luminis platform.

The enterprise systems are operated and maintained by the ITC, thereby ensuring high-quality IT services to the University community. The ITC virtualization platform supports three critical goals: efficient server consolidation, robust disaster recovery implementation, and on-demand server provisioning. The University's storage facilities are based on an intelligent setup of advanced replication technologies, which facilitate high availability and business continuity at KFUPM.

## **LIBRARY**

The University Main Library is centrally located in Building 8 within walking distance from most classrooms and laboratories. The Library supports teaching and research in line with KFUPM's mission by providing access to recorded knowledge through collections, services, cooperative programs, and connections to worldwide resources. It is an "open stack" library, allowing users free access to its resources. Reading areas are provided on the first, third, and fourth floors. There are many reading and study rooms on the third floor for serious reading, student-teacher meetings and discussions. To encourage and maximize utilization of its resources and services, the University Library operates with minimum regulations and restrictions.

The current collection of monographs and bound periodicals totals 381,775 volumes, of which 75% is in Science and Engineering, and the remaining 25% in Humanities and Social Sciences. In addition to the print collection, the Library provides access to more than 114,000 electronic books through various aggregating databases. There are 2,035 educational films and other media, subscriptions to about 226 periodicals (many titles are available in both print and e-journal formats), 37,530 reels of journal back issues on microfilm, and 73,737 items available in multimedia format.

The Library has a fine collection of electronic resources, including 41 online full-text databases providing article-level access to more than 17,000 journal titles and 16 bibliographic databases, and abstract-level access to more than 65,000 journal titles. The Library is also a member of the prestigious Saudi Digital Library Consortia, one of the pioneering projects of the National Center for E-Learning, Ministry of Higher Education. Most of the electronic resources including online databases can be accessed remotely both on- and off-campus through the Internet.



In addition to providing a complete range of library services to the KFUPM community, it also provides borrowing privileges and other select services to local government agencies and private institutions.

Some of the major library services offered are:

- Circulation of library materials
- Reference and Information Services
- Research assistance, including literature searches and on-line searching of bibliographic and full-text databases
- Interlibrary loan and photocopy services
- Audiovisual and multimedia services, and
- Library instruction (orientation of new faculty and preparatory year students for effective use of the Library)

There are two separate Internet search labs for faculty and students with over 45 high-end personal computers providing access to electronic resources through the Intranet and Internet.

Audiovisual materials and services are provided through a well-equipped AV department. The AV collection mainly consists of microforms, motion pictures, videotapes, and multimedia materials (CD, DVD). The Library Auditorium is used by faculty and students for the projection of AV materials, and also for seminars, lectures, short courses, thesis defenses, and other presentations.

The Library is currently using Symphony, an Integrated Library System, which has all the features of a modern system, including client/server architecture, GUI, and an Internet interface. With these features, users are able to perform multiple tasks from a single workstation, including access to the Internet, KFUPM Intranet, and e-library (OPAC), the web-catalogue.

For the convenience of Library patrons, a self-check-out station is also available for checking-out library materials without the mediation of the staff.

In addition to providing these services and resources, the Library also acts as a node for providing access to Turnitin, software for checking originality (plagiarism), and other user-centric services.

## **DEANSHIP OF ACADEMIC DEVELOPMENT**

The faculty, curricula, and facilities are key components of the academic system of any University. The effectiveness of each of these components directly influences the effectiveness of student learning. King Fahd University of Petroleum and Minerals realized from the very beginning the vital importance of the continuous improvement and development of its faculty, academic programs and instructional technology, which forms the cornerstone in the quality of its graduates. Although the University has a rigorous academic system based on the regulations of the Ministry of Higher Education and on international standards, it has always been dynamic in exploring ways and means that lead to excellence in all academic activities. The Deanship of Academic Development (DAD) has therefore been

established to help the University community, particularly the faculty members, to increase their effectiveness in teaching and learning, to insure the highest quality in academic programs, and to utilize the latest technologies in teaching.

DAD was originally established as the Academic Development Center (ADC) in the year 2000, which was later promoted to a Deanship in the year 2003. The Deanship creates a focal point for the emphasis on academic matters such as teaching excellence, program development, quality assurance, and e-learning at KFUPM. It deals directly with issues related to the development of academic excellence for all faculty members through a variety of means such as training programs, consultations, the development and implementation of the instruments of quality assurance, and the promotion of the use of technology in instruction. Financial support through grants is provided to faculty members to carry out studies for the enhancement of the learning environment at the University.

### **Mission**

The mission of DAD is to assist the University in continuously improving its academic system by enabling faculty and teaching assistants to reach their full potential in teaching and research and also by advising the University in the enhancement of its academic programs, facilities and processes to the best available quality standards.

### **Objectives**

DAD's mission will be accomplished by assisting the academic departments in their pursuit of the following objectives:

- Excellence in teaching: Enhance the teaching effectiveness of faculty and teaching assistants to provide instruction consistent with the best practices in teaching and learning
- Excellence in research: Continuous improvement of faculty development to enable faculty members to reach their highest potential in research and to progress in academic rank in a timely fashion
- Effective processes and methods: Enhance the effectiveness of processes and methods that are critical to teaching and research
- Quality assurance: Assist the departments toward the quality assurance of their academic programs and academic advising
- Instructional technologies: Utilize instructional technologies to improve the educational process at the University

### **Activities and Services**

In order to achieve its objectives, DAD identified specific fields of interest, which are reviewed periodically according to the University's evolving plans and policies. The main areas currently under DAD's focus include:

- Faculty development to enhance teaching, learning and research productivity
- Quality assurance of academic programs
- Assessment of student learning
- Self-Assessment of academic programs

- Development of administrative skills
- Instructional technologies
- Development and delivery of quality online courses

DAD offers most of its services to the University community through its four Centers. It provides a range of academic development workshops, discussion forums and seminars in which international, national and local experts participate. The Deanship, through its Centers, sponsors activities related to teaching, research, faculty evaluation, student learning and curriculum, often with a specific audience in mind, such as new faculty, heads of departments, and college deans. The Deanship also conducts training programs on web-based education and develops its own expertise in this direction. In addition, personal consultation is available to any faculty member to enhance his teaching.

DAD also provides financial support/incentives through various grants to enable faculty to meet their objectives. The faculty members involved are expected to conduct studies in the various academic development areas such as faculty development; enhancement of the learning environment; technology-enhanced learning, etc. The Deanship is keen to collaborate with members of the University community on issues that lead to academic development at KFUPM. DAD also manages a resource center, offering a range of books, newsletters, journals and multimedia references such as videotapes, CD's, slides and other materials relating to its main areas of interest, especially teaching, learning and quality-assurance related issues. In addition, the Deanship publishes the proceedings of its workshops and discussion forums, as well as pamphlets on research and practices relating to teaching, learning, assessment and evaluation. These resources can be accessed by contacting the Deanship office.

## **Organization**

DAD has four centers under its patronage, namely:

1. Teaching & Learning Center
2. Program Assessment Center
3. E-learning Center
4. Testing & Evaluation Center

Each center carries out various activities in its specific domain and is headed by a Director who reports to the Dean. The Dean reports to the Vice Rector for Academic Affairs of the University. A standing Committee on Academic Development comprising members from various academic departments of the University also supports the Deanship in carrying out its activities.

### ***Teaching & Learning Center***

King Fahd University of Petroleum & Minerals believes that every individual at KFUPM has a right to experience personal growth and development through enriched academic opportunities. The purpose of establishing the Teaching & Learning Centre (TLC) in 2003, as one of the centers of the Deanship of Academic Development, was to provide such experience by promoting excellence in teaching at all ranks and excellence in student learning inside and outside the classroom. The TLC activities include the provision of workshops, mini-courses, seminars, consulting services and resources to the faculty and

graduate teaching assistants to enhance teaching and learning. The TLC also administers several special programs including academic development grants.

**Objectives:** The primary objective is to provide KFUPM faculty members with a comprehensive range of activities and services to help offer quality education to the students. Specific objectives include:

- Fostering an environment of continuous academic development
- Assisting faculty members to attain their highest potential in teaching
- Providing instructional assistance to new faculty on campus
- Encouraging the use of new instructional technologies

#### **Activities, Services and Grants**

To achieve its objectives, the TLC provides a variety of activities, services and grants. These include training, support, and professional development programs for faculty, academic professionals, and academic departments.

##### ***Activities***

The activities of the TLC include:

- Workshops, Discussion Forums and Seminars
- Microteaching: TLC organizes and facilitates microteaching workshops in which six to eight participants present brief lessons in their field, and then receive feedback from their peers
- Department-Based Workshops: TLC encourages and support departmental-based workshops on topics related to teaching and learning

##### ***Services***

The services offered by TLC include:

- Class Videotaping and Consulting consultant
- Peer Consultation in Teaching: The main objective of Peer Consultation in Teaching (PCT) is to provide faculty members with formative feedback on their teaching
- Teaching Consultation: Offers Discussions with Peer (senior) consultants who have been working with a number of faculty members and observed a good number of classes
- Resource Room: DAD administers a room, which has a collection of publications on the subject of faculty development and the enhancement of teaching and learning

##### ***Grants***

TLC offers a number of academic development grants. Areas of the grants include:

- Enhancement of learning environment
- Technology enhanced learning
- Faculty development

## ***Program Assessment Center***

Continuous assessment is the key to quality assurance at the University. The aim of assessment is to understand how educational programs are working and to determine whether they are contributing to student growth and development. Program assessment focuses on programs rather than on individual students. It provides information on whether the curriculum as a whole provides students with the knowledge, skills and values that graduates should possess in accordance with its mission, set goals and learning objectives.

The new trends in accreditation criteria have focused on outcome assessment. Accrediting agencies such the Accreditation Board for Engineering and Technology (ABET), the Association to Advance Collegiate Schools of Business (AACSB), the Computer Science Accreditation Board (CSAB), and the National Architectural Accrediting Board (NAAB) require programs or colleges seeking accreditation to undergo self-assessment. Pressure from industry and competitive job markets have also contributed to the need for continuous program quality improvement that focuses on student learning and preparation for professional practice after graduation.

The Program Assessment Center (PAC) at KFUPM strives to achieve its mission towards developing quality education that meets local industry needs following reputable international standards. It provides the necessary services and support for the various academic programs and research units at the University. It also facilitates and coordinates their efforts to meet their objectives and institutional goals.

### **Objectives**

- Promote the culture of assessment university-wide
- Improve and maintain the highest academic standards at KFUPM
- Enhance students' learning outcomes
- Provide support for academic programs and research units to meet their objectives and institutional goals
- Provide feedback for quality assurance of academic programs and research units
- Prepare the academic programs for national/international accreditation

The Program Assessment Center offers support, consultation and training for KFUPM faculty on assessment and accreditation issues. It keeps KFUPM faculty, academic and research departments updated on assessment and accreditation related issues through the invitation of reputable international speakers to conduct workshops and deliver seminars on the subject. The Center also keeps links with national and international assessment and accreditation organizations and invites international professionals to participate in the self-assessment teams of the various programs of the University.

## ***e-Learning Center***

The e-Learning Center strives to achieve excellence in teaching and to enhance the quality of teaching and learning through the effective use of web-based education, an education-enhancing development able to reach more students, and self-paced learning.

The e-Learning Center provides the following services to the university community:



### **Awareness Events**

The Center regularly organizes public awareness events on new and diverse issues related to e-learning and to the role of e-Learning in enhancing teaching and learning. Such events include the benefits of e-learning, instructional design, online teaching, etc. Speakers of international reputation in e-learning are invited to conduct these events.

### **Software and Resources**

The e-Learning Center provides all necessary software and e-learning platforms, such as Learning Management Systems (LMS), Authoring tools, Assessment tools, etc., to ensure the successful delivery of e-learning activities. Currently, the e-Learning Center is providing *LMS Blackboard* and the synchronous teaching and video conferencing tool *Centra*, for the KFUPM community. Multimedia and graphic-designing software such as *Rapid Learning*, *Articulate Flash*, *Author ware*, *Adobe Photoshop*, *Adobe Illustrator* are also available. In addition, the Center provides a range of books, journals, videotapes and other materials related to e-learning available in the DAD Resource Center.

### **Training Workshops**

Hands-on training programs are frequently conducted for KFUPM faculty to enable them to develop effective web-based instruction. These training programs cover a wide range of topics starting from the instructional design of online courses where participants are introduced to various concepts and tools that help in designing pedagogically sound online courses to the development of web-based content using various web-based content development tools. In addition, the Center provides training on *Blackboard* and its tools and on *Centra*. The Center also provides training on blended learning and tutoring on online courses. Frequent training sessions on different software are also conducted.

### **Grants**

The e-Learning Center, through DAD, awards grants for the development of some KFUPM courses as comprehensive online courses, which could be delivered completely through the Web. In addition, DAD awards grants to encourage research and development in the area of technology-enhanced learning.

### **Online Instructional Material**

The e-Learning Center provides support to develop online courses. Faculty members provide only the content of the online course and the support team in the e-Learning Center does the rest of the job. In addition, the e-Learning Center provides assistance to all KFUPM faculty members to develop quality online instructional material to enhance student learning.

### **e-Learning Quality Standards**

To ensure quality in all e-learning activities at KFUPM, the Center has started the development of guidelines and quality standards for e-learning processes like copyrights, content development, course delivery, assessment and evaluation, online teaching, infrastructure, etc.

## ***Testing & Evaluation Center***

The Testing and Evaluation Center is concerned with the promotion and development of the best practices in academic testing and evaluation to enhance student learning, test equity and fairness. The Center provides support and training in test construction methods that would generate reliable and valid test scores. Also the Center conducts studies that support the development of standard exams and makes recommendations related to the process of student selection and overall assessment.

### **Mission**

The Testing & Evaluation Center is dedicated to the advancement of testing and evaluation practices in teaching.

### **Objectives**

- Make the Center available to all departments and faculty members for consultation on test construction techniques, and methodology for improving item writing, and improving test reliability and test content validity, without jeopardizing other equally significant features of good testing, such as construct validity
- Explore existing proficiency exams, with particular reference to admission and placement purposes
- Organize workshops and seminars on test construction techniques, for the benefit of KFUPM community, and other institutions in the region
- Follow modern trends in test adaptation and creation, and maintain ties with domestic and international organizations for a useful exchange of information on the quality and efficiency of assessment through joint research and experimental development
- Conduct research on issues relating to student pre-University performance, to specific University courses, and to students' overall performance

### **Services and Activities**

- Help academic departments with test construction and item analysis on various academic exams and standardized tests
- Prepare in collaboration with the Program Assessment Center, outcome (exit) exams to help academic departments assess their programs
- Train faculty in writing multiple-choice exams, based on international standards, and in cooperation with national and international centers for testing and evaluation
- Study the performance of students as related to KFUPM admissions criteria
- Study the effect of non-academic factors on student performance

## **DEANSHIP OF STUDENT AFFAIRS**

The Deanship of Student Affairs deals with all issues concerning students and helps them from the joining date until graduation. According to its administrative structure, the Deanship consists of three main Assistant Deanships: Student Affairs, Employment & Training, and Counseling & Advising. The main units and departments of the Deanship include: the General Directorate of Student Affairs, Student Housing Department, Student Activities

Department, Student Fund, Counseling and Advising Center (CAAC), Training Department, Alumni Department, Career Guidance Department, Part-Time Unit, Scholarship Program Unit, Alumni Club, Religious Affairs Committee in Student Housing, and the Special Needs Office.

### **General Directorate of Student Affairs**

The Deanship of Student Affairs is always concerned for the student and gives him full support and care since the day he joins the university until the day he graduates. The General Directorate of Student Affairs plays a vital and steady role in providing this care through the facilitation of the tasks of students in the University. The Directorate provides the following services for students: issuing identification certificates, clearance certificates, and low-price ticket certificates; issuing university ID's, contacting parents (when appropriate), issuing official medical excuses, and replying to all student inquiries and directing the students to the appropriate parties.

The Student Records division plays a vital role in keeping the Deanship's documents and transactions in good order and in regularly updating the many regulations and instructions pertaining to the deanship. The work in this division is divided into two main areas:

1. Student records: to keep a student's original certificates when accepted into the University and any other formal papers during his stay at the University.
2. Various records: to keep all correspondences that

### **Student Housing Department**

To support KFUPM students' academic achievements, the University pays special attention to student accommodation. The Student Housing Department provides the requisite services and facilities for students on the university campus. The University aims to provide an accommodation environment that supports students in their studies and promotes their social communication. The student housing comprises modern buildings with about 4000 furnished rooms that can accommodate up to 8000 students. The students are received by the deanship or any other rules or regulations. Living on campus enjoy many services including internet and phone services in each room, transportation to and from academic buildings, maintenance, hygiene, recreation facilities, car parking, and general services such as food supplies, student services, restaurants, and cafes. Moreover, students can enjoy and participate in several cultural, social, and sports activities organized by the students' clubs.

The student housing department uses an effective electronic system to manage student accommodation whereby students can submit their applications and execute a number of housing services electronically. In addition, they are kept well-informed about available lists of housing, and they can register in the lists announced by the Housing Department.

### **Student Activities Department**

The primary objective that lies behind the attention paid to student activities is to provide a healthy and active atmosphere that enables each student to practice his hobbies, activities and suitable recreational preferences after the daily efforts exerted in studying. Students play the main role in planning all extracurricular activities that are coordinated and executed through students clubs, supervised by the Deanship of Student Affairs. The Department of Student

Activities aims to help students to form a well-balanced personality and to invest their time in meaningful and fruitful programs to enhance their talents and abilities. Students also receive training in leadership, loyalty and in how to bear responsibility; brotherly ties among students are strengthened, and a spirit of cooperation and harmony is fostered among students and between students and their instructors. The department also provides opportunities for students to get to know some of the administrative and social aspects.

There are 40 clubs supervised by the Student Activities Department, covering all scientific disciplines in the University, as well as sports, social, cultural and art activities. The University through the student fund provides full financial support for all approved programs and activities proposed by the student clubs. The activities of students' clubs focus on establishing training courses, scientific visits, scientific competitions, lectures, exhibitions, excursions, cultural competitions, art, literary programs, scouting, sports activities, receiving school delegations, and representing the University in many forums in the Kingdom and internationally. There are allocated offices and halls for club members.

### **Training Department**

The task of the Training Department is to follow up on all programs of Cooperative Training and Summer Training for all university students. It approaches various companies to provide training opportunities, nominates students for training in these companies, each according to his field, and then monitors their training until the end of the training period. Forming a triangular link between students, training companies and academic departments is the prime aim of the department.

***The Cooperative Program (Coop)*** is a structured educational strategy, integrating the theoretical knowledge learned in the classrooms and laboratories with real world experiences. The Coop was first introduced at KFUPM in 1970. It is one of the graduation requirements and is considered as a graded nine credit hours for students in some academic majors. The Coop program extends for a period of twenty-eight weeks. The objectives of the program are to enable the student to link theory and practice, to provide guidance for future career opportunities, familiarize the student with the work environment after graduation, develop the student's work ethic, communication, management, and teamwork skills, and to establish strong relationships between the University and industry. The Coop Department is responsible for coordinating with the employers to provide suitable training opportunities for the students.

***The Summer Training Program*** is similar to the cooperative program in its objectives except that it lasts for eight weeks. It is one of the graduation requirements for some academic departments. The Summer Training Department is responsible for coordinating with the employers to provide suitable training opportunities for the students.

### **Career Guidance Department**

It is a specialized department to help students choose the most suitable major based on accurate information about their inclinations, attitudes and abilities. The information is obtained through various activities and events, including the use of the career Oasis program, which helps to determine the academic preferences of students according to their understanding and career goals. The Department informs students about the requirements of the job market and prepares them to get the right job through recruitment events , such as

Open Day (during the first semester of the academic year), Career Day (during the second semester), and Specialty Day for Preparatory Year students. The Department provides short courses on decision-making and proper career planning, and arranges for personal pilot job interviews for students expected to graduate. Moreover, the department invites specialists from inside and outside the Kingdom to give lectures to help new students to choose the appropriate major. These lectures help students to clarify their perceptions in general, especially after hearing the outstanding experiences and stories of success from the guests.

### **Alumni Department**

There are a number of tasks and services provided by this department. These include reviewing the graduation documents, having them signed by the the relevant University officials, and then delivering them to graduates, issuing certificates of good behavior, ratifying the document copies, preparing the final graduation certificates to be signed by concerned officials and delivering them to graduates, participating in the annual graduation and honor awards ceremonies, providing employers with requested information regarding the alumni for the purpose of recruitment, and informing alumni about the employment opportunities available in organizations and companies in the private and public sectors.

### **Scholarship Program Unit**

Major national and international companies and government agencies provide scholarship opportunities for high achievers among the University students. This unit coordinates with different divisions of the University to provide the necessary support to such companies and agencies to announce their scholarship opportunities to all students and also to help them in identifying eligible and qualified students. The Scholarship Program Unit honors the signed agreement between the sponsoring agency and the student, delivers official documents and graduation certificates, and provides the necessary information to the concerned officials of the sponsoring agencies which include the academic status and progress of the student and the delivery of official documents and graduation certificates.

### **Part Time Unit**

This unit coordinates part-time work inside the University, nominating and assigning students to part-time jobs based on the actual needs of the academic and administrative departments in the University.

### **Counseling and Advising Center (CAAC)**

The main objective of the CAAC is to help equip KFUPM graduates with the right technical information and the proper personal skills. It aims to provide all students with academic and social counseling and advising. The CAAC has many objectives, among which are the following:

1. Assisting the students to achieve psychological, social and academic adjustment.
2. Psychological prevention of emotional and psychological disorder through primary and secondary prevention.
3. Assisting to modify unwanted behavior.
4. Psychological support to face psychological social and academic stresses.

5. Holding lectures workshops and discussions for educational and preventive goals.
6. Provide psychological, social and academic help, guidance and advice to all students.
7. Prepare new students for university life.
8. Activate/improve academic advising.
9. Looking after students with poor academic performance and providing the necessary guidance and follow ups.
10. Studying the behavior and common practices of student and the expected effects.

The services provided by the CAAC include counseling in the following forms:

1. **Individual Counseling:** A student meets with a counselor on a one-to-one basis to work through personal concerns.
2. **Group Counseling:** Counseling in groups offers a broad range of insight and support from peers and professional counselors.
3. **Student/Guardian Counseling:** Couples counseling works toward alleviating the strains in close relationships. In such cases, one of the relatives, usually the father or a brother, are contacted and asked to visit the center.

Counseling is a collaborative process, which involves the development of a unique, confidential helping relationship. The CAAC treats all of its contacts with students in a highly confidential manner.

In addition, the CAAC arranges and conducts skill-building workshops and interactive seminars, which provide a structured presentation of information and skills practice appropriate to the students' personal development and career in the University. The CAAC participates in the issuance of bulletins and brochures on different topics that relate to student life and skill development. The Center also participates with relevant departments in supervising the social activities in the student dorms and it participates in planning and conducting the introductory (preparatory) program for new students. Furthermore, the Center studies student requests related to loans and financial aid, the part-time employment program, and housing, and makes the appropriate recommendation. It also interviews students who are planning to withdraw from the University and provides them with appropriate alternatives.

Faculty members are encouraged to utilize the services of the CAAC by referring the student to the Center or by seeking advice on what might be done for a particular student or group of students.

## **Student Fund**

The Student Fund, established in 1406 H / 1986 by a decision of the the University Council, is considered to be one of the most important elements of the Deanship of Student Affairs as it is directly connected with the student and his financial needs .

The Student Fund performs various tasks including the financial assistance for students through subsidy and loans, as well as provides incentives for honor students. One of the vital tasks of the Student Fund is to support the students' activities through Student Activities Clubs. The Student Fund also contributes to cooperative projects that would benefit the students.

The Student Fund council management includes the Dean of Student Affairs (President), the Assistant Dean for Student Affairs (Vice President), the Executive Manager for the Student Fund (member), the Financial Controller (member), three faculty members (members), and three distinguished students (members).

### **Alumni Club**

The Club was established by the University Board in 1420 H /1999 and its headquarters are located at KFUPM in Dhahran. It aims to enhance the role of alumni in serving the Kingdom and society. The Club provides continuous communication with alumni, aiming to strengthen the relations between the University and the establishments where alumni are working and encouraging them to contribute financial and moral support to University programs and activities. The membership of the Club is divided into active, associate, and honorary membership. The Club has a council consisting of nine members who meet the selection requirements established by the University Council, and are chosen for three years (renewable) by the University Council as per the nomination of the Rector of the University. The head of the council is a member of the KFUPM Board of Executives.

### **Religious Affairs Committee in Student Housing**

The Islamic religion and moral values form an important part of the student's life in the University, so that the Deanship has focused on the allocation of a committee for Religious Affairs in Student Housing. This committee supervises a number of activities including:

1. Sport competitions and courses among groups.
2. Religious lectures during the week days.
3. Brief meetings after Isha prayer or Fajr prayer to discuss some religious issues.
4. Religious seminars, open discussion that would be held periodically.

## **GRADUATION**

Upon satisfactory completion of all requirements for a degree from the University, students are invited to participate in the graduation ceremony. This colorful, time-honored university tradition, was instituted at KFUPM in 1972, and was the first such ceremony to be held at a university in Saudi Arabia.

A unique feature of the graduation ceremony is the dress worn by graduates. Designed especially for KFUPM, the gown is the Arabian *meshlah*, featuring the color of the specific college from which a particular student graduates. Instead of the usual "mortarboard" cap, the KFUPM graduate wears his traditional *ghutra* and *egal*.

The ceremony and the dresses are an impressive blending of academic and Arabian traditions.

# **ACADEMIC REGULATIONS**



## ACADEMIC REGULATIONS AND IMPLEMENTATIONS

The Undergraduate Study and Examinations Regulations and the KFUPM Rules for Their Implementation issued by the Deanship of Admissions and Registrations, Second Edition 2011/2012, is the basis of Articles (A1) to (A53) and their Implementations, provided herewith.

The Deanship of Admissions and Registrations will provide any further assistance in this matter.

### DEFINITIONS

#### Article One

<b>The Academic Year is:</b>	Two regular semesters and a summer semester, if any.
<b>The Academic Semester is:</b>	A term of no less than (15) weeks of instruction not including the registration and final examination periods.
<b>The Summer Semester is:</b>	A period of instruction not exceeding (8) weeks not including the registration and final examination periods. The weekly duration of each course in the summer semesters is twice its duration during a regular academic semester.
<b>The Academic Level:</b>	Indicates the study level in accordance with the specifications of each approved degree plan.
<b>The Degree Plan is:</b>	A combination of required, technical elective and free-elective courses that constitute the total number of credit hours required for graduation in a major. The student has to successfully pass the specified courses in order to earn the degree in that major.
<b>A Course is:</b>	A subject of study within a certain academic level of the approved degree plan in each major. Each course has a number, code, title and a detailed description of its contents which distinguishes it from the other courses. A special file of each course is kept in the corresponding department for follow-up, evaluation and updating purposes. Some of the courses may have pre-requisite or co-requisite requirement(s).
<b>The Credit Hour is:</b>	Each of the weekly lectures or clinical lessons with a duration not less than 50 minutes or a laboratory session or field study of not less than 100 minutes duration.
<b>Academic Probation is:</b>	A notification given to a student with a cumulative GPA below the minimum acceptable limit as explained in these regulations.

<b>The Class Work Score is:</b>	The score which reflects the student's standing during a semester according to his performance in the examinations, research and other activities related to a particular course.
<b>The Final Examination is:</b>	An examination in the course, given once at the end of every semester.
<b>The Final Examination Score is:</b>	The score attained by the student in each course in the final examination.
<b>The Final Score is:</b>	The total of the class work score plus the final examination score calculated for each course out of a total grade of 100.
<b>The Course Grade is:</b>	A percentage, or alphabetical letter, assigned to a student, indicating the final grade he received in a course.
<b>Incomplete Grade is:</b>	A provisional grade assigned to each course in which a student fails to complete the requirements by the required date. This is indicated in the academic record by the letter grade "IC".
<b>In Progress Grade is:</b>	A provisional grade assigned to each course which requires more than one semester to complete. The letter grade "IP" is assigned in this case.
<b>Semester GPA is:</b>	The total quality points the student has achieved, divided by the credit-hours assigned for all the courses the student has taken in any semester. The quality points are calculated by multiplying the credit-hours by the grade earned in each course (see Appendix B).
<b>Cumulative GPA is:</b>	The total quality points the student has achieved in all courses he has taken since his enrollment at the University, divided by the total number of credit-hours assigned for these courses (see Appendix B).
<b>Graduation Ranking is:</b>	The assessment of the student's scholastic achievement during his study at the University.
<b>Course Load is</b>	The total number of credit hours a student is allowed to register in a semester. The upper and lower limits of the course load are fixed as per the implementation rules of the university.

## **DEFINITIONS OF TERMS USED IN THE IMPLEMENTATION RULES**

<b>The Grading System applicable at KFUPM</b>	Appendix "C" shows the grading system applicable at the University including the points assigned to each grade. The maximum GPA a student may attain is 4.00.
<b>Transcript</b>	An official document that includes all the courses a student has taken at the University as of the date of its printing. It indicates course codes, numbers and credit hours, the grades earned by the student, semester GPA, and cumulative GPA. In addition, it includes the list of courses and credits transferred, if any.
<b>Major GPA</b>	The major GPA is calculated on the basis of all the letter grades assigned in the courses taken in the student's major, as specified in the degree plan. The major GPA is determined by the last grade assigned in each course.
<b>The Credit-Hour for the Laboratory or Field Sessions</b>	The duration of laboratory sessions or field study usually ranges from 150 to 200 minutes; a minimum of 100 minutes is assigned in some programs.
<b>The Admission &amp; Academic Standing Committee</b>	This is a consultative committee set up by the Rector of the University to study applications for transfer, readmission petitions, suspensions, and dismissals, and to reach the appropriate recommendations in accordance with the regulations.
<b>Promotion from Prep-Year Courses</b>	This is based upon successfully passing all or some of the Prep-Year courses in accordance with the rules set by the University.
<b>The Cooperative Program</b>	A period not exceeding (28) weeks of on-the-job training spent by the student, as per the requirement of his major. The student must complete the cooperative program before his last semester at the University.
<b>Summer Training</b>	A period not exceeding (8) weeks of on-the-job training spent by the student, as per the requirement of his major. The student must complete the summer training before his last semester at the University.

## **ADMISSION OF NEW STUDENTS**

### **Article Two**

Based upon the recommendation of the college councils and the other concerned bodies of the University, the University Council determines the number of new students to be admitted in the following academic year.

## **Implementation Rules of Article Two**

1. The Deanship of Admissions & Registration prepares a draft recommendation to the University Council in coordination with the concerned bodies of the University regarding the number of students to be admitted into the university during the following academic year.
2. The Deanship of Admissions & Registration and the colleges in the University coordinate with each other in the matter of determining the majors of the students who are expected to complete the Preparatory Year Program. The major of these students will be determined according to their own choice, based upon the conditions set by the University.

## **Article Three**

An applicant for admission to the University must satisfy the following conditions.

- a. He should have a secondary school certificate, or its equivalent from inside or outside the Kingdom of Saudi Arabia.
- b. He should have obtained his secondary school certificate in a period of less than 5 years prior to the date of application. However, the University Council may waive this condition if the applicant has a satisfactory explanation.
- c. He must have a record of good conduct.
- d. He must successfully pass any examination or personal interviews as determined by the University Council.
- e. He must be physically fit and healthy.
- f. He must obtain the approval of his employer, if he is an employee of any government or private agency.
- g. He must satisfy any other conditions the University Council may deem necessary at the time of application.

## **Implementation Rules of Article Three**

Applicants having Saudi secondary school certificates must have majored in the natural sciences. If the applicant earned his secondary school certificate from outside the Kingdom, equivalent requirements apply.

## **ADMISSION OF NEW STUDENTS**

## **Article Four**

Admission is granted to applicants who satisfy all admission requirements, and is based on the applicant's grades in the secondary school examinations, the interviews and admission examinations, if any.

## **Implementation Rules of Article Four**

1. After the completion of the admission examinations, the Deanship of Admissions & Registration makes a recommendation to admit the candidates who fulfilled the criteria based on the highest compound evaluation and the capacity designated by the University. After the Rector of the University approves the recommendation, candidates are informed accordingly.

2. Admission will be canceled for candidates who have been informed of their admission but fail to report on the designated time.
3. All newly admitted students are required to complete the Preparatory Year Program before starting their undergraduate study. Students may be exempted from part or the whole program according to the implementation rules of the promotion exams.

4. The Preparatory Year Program

4.1 The Preparatory Year Program aims at preparing the newly admitted students for undergraduate study and university life, and enhancing their opportunity for success and excellence through the following:

- a. Developing students' skills in English to enable them to study and communicate in English during their undergraduate study.
- b. Strengthening students' understanding and comprehension of basic mathematical concepts, and developing their analytical and critical thinking abilities through solution approaches to mathematical problems.
- c. Providing the students with the basic knowledge and skills to prepare them for academic endeavor, develop effective learning styles, adapt to University life, choose their field of study, and practice a healthy lifestyle.

4.2 The duration of the Preparatory Year Program is one academic year, (the summer semester, if necessary), during which English, Mathematics, or any other courses that the University deems necessary, are offered.

4.3 The grades earned by the student in the preparatory year courses are recorded in his transcript together with the semester GPA and his cumulative GPA. However, these grades are not counted in calculation of cumulative GPA for the undergraduate program. The effect of the academic status assigned to the student at the end of his last semester in the preparatory year continues through his subsequent University academic level (i.e., first semester of the freshman year).

4.4 If a student earns a grade of C or above in all the English and Mathematics courses, and a grade of D or above in the remaining preparatory year courses in the allowed period, then he will be promoted to the first academic level in the University, and has the right to select a major of his choice in accordance with the rules set by the University.

4.5 A student may be exempted from studying Preparatory Year English module(s), if he proves his proficiency in English before starting study in the Preparatory Year Program as per rules set by the University.

4.6 If a student successfully passes all the preparatory year English modules, and is left with the remaining preparatory year courses, he may be allowed to register for some University courses in accordance with the rules set by the University.

4.7 A student will be dismissed from the Preparatory Year Program if either:

1. He earns the grade less than C three times or more in all English Modules or earns the grade F or DN or WF twice consecutively in the same Mathematics preparatory year course; or

2. He fails to complete all the preparatory year courses within the duration of the program in addition to a maximum of one half of that duration.

## **ACADEMIC REGULATIONS**

### **Article Five**

- a. The student gradually progresses in his study in accordance with the implementation rules approved by the University Council.
- b. Degree plans of undergraduate study are designed to comprise a minimum of eight (8) semesters.

### **Implementation Rules of Article Five**

1. The University publishes for the students through available means all rules, regulations, and requirements related to study and graduation at the University, which students are responsible to know and follow. Academic advisors assist students in planning their academic programs, but their academic advising activities do not relieve students of this responsibility. Therefore every student should be thoroughly familiar with all the academic regulations and the degree conferral system and remain informed about them throughout his career at the University. A student may consult with his academic advisor or the department's Chairman in this respect.
2. The University assigns an academic advisor to each student to assist him in matters relating to his academic progress such as:
  - a. selecting a degree program consistent with the student's objectives and ability;
  - b. interpreting and understanding the academic regulations;
  - c. informing the student of the sequence of required and elective courses in his degree program and suggesting electives;
  - d. monitoring the student's progress and performance;
  - e. assisting in early registration and other registration activities; and
  - f. assisting in course substitution, if necessary.

The academic advisor is a faculty member in the academic department or the college in which the student is enrolled. The advisor of the preparatory year students is the Assistant Dean for Preparatory Year Affairs in the College of Applied & Supporting Studies or anyone else assigned to act as an advisor amongst the faculty members.

### **3. Degree Plan**

The courses of each degree are spread over academic levels. The required as well as elective courses and the number of credit hours that a student needs to successfully complete in order to receive a degree in his major field are clearly specified for each academic level. This distribution of courses and credit hours is called "the Degree Plan". All degree plans are approved by the University Council. The academic departments regularly review and update the degree plans in order to provide students with continuously updated programs. The following rules apply to the degree plans.

- a. The academic departments select the acceptable elective courses and present them to the relevant College Council. The approved list is forwarded to the Deanship of Admissions & Registration for implementation.
- b. In special circumstances, some students may change from one degree plan to another, provided this does not affect their graduation requirements.
- c. In introducing any changes to a degree plan, it is anticipated that some courses may not be offered, or may be discontinued, or new courses may be included in the degree plan. Therefore, the concerned academic department should take into consideration the time needed for out-of-phase students by introducing an implementation plan that allows them to complete their graduation requirements in accordance with their original degree plan.
- d. If the old degree plan requires studying a course that has been canceled, and consequently it becomes impossible to register for such a course, the course could be substituted by an alternative course, consistent in level, subject area, and credit hours, with the approval of the academic advisor, the department council, and the relevant Vice Rector of the University. The Deanship of Admissions & Registration should be informed about the approval of this substitution for implementation.
- e. A readmitted student will be subject to the degree plan assigned to him during his last semester at the University before receiving discontinued status. However, if this plan has been canceled, he will be placed in the most recent plan in his major based on a recommendation from the academic department concerned.
- f. Students are required to study within the framework of their approved degree plan and once they fulfill all the requirements they are nominated for graduation.

#### 4. Assignment of Academic Status

A student's academic status will be determined at the end of each semester and will appear on the transcript that shows his achievements throughout his undergraduate study. However, the summer semester does not change the academic status. A student's academic status may be one of the following:

##### Good Standing

Good Standing status is maintained when the student's cumulative GPA and semester GPA are at least 2.00. Students are expected to maintain this standing till their graduation.

##### Academic Warning

A student will be placed under Academic Warning status after the final grades have been processed at the end of each semester (except summer semester) if any of the following cases occurs:

- a. his cumulative GPA is less than 2.00 but more than 1.00;
- b. his semester GPA is less than 2.00.

### Academic Probation

A student is placed under Academic Probation status after the final grades have been processed at the end of each semester (except summer semester), if his cumulative GPA is less than 1.00.

#### 5. Discontinuation from Study

Carrying forward the academic status that was assigned to a student at the end of his last semester in the Preparatory Year program, he shall be discontinued for at least one semester if any of the following cases occurs:

- a. his semester GPA is less than 1.00;
- b. he was previously on academic warning or probation in a regular semester and in the next term achieved a semester GPA of less than 1.75;
- c. the student receives three consecutive academic warnings.

The Rector of the University may however give the student an opportunity to continue his studies following the recommendation of the Admission & Academic Standing Committee.

#### 6. Ending of Academic Warning or Discontinuation Status

- a. After the lapse of one regular semester from issuing the warning or probation, the academic status can be revoked if the student achieves a semester and cumulative GPA of 2.00 or above at the end of that semester.
- b. A student who has been discontinued may apply for readmission within the period specified by the Deanship of Admissions & Registration. The Admission and Academic Standing Committee, in coordination with the concerned college, if needed, considers applications for readmission of the student. The discontinuation period is not counted in the period required to finish the degree.

#### 7. Conferral of Two Undergraduate Degrees

After obtaining the approval of the two department councils and the two college councils concerned, a student may apply for two undergraduate degrees provided he has completed at least 32 credit hours and his cumulative GPA is not less than 3.00. The two degrees are granted when the following requirements are fulfilled:

- a. The course and cumulative GPA requirements for each degree must be individually satisfied.
- b. The total credit-hours completed should be at least 28 in excess of that which is required by whichever of the two degree programs carries the higher credit-hour requirement.
- c. If both programs have cooperative assignments, the student may take one assignment and substitute the other by taking courses as determined by the councils of the two colleges concerned, in accordance with the study plan of the two degrees.
- d. If both programs require summer training, the student may undertake one program as per the recommendation of the councils of the two colleges concerned.

8. KFUPM employees may be admitted and registered for an undergraduate program on a part-time basis in accordance with the procedures approved by the Rector of the University.



## **THE ACADEMIC LEVELS SYSTEM**

### **Article Six**

According to the rules and regulations established by the University Council, some colleges may formulate their programs on the basis of a full academic year. In this case the academic year is equivalent to two academic levels.

### **Article Seven**

The academic levels system divides the academic year into two regular semesters. There may be a summer semester, the duration of which is considered as half a regular semester. The degree requirements are divided into various levels in accordance with the degree plan approved by the University Council.

#### **Implementation Rules of Article Seven**

For some of the University programs, a semester may be divided into two parts. The governing regulations shall be approved by the University Council.

### **Article Eight**

The University Council sets up the detailed regulations which govern registration, dropping, and adding of courses within the levels of the approved degree plan while ensuring the specified minimum course load for the students.

#### **Implementation Rules of Article Eight**

##### **1. Registration Procedures**

1.1 The approval of the academic advisor is required for completing the registration process in accordance with the rules set by the University.

##### **1.2 Early Registration**

At approximately the middle of the first (fall) semester, early registration is held for the courses to be taken by students during the second (spring) semester; and in the middle of the second semester, early registration is held for both the coming summer semester and the first semester of the following academic year. Early registration is required of all enrolled students during the semester. Students who early registered for a particular semester are also required to do registration confirmation on the scheduled registration day for that semester.

##### **1.3 Formal Registration Confirmation**

Formal registration confirmation is held at the beginning of each semester or summer semester. Students are required to complete registration confirmation as specified in the academic calendar. Each student must do registration confirmation himself. Registration by proxy or any other way is not permitted at all.

#### 1.4 Late Registration:

If necessary, a student may be allowed to register late during the period specified in the academic calendar, in accordance with the rules set by the University. The student is responsible for all the consequences of his late registration.

#### 1.5 Adding and Dropping Courses

- A student may change his registration by adding some courses during the period specified in the academic calendar. Also, courses will not appear in the student's transcript if dropped during the first two weeks of classes in a regular semester (the first week in a summer semester). The following conditions apply:

##### First: Dropping Courses

- a. The course load must remain at or above the minimum allowable limit. See Implementation Rules of this Article.
- b. If the course being dropped is a co-requisite for another registered course, the two courses should be dropped simultaneously, or continued to be studied together. (See Implementation Rules of Article 13.)

##### Second: Adding Courses

- a. The course load should not exceed the maximum allowable limit (See Implementation Rules of this Article).
- b. The courses added should not result in a conflict in the student's schedule or final examinations.
- c. If a student desires to add a course section that is closed, and taking into consideration the evenness of distribution of students among sections of that course, then he must get the approval of the Chairman of department offering the course, and submit it to the Deanship of Admissions & Registration within the specified time.

#### 2. Auditing a Course

A student can change the status of a course for which he has already registered, from regular to audit, with the concurrence of the course instructor and subsequent approval of the Chairman of the department offering the course, and the Chairman of the student's major department. However, while making a request to audit a course, the student must bear in mind that:

- a. he can audit a course only if he is expected to graduate in the current semester;
- b. he cannot audit a course that he needs in order to graduate;
- c. the "audit" status for a course cannot be changed to "credit" status after the "adding" period;
- d. once a course has been audited, it cannot be repeated for credit in subsequent semester(s) except if it is a required course in a new major. This exception will require approval of the advisor, the Chairman of the (major) department, the Dean of the college and the Vice Rector for Academic Affairs;
- e. the deadline for receiving audit requests by the Deanship of Admissions & Registration is the last day for dropping course(s) with the grade of W in the respective term as indicated in the academic calendar. (See Implementation Rules for Article 28.)

### 3. Course Substitution in the Degree Plan

Some courses can be exchanged or substituted by other courses with the approval of the relevant Vice Rector of the University, then informing the Deanship of Admissions & Registration for implementation. This is only possible in cases such as: if certain courses in the student's degree plan are discontinued, or changes are made in the contents of a course, or a new curriculum is adopted that does not include certain courses required by the student.

### 4. Repeating a Course

A student who obtains a failing grade in a required course must repeat this course. Additionally, a student can repeat a course for which he previously obtained a D or D+ grade. The last grade will reflect the student's performance in such a course. Should a student repeat a required course in which he had earned a D or D+ grade, and fail, he must repeat the course and get a passing grade. All the grades are included in the GPA calculation in the student's transcript.

### 5. Enrollment in the Cooperative Program

Some students, according to the requirements of their majors and degree plans, should spend a period (not exceeding 28 weeks) of practical training in their major field. The student must remain in continuous contact with his academic department during the training period. In order to qualify for enrollment in this program the student should:

- a. have completed more than 85 credit hours of his degree plan and should complete the cooperative assignment before his last semester at the University;
- b. have completed all the required courses as identified by his major department;
- c. have a cumulative GPA and major GPA of 2.00 or above;
- d. not be discontinued from study.
- e. not be allowed to take any other courses along with the Cooperative Program.

### 6. Enrollment in Summer Training

Some students, according to the requirements of their majors and degree plans, should spend a summer training period of eight (8) weeks in their major field. The student should complete the summer training period before his last semester at the University. In order to qualify for enrollment in this program the student should:

- a. have completed more than 65 credit hours of his degree plan;
- b. have completed all the required courses as identified by his major department;
- c. have a cumulative GPA and major GPA of 2.00 or above;
- d. not be discontinued from study;
- e. not be allowed to take any other courses along with the Summer Training.

### 7. Course Load

A course load is defined as the number of credit-hours for which a student is registered in a regular semester or a summer semester. The course load varies from one major to another and is determined as follows:

(a) The Minimum and Maximum Course Load Limit in a Regular Semester for a Student with Good Standing:

- The minimum course load limit is 12 credit hours during a regular semester. This condition is waived in the last semester before graduation.
- The maximum course load is 19 credit hours.
- A student is permitted to register for 21 credit hours with the approval of his department Chairman, if the student has maintained a minimum cumulative GPA of 3.00 in the preceding semesters that include the last 28 credit hours taken by the student.
- The maximum course load in a summer semester is 8 credit hours.

(b) Minimum and Maximum Course Load for a Student on Academic Warning or Probation:

- The minimum course load is 12 credit hours in a regular semester.
- The maximum course load is 15 credit hours in a regular semester.
- The maximum course load is 7 credit hours in a summer semester.

(c) Maximum Course Load for a Student in his Last Term Before Graduation

- The maximum course load is 20 credit hours in a regular semester.
- The maximum course load is 9 credit hours in a summer semester.
- The student should have maintained a minimum cumulative GPA of 2.00 in the preceding semesters that include the last 28 credit hours taken by the student.

8. Student Transcript of Academic Record

8.1 At the end of each academic term, a copy of the student's academic record (the Transcript) is made available for him. No copy of the transcript is issued, given or sent to any outside agency or any other person without a written authorization by the student. No partial records are issued. The transcript must comprise the complete academic record of the student from the date of admission to the issue date.

8.2 The accuracy of a student record is of the utmost importance and errors should be brought to the immediate attention of the Deanship of Admissions & Registration.

## **ATTENDANCE AND WITHDRAWAL**

### **Article Nine**

A regular student should attend all classes and laboratory sessions. A student may be discontinued from a course and denied entrance to the final examination if his attendance is less than the limit determined by the University Council. This limit cannot be less than 75% of classes and lab sessions assigned to each course during the semester. A student who is denied entrance to the examination due to excessive absences will be considered as having failed that course with a DN grade.

### **Implementation Rules of Article Nine**

If the number of unexcused absences for a student exceeds 20% of the lecture and laboratory sessions scheduled for a course, then he is not allowed to continue in the course or take the final examination and shall be given a DN grade by the course instructor with the department Chairman's approval.

### **Article Ten**

The college council - or whatever body it delegates its authority to - may exempt a student from the provisions of Article Nine and allow him to attend the final examination if he provides an excuse acceptable to the council. For such an exemption provided by the University Council, the minimum attendance requirement is not less than 50% of the lecture and laboratory sessions scheduled for the course.

### **Implementation Rules of Article Ten**

1. If the attendance of a student is less than two thirds ( $2/3$ ) of the lecture and laboratory sessions scheduled for a course, then he is not allowed to continue in the course or take the final examination and shall be given a DN grade by the course instructor with the approval of the department's Chairman.
2. The college council - or whatever body it delegates its authority to - may revoke the DN grade assigned to the student in a course, and allow him to continue in that course and take the final examination if he furnishes an excuse acceptable to the council, provided that his total attendance in the lecture and laboratory sessions is not less than two thirds ( $2/3$ ), and his unexcused absences do not exceed 20%, as the Implementation Rule for Article Nine applies for his case.

### **Article Eleven**

A student who fails to attend the final examination will be given zero in that examination. In this case, his course grade will be calculated on the basis of the class work score he earned in the course.

### **Article Twelve**

If a student fails to attend the final examination of any of his scheduled courses due to circumstances beyond his control, the college council, in exceptional cases, may accept the excuse and arrange a make-up examination for the student within a period not exceeding the end of the next semester. In such cases the course grade will be given to the student after the make-up examination.

### **Implementation Rules of Article Twelve**

1. The student must furnish the excuse to his instructor and request a make-up examination before the end of the next regular semester.
2. The course instructor shall submit his report to the department Chairman for presentation to the departmental council and then the college council.

3. Under exceptionally pressing circumstances, the college council may accept the student's excuse and give him a make-up examination before the end of the following semester. The final grade will be given to the student after that make-up examination.

### **Article Thirteen**

- (a) A student may be allowed to withdraw for a semester and not be considered as having failed the courses if he furnishes an acceptable excuse to the authorized body as determined by the University Council, during the time period specified in the implementation rules approved by the University Council. The student is given a "W" grade for the courses, and the semester is counted towards the period required to complete graduation requirements.
- (b) A student may withdraw from a course or a number of courses in accordance with the implementation rules approved by the University Council.

### **Implementation Rules of Article Thirteen**

1. The Deanship of Student Affairs shall study all applications for withdrawal for the semester. If the request is approved, withdrawal procedures are completed at the Deanship of Admissions & Registration, and the student's enrollment is suspended.
2. If a student has received any course grades before submitting an application to withdraw for a semester, all such grades are retained in his academic record.
3. A student is not allowed to withdraw for more than two consecutive and three non-consecutive semesters during his entire course of study at the university. The Rector of the University, or whomever he delegates his authority, may exempt a student from this provision. The period of interruption of study is counted towards the period required to complete graduation requirements.
4. A student may withdraw from a course or a number of courses during the periods specified in the academic calendar that is approved by the University Council as follows:
  - withdraw from a course or a number of courses without permanent record during the first two weeks of a regular semester.
  - withdraw from a course or a number of courses with "W" grade during the next four weeks.
  - withdraw from all courses with "W" grade during the four weeks that follow.
  - withdraw from all courses during the very next four weeks and his grade in each course is determined as "Withdrawn with Pass (WP)" or "Withdrawn with Fail (WF)". The grade will be assigned by the instructor, with the approval of the department Chairman, in the light of the student's performance before his application to withdraw.
5. If a student withdraws during the 15th week, Article Eleven applies.
6. A Preparatory Year student is not allowed to withdraw from any course or a number of courses included in the Preparatory Year Program. However, if he wants to withdraw from all courses, the withdrawal system/schedule indicated in the Preparatory Year academic calendar approved by the University Council shall apply.

## **INTERRUPTION AND SUSPENSION OF ENROLLMENT**

### **Article Fourteen**

A student may submit an application for suspension of enrollment, for reasons acceptable to the college council, provided the suspension period does not exceed two consecutive semesters, or a maximum of three non-consecutive semesters, during his entire course of study at the University. Otherwise, his enrollment status will be canceled. However, the University Council may, at its discretion, make exceptions to this rule, and the suspension period will not be counted towards the period required to complete graduation requirements.

### **Implementation Rules of Article Fourteen**

1. The Deanship of Admissions & Registration studies and makes a decision on all applications for suspension of enrollment for the semester. Then the student's enrollment is suspended.

### **Article Fifteen**

If a student interrupts his studies for one semester without submitting an application for suspension of enrollment, his enrollment status at the University will be canceled. The University Council however, may at its discretion, cancel a student's enrollment status if he discontinues his studies for a period of less than one semester. As for student studying by association, his enrollment is canceled if he becomes absent from all final examinations for the semester without presenting an acceptable excuse.

### **Article Sixteen**

A student is not considered to have interrupted his studies during the terms he spends as a visiting student in other universities.

## **RE-ENROLLMENT**

### **Article Seventeen**

A student, whose enrollment status has been canceled, may apply for re-enrollment with the same University ID 'number and academic record he had before his suspension, provided:

- a. that he applies for re-enrollment within four regular semesters from the date of cancellation of his enrollment status;
- b. the relevant college council and concerned departments agree on his re-enrollment;
- c. that four or more semesters have lapsed since cancellation of his enrollment, in which case the student can apply to the University for admission as a new student without considering his old academic record, if he fulfills all the admission requirements for new students. The University Council may exempt a student from this provision in accordance with the regulations issued by the Council;
- d. that he has not been re-enrolled previously. Under exceptionally pressing circumstances, the University Council may exempt a student from this condition; and
- e. that he was not dismissed for academic reasons.

### **Implementation Rules of Article Seventeen**

1. A suspended student should submit his re-enrollment application to the Deanship of Admissions & Registration, during the period specified by the Deanship, before the beginning of the semester in which he intends to resume study.
2. The Deanship of Admissions & Registration coordinates with the relevant college council in order to arrive at a decision regarding the application.
3. A student who interrupts his studies for more than four semesters may apply for admission as a new student if he fulfills all admission requirements for new students. No credits will be transferred from his previous record, though such credits will appear in his new academic record.
4. This article does not apply to students who are dismissed.

### **Article Eighteen**

A student who has been dismissed from the University for academic or disciplinary reasons - or from other universities for disciplinary reasons - will not be re-enrolled at the University. If it becomes known later that a student has been dismissed for such reasons, his enrollment will automatically be considered null and void as of the re-enrollment date.

## **GRADUATION**

### **Article Nineteen**

1. A student graduates after successfully completing the graduation requirements according to the degree plan, provided his cumulative GPA is not less than what is specified by the University Council for each major, and in any case is not less than "Pass".
2. Following the recommendation of the department council, the college council may determine certain additional courses the student should take to improve his cumulative GPA if he has passed the required courses, but his graduation GPA is not satisfied.

### **Implementation Rules of Article Nineteen**

1. A student should successfully complete all graduation requirements according to the degree plan of his major.
2. A student must attain a cumulative GPA and major GPA of 2.00 or above to graduate.
3. To obtain any degree from KFUPM, the student must have studied at KFUPM a minimum of 65 credit-hours, including at least 25 credit hours in his major field.
4. The Deanship of Admissions & Registration will prepare a list of students expected to graduate at the end of each semester, and present it to the University Council.
5. The Deanship of Admissions & Registration notifies the relevant departments to review the academic records and degree plans of all candidates for graduation to ensure that they have satisfied all graduation requirements. Then, the departments provide the Deanship of Admissions & Registration with a list of the students who qualify for graduation.
6. The Deanship of Admissions & Registration minutely reviews and checks all student records to ensure that all the graduation requirements have been completed.
7. The Deanship of Admissions & Registration shall prepare a list of students who have actually graduated at the end of each semester, and present it to the University Council.
8. A graduating student is obliged to obtain a clearance form from the Deanship of Student Affairs and have it signed by the following departments:



The Central Library, Bookstore, Security, Medical Center, Student Housing, Academic Major Department, Student Fund, Deanship of Admissions & Registration, Accounting, and any other departments as determined by the Deanship of Student Affairs.

9. The Deanship of Admissions & Registration prepares and issues the official graduation certificates and degrees and maintains copies of these documents.
10. No change is to be introduced to the academic record in any case after the graduation document is issued.

## **DISMISSAL**

### **Article Twenty**

Dismissal from the University will occur in the following circumstances:

- a. A student will be dismissed if he obtains a maximum of three consecutive academic probations as the result of his cumulative GPA being less than the GPA needed for graduation as per Article 19 of these regulations. Following the recommendation of the college council, the University Council may allow the student a fourth opportunity to improve his cumulative GPA by taking additional courses.
- b. A student will be dismissed if he fails to complete the graduation requirements within a maximum additional period equal to one half of the period determined for his graduation in the original program period. The University Council, however, may exempt the student from this restriction and give him the opportunity to complete the graduation requirements within an additional period of maximum duration equal to that of the original program.
- c. The University Council, in exceptional cases, may address status of the students on whom the provisions of (a) and (b) above apply, and give them an additional opportunity not exceeding two semesters to complete the graduation requirements.

### **Implementation Rules of Article Twenty**

1. A student is dismissed if he receives three consecutive academic probations.
2. Following the recommendation of the Deanship of Admissions & Registration in coordination with the college council, the University Council may allow the student a fourth opportunity to improve his cumulative GPA.
3. A student is dismissed if he fails to complete the graduation requirements within an additional period equal to one half of the original program's duration. The University Council, based upon the recommendation of the Deanship of Admissions & Registration in coordination with the college council, may exempt the student from this restriction and give him the opportunity to complete the graduation requirements within an additional period of maximum duration equal to that of the original program.
4. A student is dismissed if he fails to complete the graduation requirements within an additional period equal of to that of the original program's duration. Following the recommendation of the Deanship of Admissions & Registration in coordination with the college council, the University Council may grant the student an additional opportunity not exceeding two regular semesters to complete the graduation requirements.
5. The Deanship of Admissions & Registration informs the student of his dismissal and cancels his enrollment.
6. A dismissed student is obliged to obtain a clearance form from the Deanship of Student Affairs and have it signed by all the relevant departments as mentioned in Article Nineteen.

## **STUDY BY AFFILIATION**

### **Article Twenty-One**

Based upon the recommendation of the colleges, the University Council may adopt the principle of admission by affiliation in some colleges and majors which allow this option. The University Council sets the rules and regulations for affiliation according to the following parameters:

- (a) The credit-hours required for the graduation of an associate student should not be less than the credit-hours required of a regular student.
- (b) The associate student will be treated, with regard to admission, grading, transfer, dismissal and re-enrollment, in exactly the same manner as a regular student except the requirement regarding class attendance.
- (c) On the basis of the college council's recommendation, the University Council determines the rules required to evaluate the performance of associate students.
- (d) The student transcript, graduation certificate, and degree, must indicate that the student has studied "by affiliation".

## **EXAMINATIONS AND GRADES**

### **Article Twenty-Two**

The class work score shall comprise not less than 30% of the course total score, as found by the college council on the basis of the recommendation of the department council offering the course.

### **Article Twenty-Three**

The class work score is evaluated either by:

- (a) oral and practical examinations, research, other class activities or some or part of all these and at least one written examination; or,
- (b) at least two written examinations.

### **Article Twenty-Four**

Based upon the recommendation of the department council offering the course, the college council may include practical or oral tests in the final examination of any course, and allocate a percentage to these tests as part of the final examination score.

### **Article Twenty-Five**

Upon the instructor's recommendation, the council of the department which teaches the course may allow the student to complete the requirements of any course during the next term. In such an event, the grade IC will be recorded for the student in his academic record. IC grades are not included in the calculation of the semester and cumulative GPA until the student obtains his final grade in the course by completing all the requirements. If no change has been made in the IC grade after the lapse of one semester, the IC status will be changed to an F grade which will be included in the calculation of semester and cumulative GPA.

### **Implementation Rules of Article Twenty-Five**

1. The course instructor may allow the student to complete the course requirements during the following term if there are exceptional circumstances which are beyond the student's control.
2. The course instructor assigns an IC grade for the student and submits a report to the department Chairman indicating the reasons and justifications for assigning the IC grade, and identifies the work and the time required to complete the course requirements.
3. The student must complete the course requirements by the end of the next regular semester. However, exceptions may be made in the following cases:
  - (a) A student who attained an IC grade in the co-op program may, with the approval of the department Chairman, extend completion of the course requirements for one additional regular semester.
  - (b) A student who attained an IC grade in a course in the semester preceding his co-op program may, with the approval of the department Chairman, extend completion of that course's requirements within a maximum period of one regular semester after returning from the co-op program.
4. When the student completes the course requirements within the specified period, the course

instructor changes the student grade from IC to the new earned grade. The instructor also informs the Deanship of Admissions & Registration of the grade change within this period through the department Chairman concerned.

5. The Deanship of Admissions & Registration changes the grade to F and informs the student, course instructor and department Chairman accordingly if the grade has not been changed by the instructor within the specified period.
6. A student cannot repeat a course in which he previously earned an IC grade and the said grade has not been changed.
7. If a student has an IC grade, this results in the suspension of the student's academic standing during that semester. This also includes the suspension of distinction status.
8. A student is not allowed to register for a course wherein he earned an IC grade in the pre-requisite(s) of that course.

### **Article Twenty-Six**

Courses involving symposia, research, field work, or of a practical nature, may be excluded from some or all the rules of Articles 22, 23 & 25 following a decision by the college council and the recommendation of the department council teaching the course. The college council identifies alternate ways to evaluate the student's achievement in such courses.

### **Article Twenty-Seven**

If any course of a research nature requires more than one semester for its completion, the student will be assigned an IP grade, and after the completion of the course, the student will be given the grade he has earned. However, if he fails to complete the course on time, the department council teaching the course may approve the assignment of an IC grade for this course in his record.

### **Article Twenty-Eight**

The grades a student earns in each course are calculated as follows:

Percentage	Grade	Grade Code	GPA (out of 5.00)	GPA (out of 4.00)
95 - 100	Exceptional	A+	5.00	4.00
90 - less than 95	Excellent	A	4.75	3.75
85 - less than 90	Superior	B+	4.50	3.50
80 - less than 85	Very Good	B	4.00	3.00
75 -less than 80	Above Average	C+	3.50	2.50
70 - less than 75	Good	C	3.00	2.00
65 - less than 70	High Pass	D+	2.50	1.50
60 - less than 65	Pass	D	2.00	1.00
Less than 60	Fail	F	1.00	0.00

## Implementation Rules of Article Twenty-Eight

1. The student's final course grade will be one of the nine levels mentioned in the Article and his grades will be calculated in accordance with this distribution. The course instructor may consider other known assessment methods such as the grade average and the standard deviation in determining the student's end-of-course grade which reflects his achievement in the course.
2. The grade AU will be assigned to students who attend a course as auditors without being given any grades, regardless of their performance in the course. The effect of this assignment on the student's cumulative or semester grade is the same as the grade "No grade-Pass" or NP. However, if the instructor informs the Deanship of Admissions & Registration that the student was absent for more than one third of the classes, the course will be eliminated from his record. See Implementation Rules for Article 8.
3. The grades "No grade-Pass (NP)" or "No grade-Fail (NF)" are assigned for courses offered on the basis of pass or fail.
4. If a student is registered in the Cooperative Program in summer semester and is assigned an IP grade in it, the IP grade will be changed to:
  - a. NP grade, if the student passes the Cooperative Program.
  - b. F grade, if the student fails the Cooperative Program.
5. The grade "Withdrawn with Pass (WP)" or "Withdrawn with Fail (WF)" is given in accordance with Implementation Rules for Article 13.

## **Article Twenty-Nine**

In accordance with the requirements of Article 19, and based on the cumulative Grade Point Average achieved by a graduating student, his graduation rank is assigned to one of the following :

	Rank	Range of Cumulative GPA	
		Out of 5.00	Out of 4.00
1.	Excellent	4.50 - 5.00	3.50 - 4.00
2.	Very Good	3.75 - less than 4.50	2.75 - less than 3.50
3.	Good	2.75 - less than 3.75	1.75 - less than 2.75
4.	Pass	2.00 - less than 2.75	1.00 - less than 1.75

## **Article Thirty**

First honors will be granted to graduating students who achieve a cumulative GPA of 4.75 - 5.00 (out of 5.00) or 3.75 - 4.00 (out of 4.00). Second honors will be granted to graduating students who achieve a cumulative GPA of 4.25 - less than 4.75 (out of 5.00) or 3.25 - less than 3.75 (out of 4.00).

In order to be eligible for the first or the second honors the student:

- (a) must not have failed in any course at the university he is currently attending or any other university;
- (b) must have completed all graduation requirements within a period of duration ranging between the maximum and minimum limits for completing the program of study in a college;
- (c) must have completed 60% or more of the graduation requirements at the university from which he graduates.

### **Implementation Rules of Article Thirty**

1. Third honors will be granted, at the time of graduation, to students who achieve a cumulative GPA of more than 3.00 (out of 4.00), and the conditions for offering first and second honors do not apply. However, they must fulfill the terms of paragraphs (b) and (c) of Article 30.
2. The provisions of (a) of Article 30 do not apply to a student who has failed in any Preparatory Year course.
3. At the end of each semester, the Deanship of Admissions & Registration records the names of distinguished students on the University distinction list, on the basis of their semester GPA and the quality points earned in this semester, as follows:

Distinction	Requirements		
	Semester GPA	&	Quality Points
First Distinction	3.75 - 4.00	&	60 or above
Second Distinction	3.50 - 3.74	&	56 or above
Third Distinction	3.00 - 3.49	&	48 or above

4. A student earns the rank of 'Excellent' for an academic year if he achieves one of the distinction ranks of paragraph 3, in both the first and second semesters of that year.
5. A student receives his distinction reward remuneration in the semester in accordance with the Regulations for Financial Affairs in the Saudi Universities.

## **FINAL EXAMINATION PROCEDURES**

### **Article Thirty-One**

The college council may set up a committee to cooperate with the departments in organizing the activities related to the final examination. This committee's charges should include reviewing of mark sheets and submitting them to the relevant committee within three days from the examination date of the course.

## **Article Thirty-Two**

The college council may apply the principle of strict confidentiality in the final examinations procedures.

### **Implementation Rules of Article Thirty-Two**

A course instructor or coordinator should apply caution and confidentiality in examinations procedures.

## **Article Thirty-Three**

A course instructor prepares the examination questions. However, if the need arises, the college council may assign another teacher to do the same, based on the recommendation of the department Chairman.

## **Article Thirty-Four**

A course instructor grades the final examination papers and if necessary the department Chairman may assign one or more additional instructors to participate in the grading process. The college council may also assign the grading process to another instructors(s), when the need arises.

### **Implementation Rules of Article Thirty-Four**

In the case of common examinations for a multi-section course, the grading of the examination may be assigned to course instructors regardless of which sections they teach.

## **Article Thirty-Five**

The instructor who corrects the final exam, and records the marks obtained by students on the designated grade list, signs his name on the grade sheet and has it countersigned by the department Chairman.

### **Implementation Rules of Article Thirty-Five**

1. The Deanship of Admissions & Registration determines the procedures for submitting final grades in accordance with the dates specified in the academic calendar. Course instructors submit the students' grades accordingly.
2. No grade shall be corrected or changed after the submission of the grade records to the Deanship of Admissions & Registration without a written request from the course instructor that includes proper justifications. Such request must be endorsed by the department Chairman. The Dean of Admissions & Registration should be informed of the change no later than the beginning of the final examination period of the next term. Only the new grade will appear in the student's record.

## **Article Thirty-Six**

No student is to be given more than two examinations in one day. The University Council may allow for exceptions to this rule.

### **Implementation Rules of Article Thirty-Six**

1. The Deanship of Admissions & Registration schedules the final examinations in such a way that no student is given more than two exams in one day.
2. Every semester the Deanship of Admissions & Registration prepares the schedule of the final examinations listing the date, time and location of examinations. The following considerations are observed:
  - (a) The final examinations schedule must be maintained free from conflicts to the maximum extent possible.
  - (b) The classrooms and auditoria in which the examinations shall be held are reserved.
  - (c) The departments and students are informed by an announcement of the schedule of final examinations at least one week before the commencement of the final examinations period as specified in the University's academic calendar.
3. All course instructors and students should abide by the examination schedule prepared by the Deanship of Admissions & Registration.
4. In the event of a conflict in a student's final exams, the course instructors provide make-up examinations for such courses with the approval of the Dean of Admissions & Registration and the chairmen of the departments concerned. The make-up exam is to be given during the final examination period.
5. The schedule of a final examination of a certain course may be changed for justifiable reasons upon the recommendation of the course instructor and the department Chairman. The college council, in coordination with the Deanship of Admissions & Registration, decides on such cases. The recommended new date and time of the final exam of this course must fall within the final examination period.
6. An instructor of a course which does not require final examinations, as per its approved description, may give alternative examinations or homework assignments to the students instead of the final examination.

### **Article Thirty-Seven**

No student will be allowed to sit for a final examination after the lapse of 30 minutes from the beginning of the examination. Also, no student will be allowed to leave the examination venue less than 30 minutes after the beginning of the examination.

### **Article Thirty-Eight**

Cheating, or attempting to cheat, or violating instructions and examination regulations shall render the offender subject to punishment in accordance with the Student Disciplinary Rules as issued by the University Council.

### **Implementation Rules of Article Thirty-Eight**

1. Cheating is an act of dishonesty and faculty members and students must maintain trust and honesty to ensure and protect the integrity of grades.



2. All academic work or requirements assigned to a student must be carried out by him without any unauthorized aid of any kind.
3. Instructors must exercise due professional care in the supervision and verification of academic work so that honest effort on the part of the students will be positively encouraged.
4. A course instructor who discovers that a student is cheating or helps in cheating in homework assignments, quizzes or any other requirements of the course shall assign for the student a zero grade in that work. The instructor shall report in writing the case and his recommendations to the department Chairman who, in turn, shall submit the case to the Dean of the college. After deliberating the case, the college council, may review the penalty or approve the instructor's decision(s) or give an F grade to the student in the course, or else if further action is required refer it to the Student Affairs Committee for review and submitting its recommendation to the Rector of the University based on the Student Disciplinary Rules. A student has the right to appeal to the Dean of Student Affairs within one week of notification of the disciplinary decision.
5. A course instructor or a supervisor of a course examination who discovers that a student is cheating, attempting to cheat or helps in cheating in any of the written examinations must not allow the student to continue in the examination, and the student deserves an F grade in that course. The instructor shall report the case in writing to the department Chairman who, in turn, shall submit the case to the Dean of the college. After deliberating the case, the college council may decide:
  - (a) that the student does not deserve the F grade. In this case, the instructor gives the student a make-up exam;
  - (b) that the student deserves the F grade. In this case, the college council refers the case to the Student Affairs Committee for review and submitting its recommendation to the Rector of the University based on the Student Disciplinary Rules. A student has the right to appeal to the Dean of Student Affairs within one week of notification of a disciplinary decision.

### **Article Thirty-Nine**

If the need arises, the council of the college which offers the course may agree to the re-grading of examination papers within a period not exceeding the beginning of the next semester's examinations.

### **Implementation Rules of Article Thirty-Nine**

A student who feels strongly that he has received a grade that is demonstrably inaccurate, or that the grading was unfair, must promptly discuss the matter with the instructor of the course. If the student and his instructor are unable to arrive at a mutually agreeable solution, the student may forward an official appeal to the Chairman of the department offering the course, no later than the end of the fourth week of the next semester. The department Chairman will investigate whether the appeal is justified by reviewing the instructor's evaluation of the student based on the student's class work and final examination scores. The department Chairman will then take appropriate action, if he deems necessary, by submitting the student's appeal to the college council to decide on the case.

## **Article Forty**

Following the recommendation of the relevant department council, the college council determines the duration of the final written examinations which, in any case, should not be less than one hour and not more than three hours' duration.

## **Article Forty-One**

Consistent with the provisions of Articles 31-40 of this document, the University Council establishes the regulations that govern the final examination procedures.

# **TRANSFER**

## **TRANSFER FROM ONE UNIVERSITY TO ANOTHER**

### **Article Forty-Two**

The transfer of a student from outside the University may be accepted under the following conditions.

- a. The student should be enrolled at a recognized college or university.
- b. The student must not have been dismissed from that university for disciplinary reasons.
- c. The student must satisfy the transfer provisions as determined by the University Council.

### **Implementation Rules of Article Forty-Two**

All transfer applications are submitted to the Admission & Academic Standing Committee which studies the application and ensures that the applicant fulfills the requirements of this article, in addition to any other provisions the Committee deems necessary in coordination with the colleges concerned.

### **Article Forty-Three**

The college council shall review the courses taken by the student outside the University based on the recommendations of the departments which offer equivalent courses. The courses evaluated as equivalent will be transferred to the student's record but will not be included in the calculation of his cumulative GPA.

### **Implementation Rules of Article Forty-Three**

In order to get transfer of credit for any course taken outside the University, the following provisions shall be observed:

1. the student should have completed the Preparatory-Year program, or have been admitted to the university as freshman student;
2. the student should have obtained grade of C or higher in that course;

3. the course was taken at a recognized college or university;
4. the course is equivalent in its contents to one of the courses which are included in the KFUPM degree requirements. Otherwise, it may be counted as an elective with the approval of the council of the department offering the degree program and the college council concerned.
5. The grade earned by the student in the course is not included in the student's cumulative GPA.
6. Courses taken at two different institutions at the same time are not considered for transfer of credit.
7. Courses taken at another institution simultaneously while studying at KFUPM (in the same semester) are not considered for transfer of credit.

#### **Article Forty-Four**

If, after his transfer, it is discovered that a student had been dismissed from his previous university for disciplinary reasons, his enrollment will be considered canceled as from the date of acceptance of his transfer to the University.

#### **Article Forty-Five**

The transfer of a student from one university to another during any semester takes place in accordance with the procedures and the dates announced by the university to which the student is transferring, under the general transfer rules.

### **TRANSFER FROM ONE COLLEGE TO ANOTHER WITHIN THE SAME UNIVERSITY**

#### **Article Forty-Six**

A student may be transferred from one college to another within the University in accordance with rules established by the University Council.

#### **Implementation Rules of Article Forty-Six:**

1. A student may transfer from one college to another within the University before he completes the fourth academic level in his undergraduate studies.
2. The student should continue to study all the courses he registered for at the level preceding the transfer, in compliance with the adding and dropping rules.
3. The transfer from one college to another will appear in the academic record of the student starting the term following the transfer.
4. A student is allowed a maximum of two transfers from one college to another.

#### **Article Forty-Seven**

The academic record of a student transferred from one college to another includes all the courses he has studied together with the grades and the semester and cumulative GPA's obtained throughout his period of study at the University.

## **TRANSFER FROM ONE MAJOR TO ANOTHER WITHIN THE SAME COLLEGE**

### **Article Forty-Eight**

With the approval of the Dean of the relevant college, a student may transfer from one major to another within the same college according to the rules established by the University Council.

#### **Implementation Rules of Article Forty-Eight**

1. A student may transfer from one major to another within his college at any time before he completes the fourth academic level in his undergraduate studies. The college council may consider exceptional cases after that level.
2. The transfer to the new major will appear in the academic record of the student starting the term following the transfer.
3. A student is allowed a maximum of two transfers from one major to another within the same college. The college council may consider exceptional cases.

### **Article Forty-Nine**

The academic record of a student transferring from one major to another will include all the courses the student has taken, including the grades and the semester and cumulative GPA's obtained throughout his period of study at the University.

## **VISITING STUDENTS**

### **Article Fifty**

A "visiting student" is a student who studies some courses at another university or in one branch of the university to which he belongs without transferring. Equivalency for such courses shall be granted according to the following rules.

- a. The student must obtain prior approval from the college at which he is studying.
- b. The student should be enrolled at a recognized college or university.
- c. The course the student is taking outside his university should be equivalent to one of the courses included in his degree requirements.
- d. If the visiting student is studying in one of the branches of the university to which he belongs, the case should be dealt with in accordance with Article 47.
- e. The University Council determines the maximum credit hours to be allocated to a visiting student from outside the University.
- f. The course grades credited to the visiting student will not be considered in his cumulative GPA.
- g. The University Council may establish other conditions regarding visiting students.

## **Implementation Rules of Article Fifty**

### **Case One: A student from KFUPM visiting another university**

- (a) The student should submit to the Chairman of the academic department a written application indicating the course(s) he intends to study at the other university. The department council sets up a committee to evaluate these courses and suggest, if applicable, the equivalent courses at KFUPM.
- (b) After completing the course(s) the student submits a formal request to the Deanship of Admissions & Registration for transfer of credit. The final decision whether or not to accept a course for transfer is made in compliance with the Implementation Rules of Article 43.
- (c) Notwithstanding the degree requirements, the maximum total credit hours that can be transferred from outside the University is 48 and the student's grade in each transferred course must not be lower than C. These grades are not included in the cumulative or major GPA.
- (d) The maximum number of semesters a student can study outside the University is three consecutive or non-consecutive semesters (except summer semesters).
- (e) The student will receive KFUPM stipend as per the governing rules and regulations for stipends.
- (f) The student can apply to get approval to study a summer term in other University only if:
  - i. The summer term is part of the Study Abroad Program or;  
The student is a candidate to graduate in that summer or the following term and the registered course is not offered at KFUPM in the summer term.
  - ii. The course(s) is/are equivalent to KFUPM course(s) in terms of credit hours, content and mode of delivery.
  - iii. The delay in taking the course on time is for reasons beyond the control of the student.

### **Case Two: A student from another university visiting KFUPM**

- (a) The student should submit approval from the institution at which he is currently studying, indicating justifications for taking the courses outside his institution. The student must satisfy all the requirements of the courses for which he is intending to register.
- (b) The courses for which the student wishes to register must be available and not fully enrolled.
- (c) All courses should be recorded in a unified academic record, including all courses studied at this University while a regular or visiting student.
- (d) The student will not receive KFUPM stipend and will not be provided with Textbooks.

## **GENERAL RULES**

### **Article Fifty-One**

These regulations supersede all the preceding rules and regulations established for study and examinations at the undergraduate level.

### **Article Fifty-Two**

The University Council may set up implementation rules which will not contradict these regulations.

#### **Implementation Rules of Article Fifty-Two**

The University Council reserves the right to interpret and amend the implementation rules accompanying these regulations.

### **Article Fifty-Three**

The Higher Education Council reserves the right to interpret these regulations.

## APPENDICES

### APPENDIX (A)

#### Academic Records and Grade Codes

##### Academic Record

The academic record is a statement which explains the student's academic progress. It includes the courses studied in each term with course numbers, codes, number of credit-hours, the grades attained and the codes and points of these grades. The record also shows the semester, cumulative GPA and the student's academic status in addition to the courses from which a transferred student is waived.

##### Grade Codes

Letter Grades	Marks	Points		Meaning
A+	95-100	4.00	5.00	Exceptional
A	90 - Less than 95	3.75	4.75	Excellent
B+	85 - Less than 90	3.50	4.50	Superior
B	80 - Less than 85	3.00	4.00	Very Good
C+	75 - Less than 80	2.50	3.50	Above Average
C	70 - Less than 75	2.00	3.00	Good
D+	65 - Less than 70	1.50	2.50	High-Pass
D	60 - Less than 65	1.00	2.00	Pass
F	Less than 60	0.00	1.00	Fail
IP	–	–	–	In-Progress
IC	–	–	–	Incomplete
DN	–	0.00	1.00	Denial
NP	60 or above	–	–	No grade-Pass
NF	Less than 60	–	–	No grade-Fail
W	–	–	–	Withdrawn

## APPENDIX (B)

### Example of the Calculation of Semester and Cumulative GPA

#### First Semester

Course	Cr Hrs	%	Code	GPA		Quality Points	
IAS 301	2	85	B+	4.50	3.50	9	7
CHEM 324	3	70	C	3.00	2.00	9	6
MATH 235	3	92	A	4.75	3.75	14.25	11.25
PHYS 312	4	80	B	4.00	3.00	16	12
Total	12					48.25	36.25

$$\text{First Semester GPA} = \frac{\text{Total Quality Points (48.25)}}{\text{Total Credits (12)}} = 4.02$$

Or

$$\text{First Semester GPA} = \frac{\text{Total Quality Points (36.25)}}{\text{Total Credits (12)}} = 3.02$$

#### Second Semester

Course	Cr Hrs	%	Code	GPA		Quality Points	
IAS 104	2	96	A+	5.00	4.00	10	8
CHEM 327	3	83	B	4.00	3.00	12	9
MATH 314	4	71	C	3.00	2.00	12	8
PHYS 326	3	81	B	4.00	3.00	12	9
Total	12					46	34

$$\text{Second Semester GPA} = \frac{46}{12} = 3.83 \text{ or } \text{Second Semester GPA} = \frac{34}{12} = 2.83$$

$$\text{Cumulative GPA} = \frac{\text{Total Quality Points (48.25 + 46)}}{\text{Total Credits (12 + 12)}} = 3.93 \text{ or } \frac{36.25 + 34}{12 + 12} = 2.93$$



## APPENDIX (C)

### The Grading System Applicable at KFUPM

#### Grade Codes

Letter Grades	Marks	Points		Grades in English
A+	95-100	4.00	5.00	Exceptional
A	90 - Less than 95	3.75	4.75	Excellent
B+	85 - Less than 90	3.50	4.50	Superior
B	80 - Less than 85	3.00	4.00	Very Good
C+	75 - Less than 80	2.50	3.50	Above Average
C	70 - Less than 75	2.00	3.00	Good
D+	65 - Less than 70	1.50	2.50	High-Pass
D	60 - Less than 65	1.00	2.00	Pass
F	Less than 60	0.00	1.00	Fail
IP	–	–	–	In-Progress
IC	–	–	–	Incomplete
DN	–	0.00	1.00	Denial
NP	60 or above	–	–	No grade-Pass
NF	Less than 60	–	–	No grade-Fail
W	–	–	–	Withdrawn
WP	–	–	–	Withdrawn with Pass
WF	–	–	–	Withdrawn with Fail
AU	–	–	–	Audit

**ACADEMIC COLLEGES,  
DEPARTMENTS AND PROGRAMS**

## ACADEMIC COLLEGES, DEPARTMENTS, AND PROGRAMS

<b>College of Applied and Supporting Studies</b> <ul style="list-style-type: none"> <li>• Preparatory Year Program</li> <li>• Skills Development Program</li> <li>• Department of Islamic and Arabic Studies</li> <li>• Physical Education Department</li> <li>• Department of General Studies</li> <li>• English Language Department</li> </ul>	<b>College of Environmental Design</b> <ul style="list-style-type: none"> <li>• Architectural Engineering</li> <li>• Architecture</li> <li>• City and Regional Planning</li> </ul>
<b>College of Applied Engineering</b> <ul style="list-style-type: none"> <li>• Applied Aerospace Engineering</li> <li>• Applied Chemical Engineering</li> <li>• Applied Civil and Environmental Engineering</li> <li>• Applied Electrical Engineering</li> <li>• Applied Mechanical Engineering</li> </ul>	<b>College of Industrial Management</b> <ul style="list-style-type: none"> <li>• Accounting and Management Information Systems <i>Accounting</i> <i>Management Information Systems</i></li> <li>• Finance and Economics</li> <li>• Management and Marketing <i>Management</i> <i>Marketing</i></li> </ul>
<b>College of Engineering Sciences</b> <ul style="list-style-type: none"> <li>• Aerospace Engineering</li> <li>• Chemical Engineering</li> <li>• Civil and Environmental Engineering</li> <li>• Electrical Engineering</li> <li>• Mechanical Engineering</li> </ul>	<b>College of Petroleum Engineering &amp; Geosciences</b> <ul style="list-style-type: none"> <li>• Geosciences <i>Geology</i> <i>Geophysics</i></li> <li>• Petroleum Engineering</li> </ul>
<b>College of Computer Sciences and Engineering</b> <ul style="list-style-type: none"> <li>• Computer Engineering</li> <li>• Information and Computer Science <i>Computer Science</i> <i>Software Engineering</i></li> <li>• Systems Engineering <i>Industrial and Systems Engineering</i> <i>Control and Instrumentation Systems Engineering</i></li> </ul>	<b>College of Science</b> <ul style="list-style-type: none"> <li>• Biology</li> <li>• Chemistry <i>Chemistry</i> <i>Industrial Chemistry</i></li> <li>• Earth Sciences <i>Geology</i> <i>Geophysics</i></li> <li>• Mathematics and Statistics <i>Mathematics</i> <i>Statistics</i> <i>Actuarial Sciences</i></li> <li>• Physics</li> </ul>

# **COLLEGE OF APPLIED AND SUPPORTING STUDIES**

**Dean: Dr. Ismail Budaiwi**

## **PROGRAMS**

PREPARATORY YEAR  
SKILLS DEVELOPMENT

## **DEPARTMENTS**

ISLAMIC AND ARABIC STUDIES  
PHYSICAL EDUCATION  
GENERAL STUDIES  
ENGLISH LANGUAGE

The College of Applied and Supporting Studies was established in 2007 to provide core courses in disciplines not covered by the other colleges. The College is responsible for developing in all KFUPM students the crucial knowledge, skills, attributes and values to be competitive in the market place and to realize their role as leaders in their communities. Through its programs and the courses offered, the College provides University students with the opportunities to expand their horizons and vision, reinforce their ethical and moral values, develop their communication skills and enhance their personal characteristics and positive behavior.

The College is committed to having a major influence on KFUPM graduates by maintaining close contact with both students and academic departments, and by continuously assessing and developing its programs and courses to accommodate the changing needs and conditions required to accomplish its set objectives and goals.

### **Vision**

To become a leading platform for fostering students' academic and professional success, excellence in research and advancement in community service.

### **Mission**

1. To prepare students to become successful members of KFUPM and the community by:
  - providing them with sound basic academic and general knowledge.
  - empowering them with, values, ethics, skills, and healthy attitudes.
  - enabling students to become well rounded individuals.
2. To enrich and complement the curriculum of all KFUPM programs through the supporting humanities and social courses offered by the college.
3. To engage CASS with the community through services and research of mutual interest.

### **Goals**

CASS goals reflect its strategic issues inferred from the SWOT analysis and aligned with KFUPM's goals and strategies.

- 1- Build a highly qualified national and international faculty body.
- 2- Develop students' English language proficiency to successfully pursue their undergraduate education and future careers.
- 3- Improve student retention rate in the Preparatory Year Program.
- 4- Cultivate students' knowledge in social sciences and humanities as well as values, skills and attitudes.
- 5- Excel in community-related research and services.

### **College Programs and Departments**

The College comprises two programs: the Preparatory Year Program (PYP) and the Skills Development Program; and four supporting academic departments: the Islamic and Arabic Studies Department; the Physical Education Department; the General Studies Department; and the English Language Department. The Departments offer courses that are core requirements for all KFUPM students.

## **Preparatory Year Program**

The PYP aims to prepare students for entry to undergraduate studies by exposure to various academic programs and courses including:

1. Preparatory English Program.
2. Preparatory Math Program.
3. Preparatory Science and Engineering Program.

In addition, the PYP offers students extra-curricular activities to help them adjust to the University life.

## **Skills Development Program**

The program aims to enhance students' personal skills and train students to attain high qualifications for their future career. The program enables students to gain experience in a variety of skills through: volunteer work; community and student activities; training programs; public lectures; meetings with successful businessmen; on-line Skills Courses (e.g., Thomson NETg); skills infusion in academic curriculum; and reading skills publication.

## **Islamic & Arabic Studies Department**

The department offers courses in Islamic ideology, professional ethics and human rights in Islam, objective writing, communication skills, Arabic and Islamic history, Arabic literature as well as other courses in Islamic and Arabic studies.

## **Physical Education Department**

The Department offers courses to Preparatory Year and Undergraduate students designed to raise their awareness of the following aspects: personal health; physical fitness; and knowledge of sports. The department also offers special courses for students with special needs. In addition, the department organizes activities to raise community awareness about healthy life style and physical fitness.

## **General Studies Department**

The department offers students opportunities to broaden their knowledge and reinforce their skills through courses in the following areas: Sociology; International Relations; Psychology; Anthropology; History; as well as other areas in social sciences and humanities.

## **English Language Department**

The department is responsible for improving students' English Language and communication skills to better prepare them for their academic studies and future career. The Department offers three courses in Academic Discourse (ENGL 101); Introduction to Report Writing (ENGL 102), and Academic and Professional Writing (ENGL 214).

# Preparatory Year Program

**Assistant Dean for Prep Year Affairs: Dr. Abdulaziz Al-Assaf**

Since the establishment of KFUPM in 1963, the Preparatory Year Program has been a core component of the University's academic curriculum. The Prep Year Program is continually developing concurrent with KFUPM academic programs.

## Vision

The Prep Year Program (PYP) strives to ensure that high school graduates of the Kingdom of Saudi Arabia become successful participants in the KFUPM community and future leaders in their fields of study.

## Mission

The PYP aims to ensure that students attain the level of proficiency in academia necessary to participate fully as KFUPM students. While academic skills are important, PYP provides students not only with a sound basis in academic skills, but also seeks to develop students into well-rounded individuals. The curriculum is designed to ensure that each student maintains a sense of pride in his native culture.

## Goals

The PYP program at KFUPM prepares newly admitted students for undergraduate studies at the University and aims to enhance their opportunities to succeed and excel through:

1. Improving students' English language proficiency to prepare them for University studies.
2. Reviewing and reinforcing students' knowledge of Mathematical and analytical techniques through problem solving and their ability to relate to various Math concepts.
3. Consolidating students' knowledge of basic sciences, providing necessary skills for effective learning, assisting students in choosing their academic majors through career guidance, as well as promoting student's physical well-being.

## Prep Year Program Calendar of Study

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
ENGL 01-xx	Prep. English I	15	5	4	ENGL 03-xx	Prep. English III	15	5	4
ENGL 02-xx	Prep. English II			4	ENGL 04-xx	Prep. English IV			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Life Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		20	10	16			18	12	15
<b>Total credit hours required in Preparatory Program: 31</b>									

The Prep Year program is composed of three interdependent programs: English, Mathematics, and Science & Engineering.

## Preparatory English Program (PEP)

**Director: Paul Brown**

### Faculty

Abdullah	Graham	McCarthy
Amison	Gray	McKay
Appling	Green	Moore, D.B.
Armstrong	Hands	Moore, H.M.
Baker	Hennessey	Mountjoy
Brigham	Hillmer	Owen
Brooks	Hind	Oxley
Brookshire	House	Paddock
Brown	Hudson	Pearson
Burridge	Johnston	Poores
Carey	Jones	Powell
Clermont	Kearney	Robben
Combes	Knight	Rycroft
Debenham	Knott	Silke
Fernelius	Kriel	Sliwa
Fletcher	Lake	Smith
Fogarty	Lavelle	Snow
Foord	Lewis	Snyman
Garlington	MacDonald	Turbett
Gaylard	Mann	Watson
Gowlett	Marsh	Wick



The Preparatory English Program (PEP) is responsible for developing the English proficiency required in a university where English is the language of instruction. This intensive five-course (half-semester) program, to which all new students are initially admitted, is designed to consolidate and develop the basic knowledge of English that the student has acquired in school. Four hours of English instruction per day are given. The course is specifically designed to help students develop all four-language skills - reading, listening, writing and speaking - that they will need in order to succeed in their academic studies. Grammar and vocabulary instruction support these skills, as do projects and computer-based exercises. Alongside the development of language, the PEP courses also aim to help students develop the study skills and self-discipline necessary for success in their academic careers.

The Modules are aligned on a continuum, where objectives and learning outcomes are progressive throughout the entire program. The skills developed in one module become the means for advancing onto the next module. At the lower levels, Modules ENGL00 and ENGL01 incorporate General English course books with the inclusion of ESP supplements. Modules ENGL02 and ENGL03 focus more on Academic Skills development, and by Module ENGL04, students have the working grounds for engaging in Integrated Skills practice. The objectives for reading, listening, use of English, speaking and writing do in fact overlap from one Module to the next, which ensures that the students continue building upon the skills they have developed throughout the program

Through the integrated Preparatory English Program, the students' ability to cope with university-level work in a technical environment is improved. A particularly advantageous aspect of the Preparatory English Program is that some of the course materials are designed, written, and produced by the program's own staff or the specific needs of KFUPM students.

The student who successfully completes the program is equipped with a solid basis of English, on the strength of which he is able to commence his freshman studies. However, those students who can demonstrate that their use of English is already at a high-enough level on entering the Preparatory Year, either by their performance in internationally-recognized examinations or by passing the PEP promotion exams, can bypass some or all of the five PEP courses, a few proceeding directly to freshman studies.

### **Other Features of the PEP**

The PEP moved to new premises and is well equipped with modern educational aids. Facilities exist for recording and playing both audio and video material. English language instruction also takes place in the Computer Assisted Language Learning (CALL) Labs. There are six labs, with 180 workstations connected to a server on a Local Area Network (LAN). Students have access to a range of material prepared by faculty members as well as commercial software and the facility to produce printed copies of written assignments.

The program serves both the KFUPM community and the community at large in a program of continuing education. Evening courses in English are offered each semester, and other, specialized courses are produced to meet the needs of local industry.

The English Language Center also provides professional editing services through the University Editing Board. Papers, theses and other documents prepared by professors and lecturers at KFUPM published in academic journals and elsewhere, are edited by experienced Preparatory Year English faculty members.

The Program also conducts examinations to check the English proficiency of non-KFUPM graduate students who apply for post-graduate studies. Based on these results, recommendations are sent to the Dean of Graduate Studies about their proficiency in English and their ability to pursue graduate studies at the University.

The Preparatory English Program does not grant a degree but, for all Preparatory Year students, success in the PEP (a grade C in all courses) is a requirement for promotion to the freshman year.

## **Preparatory Math Program (PMP)**

**Director: Husam K. Sharqawi (A)**

### **Faculty**

Abujiya	Arafah	Imam
Ahmad	Dehwah	Omar
Alaimia	Demir	Saifullah
Al-Shammari	Elghanmi	Sharqawi
Al-Shawish	Ibrahim	Yushau

The Preparatory Year Math Program consists of two courses. The first course is Math 001 (College Algebra and Trigonometry I), which contains the standard topics of college Algebra, whereas the second course, Math 002 (College Algebra and Trigonometry II), contains trigonometry and extended topics in college Algebra.

The program aims to review and reinforce the student's knowledge of mathematical and analytical skills through the medium of English. In addition, the program seeks to develop student's writing skills in Math through interrelated logical procedures.

The program is designed such that students are continuously involved in class work activities, mainly solving problems during the recitation hours and through weekly online assignments and tests. Peer tutoring is an essential component of the learning process. Weekly seminars are conducted in which students can enhance their knowledge and have the opportunity to share and exchange ideas with fellow students and their instructors.

## **Preparatory Science & Engineering Program (PSEP)**

**Director: Dr. Abdulaziz Al-Assaf (A)**

### **Faculty**

Abulraub	Ghaleb	Reda
Ahmed	Hussain	Saleem
Al-Zoubi	Hussaini	Sankaran
Baber	Haque	Sharif
Baqais	Malik	Siddiqui
Butt	Malkawi	Zafar-ul-Malik
Farahat	Mosazay	
Fazal-ur-Rahman	Raharja	

The PSEP was formed on May 17, 2010. This department comprises the following courses: PYP 001 (Preparatory Physical Science), PYP 002 (Preparatory Computer Science), PYP 003 (University Life Skills), and PYP 004 (Preparatory Engineering Technology). Half of the newly admitted students take PYP 001 and PYP 003 in the first semester, and PYP 002 and PYP 004 in the second semester, or vice versa.

The PSEP aims to provide students with a basic understanding of science and engineering concepts as well as the necessary scientific and study skills to prepare them for undergraduate studies.

# Skills Development Program

**Assistant Dean for Skills Development: Dr. Salem Al-Dini**

The mission of the skills program is to support the University in accomplishing its mission with relation to providing opportunities for its students to develop their skills and attributes. The program aim is to enhance students' personal skills to achieve high qualifications and prepare them for their future careers.

The importance of such a program arises from the findings of scientific research showing that the success of an individual and his efficiency in social life and career does not rely mainly on his education and/or his intelligence. Rather, an individual's personal skills play an important role in determining his success and efficiency.

In order to achieve our goals, research and surveys have been conducted and twenty-six different skills have been identified as the most important and most necessary skills for student success in their studies and future working life.

A Skills Card has been designed which lists all the 26 skills, divided into three categories:

- 1) Mental Skills
- 2) Interpersonal Skills
- 3) Personal Skills

To achieve the objectives the program established five units under the supervision of the Assistant Dean of skill development:

## ***Training unit:***

This unit is responsible for designing, implementing, and evaluating training programs which cover the skills listed in the Skills Card such as communications skills, team building, problem solving, planning, thinking skills, etc. The unit is also supervising the contents of different publications addressing different skills in both languages (Arabic & English) such as brochures, manuals, and books. It also assists the University's library in selecting books which contribute to the development of the students' skills. The unit also organizes lectures with highly successful people from industry and the private sector to relate their success stories to the students.

## ***Gifted students unit:***

This unit is responsible for designing programs which promote student research. The program focuses in three different tracks:

- 1- Research by discipline.
- 2- Interdisciplinary research (Student project such as Formula 1 students' version).
- 3- Participation of students in national and international competitions

The unit is also responsible for creating a data base system which includes students who have patents and research papers, and who have participated in local, regional, and international scientific conferences.

### ***Voluntary work unit:***

The University took the initiative to establish the Voluntary Work Unit as part of the skills development program under the College of Applied and Supporting Studies. The Voluntary work unit is one of the schemes of the University through which students can provide community services to the larger community of the Eastern Province in coordination with non-profit organizations. These activities are diverse and include: social, cultural, environmental, health care, educational, humanitarian, and other initiatives. Also students volunteer through professional societies based on their future careers.

Through this participation in volunteering, the Voluntary Work unit aims that students through the participation in volunteering efforts will improve their skills, discover their potential, and fulfill part of their social responsibility towards their community and nation.

The unit also promotes volunteerism amongst students and the community at large through designing and organizing programs that are new, professional, and based on best practices. Also, the unit is working in developing a model to manage volunteers, which has fifteen components, which includes: a rewarding system, membership system, marketing system, training program, etc. Also, the unit supervises the infusion of community services in the curriculum through service-learning models. In addition, one of the core responsibilities of the unit is to institutionalize the efforts and ensure it is sustainability.

### ***Infusion of skills unit:***

This unit works in collaboration with the Deanship of Academic Development (DAD) to ensure the infusion of skills in the curriculum. It also works with other departments in the University to introduce Service-Learning models in some courses. The unit has been successful in converting the “University Skills” course offered in the Preparatory Year to a first-year Service-Learning course.

### ***Data base and online training Unit:***

This unit is responsible for the development of a database related to the Skills Card through which students will be able to access their profiles and keep a record of the skills they have acquired. The database system consists of three main parts:

#### **1. Database for Skills Card:**

This system records all the activities related to skill development, such as training, voluntary work, student activities, and academic activities, etc. In addition, comparative and cumulative participation of students in terms of skill values in different majors, departments, colleges and levels can be presented graphically as bar charts and also with numbers and percentages. Also, the participation of the students in a particular skill and attribute can be monitored in any/all majors, departments, colleges and levels.

#### **2. Database for voluntary work and community services:**

This system matches the volunteering opportunities provided by the volunteering organizations in the community with the students. It allows the organization to post their requirements and provide students with feedback upon the completion of the work. Students can also evaluate their experience with the organizations and volunteering.

### 3. Database for the skills program:

In this system the students can register for all the activities provided by the skills program. In addition, different surveys can be conducted through the system.

The unit also supervises the online training courses through Thomson NETG in collaboration with the ITC. These courses provide students with valuable content and flexibility in training time.

## Department of Islamic and Arabic Studies

**Chairman: Dr. Abdulrahman A.Howsawi**

### Faculty

Afzal	Mubarak	Al-Zamil
Alabri	Almuzeini	Al-Assaf
Alamri	Al-Nemri	Howsawi
Al-Humeidan	Al-Ghahtani	Hussein
Aljbarat	Al-Qahtani	Ibrahim
Al-Khaledi	Al-Sulaiman	Kadi
Al-Khulaify	Al-Shalhoob	Osman
Al-Mashookhy	Al-Sulami	Sendi
Almulla	Altwaigeri	
Mobarak	Al-Zahrani	



The Islamic & Arabic Studies Department (IAS) is one of the academic departments under the College of Applied & Supporting Studies (CASS). Since its establishment, the IAS department has worked in harmony with the needs of higher education in Saudi Arabia, and has remained consistent with university policy, placing great emphasis on the enhancement of Islamic culture and the moderate understanding of its meanings. The IAS department consists of two fields of study, Islamic Studies and Arabic Studies. As a supporting academic department, its role is not only limited to the academic teachings, but also includes research activities, social activities, and interaction with communities inside and outside KFUPM.

### **Mission**

The main objectives of the IAS department are to broaden the students' intellectual horizon in the Islamic and Arabic studies in line with the academic needs of KFUPM. This will benefit students in their professional career after graduation.

### **Objectives**

- To enhance moral values and good behavior, and encourage students to practice the Islamic ethics.
- To develop the immunity against ideological and behavioral difference.
- To improve oral and written communication skills with useful applications and experimental activities with the aid of modern technical educational support.
- Continuous course development with the assistance of modern teaching techniques and with the cooperation of other leading academic departments.

### **Required Islamic Studies Courses (6 Credit Hours)**

Each undergraduate student must take six credit hours (i.e. three courses) in Islamic Studies. These courses are "Belief and its Effects" (IAS 111), "Professional Ethics" (IAS 212), and "Human Rights in Islam" (IAS 322).

### **Required Arabic Language Courses (6 Credit Hours)**

Each Arabic-speaking undergraduate student, in almost all majors, must take six credit hours (i.e. three courses) in Arabic Language. These courses are "Practical Grammar" (IAS 101), "Objective Writing" (IAS 201), and "Language Communication Skills" (IAS 301).

### **Elective Courses**

In addition to the above, a student, in some departments, may select an elective course from: "Contemporary Islamic World" (IAS 411), "Al-Sirah Al-Nabawiyah" (IAS 416), "Contemporary Financial Transactions in Islam" (IAS 418), and "Inimitability of Al-Quran" (IAS 419).

### **Courses for Non-Arabic-Speaking Students**

Each non-Arabic-speaking student is required to take a sequence of three two-credit hour courses in Arabic as a "Second Language" in lieu of IAS 101, 201, and 301, as follows: "Objective Writing" (IAS 131), "Grammar and Composition" (IAS 231), and "Literature and Text" (IAS 331).

# Physical Education Department

**Chairman: Dr. Abdulhameed Al Ameer**

## Faculty

Abu Hilal  
Adejumo  
Al Moslim  
Al-Ameer  
Allen  
Antony

Azeem  
Choi  
Hamdan  
Hasnain  
Hassan  
Ibeid

Ibrahim  
Kanniyan  
Rabaan  
Tomar  
Tufekcioglu

Health education is a social science that draws its principles from the biological, environmental, psychological, physical and medical sciences to promote health and prevent disease, disability and premature death through education-driven, voluntary, behavior-change activities. Knowing how to live healthily is the secret for living a good life. This is more important in today's society, where unhealthy diets such as fast food and unhealthy habits such as playing computer games and drug abuse are prominent. It is also necessary that students know and are able to keep themselves healthy by not giving into these external influences. Health Education develops in the students a positive attitude to take care of their health and not to neglect it and provides opportunities to apply this knowledge and practice good health habits on themselves that will last them a lifetime.

The initiation of physical education courses and activities in the realm of educational pursuits at KFUPM has contributed to shape the destiny of many brilliant students in making their life healthy, peaceful and enjoyable. As the idiom “ A sound mind in a sound body” goes, there should be a balance between brawn and brain, and this is a vital factor that leads to tranquility, peace, friendship, comradeship, serenity, and above all to the wellness of an individual.

KFUPM is the only university in the whole Gulf region to make physical education compulsory for students during their time at the university. Students have to undergo four physical education courses during their time at KFUPM, two during the preparatory year and two during the undergraduate years; in addition, there are two special courses for students with special needs which are equivalent to the undergraduate courses.

### **Vision**

To aspire to be the leader in providing the best physical education activities to combat stress and other related diseases which are the bane of life today. The department will be at the forefront of inculcating healthy habits and providing the knowledge of how to avoid addictive behavior leading to a deterioration in health. The department aims to contribute to society by promoting the health of the nation's citizens.

### **Mission**

The Department's mission is to provide a solid foundation for the future life of the students through appropriate physical education programs and health-related issues which will inculcate fitness and wellness in their lifestyles and thereby enhance the quality of their life.

### **Objectives**

- Identify the basic physical education content, concepts and tools related to the development of the physically educated person and offer a wide variety of physical activities.
- Compile a learning plan which will enable students to understand the pedagogical process and practice it through peer and field experiences.
- Teach responsible personal and social behavior during physical activity.
- State the basic concepts and issues related to general health education programs and reduce health risks.
- Provide relief from stress and enjoyment in participation.
- Teach the specified sports, their history, laws, rules, skills and tactics.

- Encourage students to participate with confidence in sports.

### Learning outcomes for students

- To understand the knowledge and skills needed for movement and so obtain the foundation for enjoyment, continued social development through physical activity and access to a physically active lifestyle.
- To understand the relationship between physical education and general health in their daily life.
- To be able to assess performance accurately and develop plans for improvement.
- To be able to reflect, plan and act in order to develop essential knowledge and understanding, attitudes, values and skills which promote healthy practices, encourage participation in regular physical activity, and support the maintenance of a healthy lifestyle.
- To learn the skills, tactics and methods of play of the specified sports.

During the first and second semesters of the preparatory year the courses offered are PE 001 and PE 002, in which the student is introduced to three weeks of health education and twelve weeks of physical education (specified sports), where swimming is a compulsory activity for all.

The students take the above courses as per the syllabus prepared by the Physical Education Department which is as follows:

Unit	No. of weeks	Hours per week	Total hours
Preparatory Health Education	3	2	6
Preparatory Physical Education (specified sports) includes 2 weeks of Pre-Test and 2 weeks of PostTest in Physical Fitness.	12	2	24
<b>Total</b>			<b>30</b>

At the undergraduate level the courses offered are PE 101, PE 102 and two PE special courses, PE 201 and PE 202. In these courses student studies three weeks of health education and twelve weeks of physical education (specified sports) in each course and the number of hours per week and the total hours are the same as for the preparatory classes i.e. six hours health education and twenty-four hours of physical education making it thirty hours totally. The courses taken at the undergraduate level are either a continuation of the courses at the preparatory level but an advance stage or some new activities are introduced.

The students who are suffering from physical disabilities, deformities and the cases who are recovering from surgery or accidents receive rehabilitation through a special needs course which is a part of the 101 and 102 courses. In addition, the department also caters to the needs of under-nourished and obese students through special programs.

The physical education department also takes care of the coaching of University teams in specified games which are approved by the Saudi University Sport Federation. The teams trained by expert coaches participate in the Gulf inter-university competitions.

The department also provides consultancy to the University community, which includes the faculty members, staff and employees through various programs and takes care of rehabilitation for the individuals in the physical therapy unit (located in the stadium). The health clubs for the community provide special programs for the members to maintain their health, fitness and and general well-being.

The department also makes available its entire infrastructure, including facilities and equipment, to those students, faculty, and staff who seek recreation through various physical activities after regular working hours.

## Department of General Studies

**Chairman: Dr. Shafi Aldamer**

### Faculty

Albaridi  
Aldamer  
Almadkhali  
Almatrodi  
Almogren  
Alqurtuby

Bendania  
Alowidha  
Jiang  
Khogali  
Magliveras  
Moftah

Saeed  
Scheffinger  
Sondaal  
Thompson

The Department of General Studies (DGS) represents an important part of the overall education of all students at the University. The department seeks to expand and enrich the educational experience of KFUPM engineering, science, and industrial management majors through a social science curriculum.

The Department of General Studies offers courses in the social sciences (sociology, political science, and psychology). The educational goal of the curriculum in General Studies is for students to gain substantive knowledge in these fields of study, and in the process to develop their thinking, communication, and creative abilities. It is important for students to understand human behavior and the social, political, cultural, and historical processes that impact individuals and societies. Such understanding enhances critical thinking, sound judgment, and the more effective performance of occupational roles. The learning objectives of General Studies courses can be divided into three categories:

I. Gaining understanding and substantive knowledge about: principles of human behavior, processes and outcomes of social organization, social institutions, social forces shaping the modern world, international relations, other cultures, regional histories.

II. Development of intellectual abilities:

- Broaden students' perspectives on themselves, their society, and the world.
- Develop analytical skills and strategic thinking, by analyzing social problems in the real world.
- Develop critical thinking, by examining issues from different social, cultural, and political perspectives.
- Develop communication skills, by encouraging discussion and presentation of ideas (in verbal and written form).
- Encourage creativity in addressing social problems.
- Emphasize that learning is a life-long process and encourage students to continue to be informed, to learn, and to grow.
- Develop research skills and skills in evaluating and presenting information.

III. General Studies curriculum and academic objectives of the University

- Fulfill graduation requirements pertinent to General Education requirements.
- Support other University departments by offering courses that compliment scientific specializations.
- Contribute to the "University competencies and capabilities" requirements for academic accreditation, by the accreditation organizations such as Saudi National Academic Accreditation and Assessment (SNAAA) and Accreditation Board for Engineering and Technology (ABET), and Association to Advance Collegiate Schools of Business (AACSB).

## **Vision**

To become an outstanding multidisciplinary social science department that substantially contributes to KFUPM's tradition of excellence in high-quality teaching, superior research, and outstanding community services.

## **Mission**

To produce and provide world-class courses that complement KFUPM students' education, through a diverse and broad social science curriculum that will enhance their knowledge and proficiency.

To produce superior multidisciplinary social science research that best contributes to the development of the Kingdom of Saudi Arabia and of the region at large.

To provide the community with an outstanding service that dynamically assists its advancement.

## **Strategic Objectives**

- Create a dynamic environment for learner success.
- Recruit and retain highly qualified and committed academic faculty.
- Provide KFUPM students with broader social science knowledge.
- Develop essential academic and professional skills that would enhance the education of KFUPM students.
- Produce superb research that is nationally and internationally well recognized.
- Interact with the community with highly quality services.



# English Language Department

**Chairman: Terry Dale**

## **Faculty**

Anyan  
Berry  
Billam  
Blazenko  
Congreve  
Dale  
Daly  
Donovan

Gibson  
Graham  
Hamilton  
Hartley  
Horn  
Ismail  
Jameson  
King

Lawrie  
Marquis  
Nagy  
Nelson  
Nicholas  
Pearson  
Pollard  
Unal

The English Language Department (ELD) consists of a Director and a teaching faculty of 25 lecturers. The department program offers three undergraduate-level English language courses: English 101 (An Introduction to Academic Discourse), English 102 (An Introduction to Report Writing), and English 214 (Academic & Professional Communication).

English 101 is a freshman English course that marks a transition from the Preparatory English Program (PEP) to undergraduate English studies. The primary aim of this course is to introduce students to an academic approach to thinking, reading, speaking, writing and language usage in an integrated, meaningful manner such that they are able to apply the skills learnt to their departmental studies. In addition, the ENGL 101 course aims to further develop the linguistic accuracy and range in English that students have acquired in their Preparatory Year.

The ENGL 102 and 214 courses concentrate on consolidating students' academic approach to thinking, reading, speaking, writing and language usage, as initiated in ENGL 101. In addition, the ENGL 102 and 214 courses aim to develop and expand on the students' abilities to synthesize and evaluate information and conduct basic, independent research leading to the writing of a report. Additionally, in English 214, students are taught professional skills such as business correspondence, job interviewing, and multimedia presentations.

In all three courses, students will be expected to take on varying degrees of responsibility for their own learning and to perform a number of independently based tasks and activities outside the classroom. Indeed the focus of all courses will be on students learning rather than teachers teaching.

### **Mission**

The mission of the English Language Department is to provide the University's undergraduate students with the English language skills necessary to succeed in academic and professional life.

### **Vision**

Our vision is the continuous development of our faculty and teaching curricula in order to equip the University's graduates with outstanding English language communication skills that will enhance the University's reputation and help make KFUPM graduates the most sought-after recruits nationally and regionally.

### **Goal**

The main function of the ELD is to provide a language learning environment that is conducive to the teaching and learning of English language communication skills. The emphasis is twofold: *academic*—providing students with the linguistic and communicative skills needed in their university studies, including preparation for co-op and summer training); and, *professional*—providing students with high-level English language skills that will enable them to function at a high level in the workplace in reading, writing and speaking.

### **Program Objectives:**

- To establish agreed standards of performance and proficiency in English at all levels in the University.

- To contribute to the development of courses that help to raise all students to acceptable levels of proficiency in English.
- To raise the standards of communicative competence for all students completing English courses in KFUPM.
- To broaden students' awareness of the world around them so that they are aware of, and equipped to deal with the challenges facing Saudi Arabia in the 21<sup>st</sup> century.

### **Program Outcomes:**

Upon completion of the ELD courses, undergraduate students should be able to:

- Apply the critical thinking skills of analysis, synthesis and evaluation to a variety of texts;
- Apply a variety of strategies for planning, writing and revising academic essays and reports
- Write well-organized, unified, coherent essays and reports
- Work collaboratively with peers to plan, develop, and carry out writing projects and provide constructive feedback
- Conduct basic research by accessing appropriate print and electronic sources in the Library and by using advanced search skills on the Internet
- Incorporate source material into essays and reports by summarizing, quoting, and paraphrasing correctly
- Provide documentation for sources with a Works Cited/References page and parenthetical citations using the MLA (English 102) or APA (English 214) formats
- Appreciate the need for formal correctness in their writing through the use of revision and editing skills
- Present information in an engaging and organized manner to an audience
- Utilize basic body language techniques to improve their delivery of presentations (eye contact / stance / gesture)
- Utilize clear, effective visual techniques to exemplify and provide support in their presentations
- Review general reading in order to focus their search for texts on a specific area
- Evaluate a variety of reading texts for their suitability by assessing: relevance to topic and task; readability; elements of bias, and appropriateness of text type
- Understand and avoid plagiarism by:
  - taking appropriate notes from a variety of texts and keeping such notes in an organized manner
  - taking full citation notes on parts of texts to be summarized, paraphrased or quoted in later written tasks
  - Recording full reference information from all texts consulted and utilized using a consistent referencing format
- Use appropriate language and techniques to write a letter, memo or email to a person, institution or business organization for a variety of purposes
- Compose an appropriately designed CV/Résumé in support of a job application
- Perform well in job interviews

# **COLLEGE OF APPLIED ENGINEERING**

**Dean: Dr. Omar A. Al-Suwailem**

## **UNDERGRADUATE DEPARTMENTS**

APPLIED AEROSPACE ENGINEERING  
APPLIED CHEMICAL ENGINEERING  
APPLIED CIVIL AND ENVIRONMENTAL ENGINEERING  
APPLIED ELECTRICAL ENGINEERING  
APPLIED MECHANICAL ENGINEERING

## **Vision**

The vision of the College of Applied Engineering at KFUPM is to provide accessible and responsive applied engineering programs recognized internationally for their high quality and for graduates with valuable education to the local industry.

## **Mission**

The mission of the College of Applied Engineering at KFUPM is to graduate well-educated engineers who will contribute to the advancement of technical knowledge, provide innovative solutions to engineering problems and service to the nation at large.

## **Philosophy**

The programs of the College of Applied Engineering are designed to meet the challenges of the 21<sup>st</sup> century by emphasizing both theory and practice that enhance students' preparation for professional careers, life-long learning, and responsible participation as members of society. Emphasis is placed on religious, general and sociological education to make today's engineer aware of environmental, sociological, and other "human concerns" in addition to safety, aesthetics, economics and cost of energy in their decision making. Clear and precise communication skills, oral and written, are required of the engineer who delivers judgments, plans and decisions. A sound knowledge of engineering and related disciplines is required so that the engineer can work effectively with other engineers, scientists and technicians, in fulfilling engineering assignments.

## **College Programs**

The demand for engineering graduates who are more trained toward practice has been duly recognized by the College of Applied Engineering by developing an academic program which emphasizes both theory and practice. An elaborate on-job training program is an essential core of this broad-based engineering education. Equipped with the knowledge of mathematics, physical sciences, tools of computational and statistical analysis of data, and on-job training, the student is ready to engage in creative design and construction of real-world engineering projects upon graduation. The College of Applied Engineering also continues to provide flexibility in different programs through a spectrum of electives, which allows the College graduate to exercise a limited choice in tailoring his program to fit his personal career plans.

All programs of the College of Applied Engineering met the Accreditation Criteria of the Board for Engineering and Technology (ABET) in January 2008.

## **Curricular Requirements**

The general Applied Engineering curriculum includes the following features:

***Virtually Common Freshman Year:*** In spite of the fact that students are required to declare their fields of major study at the Freshman level, the various specialty departments have a virtually common Freshman year.

**Basic Science Courses:** The curriculum of each major in Applied Engineering contains a number of specially designed courses in basic sciences to provide students with a firm background in the physical sciences and mathematics. Courses in general chemistry and physics, a three-semester sequence of mathematics courses, a course on differential equations and on computer programming are offered as a necessary foundation in science and computational skills.

**General Education Courses:** Several courses are designed within the framework of a curriculum to broaden the students' general education. Among the fields covered are Islamic history and culture, Arabic language and literature, English and economics.

**Engineering Breadth:** Several courses are required to give the student some breadth of study in science and technology. Courses in application of computers in engineering and statistical analysis of engineering data are clear features of the programs. In addition, under the heading of "Technical Electives", students are permitted to extend their study into further advanced courses in science, mathematics, computer technology, fields of engineering other than their major, or even from their own major.

**Engineering Depth:** Most of the courses in this category are specified courses designed to give the student the essential subject materials in his major. However, two to four departmental electives are left open to the student so that he can extend his knowledge in his own area of interest.

**Engineering Training:** A unique feature of the Applied Engineering program is its emphasis upon industrial experience in conjunction with academic training. Each student in the Applied Engineering College must spend one half-year working in industry under a supervised program known as "Cooperative Programs." In this training period, the students gain useful experience which broadens their engineering background.

## **Graduation Requirements**

In order to qualify for graduation, Applied Engineering students must

1. complete all required and elective courses in the selected degree program (133 credit hours minimum) with a cumulative GPA of 2.00 or better;
2. achieve a major GPA of 2.00 or better;
3. complete successfully after the third year a 28-week cooperative program working in industry.

## Department of Applied Aerospace Engineering

**Chairman: Dr. Ahmed Al-Garni**

### **Faculty**

Abdelrahman  
Ahmed  
Al-Fifi

Al-Garni  
Edi  
Iraqi

Saeed

## **Introduction**

Aerospace Engineering is one of the most important strategic fields in the world from at least two aspects: first, its effect on the infrastructure of the country such as fast communication, air transportation, civil aviation, industry, and economy; second, its relevance to defense issues including Air Force and Air Defense.

Due to the importance of this field to the Kingdom of Saudi Arabia (KSA) and the region, an Aerospace Engineering program was established in 1419H (1998G) to serve two branches: Aeronautics Engineering and Astronautics Engineering. This program is the first and only program in KSA and the Arabian Gulf and Peninsula region that offers the two branches. It developed from the Aeronautical Engineering option which was offered in the Mechanical Engineering Department (ME) since 1406H (1986G). The current Applied Aerospace Engineering (AAE) Department was established in 1423H (2002G). Although the Department has only recently been established, it has to its credit the highest number of publications per faculty, among the Arabian countries, in leading aerospace journals (such as AIAA, Canadian, British and Japanese aerospace journals). Moreover, the AAE Department faculty have received many awards such as the King Abdul-Aziz Al-Saud Legion of Honor Medal in the first degree for a Scientific Patent, the Distinguished Engineering Scientist Award for Saudis and Non-Saudis, which is supervised by King Abdul-Aziz City for Science and Technology (KACST), the Distinguished Award in Teaching and Academic Advising by KFUPM, the Distinguished Research Award by KFUPM, and the American Romanian Academy of Arts and Sciences Book Award.

## **Curriculum**

The Applied Aerospace Engineering (AAE) Program is designed to cover all fundamental aspects of Aerospace Engineering. The curriculum includes general education courses in Mathematics, Chemistry, Physics, Engineering, Computer Science, Islamic and Arabic Studies, English, and Physical Education. The program also provides the students with a strong base in the main areas of aerospace engineering: Aerodynamics and Gas Dynamics, Flight Dynamics and Control, Aerospace Structures, Flight Propulsion and other related fields such as Aerospace Systems Maintenance, Helicopter, Avionics, Flight Traffic Control, Flight Safety, Electronic Warfare and Radar, and Astronautics. Moreover, the curriculum is also augmented by a number of elective courses in various branches of Aerospace Engineering. A student has the opportunity to take the appropriate elective courses (two from Aerospace Engineering, two from other engineering fields, and two from General Studies subjects) to broaden his knowledge of aerospace and in areas of his interest. It balances theory with application and provides practical experience through appropriate laboratory sessions. The program includes a capstone design course which provides the student with an opportunity to work with a design team that exposes him to unstructured problem-solving situations. Every Applied Aerospace Engineering student is required to spend 28 weeks in industry to make use of his knowledge and to acquire valuable experience in an industrial environment.

## **Employment Opportunities**

The employment opportunities for aerospace engineers in KSA, the Arabian Gulf and Peninsula region have been very good over the past few years. All indications show that it will be brighter in this age of ever-changing technology. These opportunities exist because of



the rapid pace of industrialization, technological development in the aerospace engineering field, the establishment and expansion of several new airlines in the region, and the procurement of new aerospace-related systems in defence and commercial aviation sectors. Moreover, the Kingdom's well-established technological infrastructure has set the stage for a very advanced, and expanding, phase of research and development, e.g., satellite development in the Space Institute of KACST (King Abdul-Aziz City of Science and Technology). In view of all these developments, well-qualified aerospace engineers are in great demand.

## **Vision**

To Position KFUPM into a "leading and preminent" institution by developing a full range of competitive aerospace degrees (undergraduate, graduate) and conducting cutting edge research programs of to meet the Kingdom's and region's needs for education, manpower, and technical expertise in aerospace engineering and related fields including renewable energy utilization.

## **Mission**

1. To provide high quality education at International level in Aerospace Engineering, well grounded in the fundamental principles of engineering, in order to inspire and prepare the students for leadership positions with the understanding of the strategic value of their work, so they can effectively participate in the development and operation of the aerospace industries and achieve successful careers in other engineering fields to serve the Kingdom and the region.
2. To conduct and promote original scientific research and its application for the advancement of aerospace industry and related industries, disseminate new knowledge through publications, conferences, seminars and workshops.
3. To participate effectively in community services and provide a source of leadership and professional expertise for KFUPM, the Kingdom and the region through continuing education programs, short courses, and consulting services by establishing close partnerships that make a difference with the industry, alumni, government, and other academia in order to develop and support innovation and economic well-being.

## **Program Educational Objectives**

The educational objectives of the Applied Aerospace Engineering Program are three-fold:

Objective #1: Fundamentals and knowledge students will have

To provide students with a strong foundation in basic sciences, mathematics, and engineering fundamentals; in-depth knowledge of Aerodynamics and Gas Dynamics, Flight Dynamics and Control, Flight Propulsion, Flight Structures and Astroynamics as well as Aviation Sciences and Technologies.

Objective #2: Skills and abilities students will possess

To prepare students for professional careers in Aerospace Engineering or related fields by developing skills and abilities pertinent to:

a) Design and Integration

To educate students in the methodology and tools of design, fundamentals of the open-ended design process including synthesis and integration of information from fundamental and interdisciplinary area necessary to carry out the design of aerospace and related multidisciplinary systems.

b) Experiment

To provide students with the necessary skills to use experimental and data analysis techniques required for aerospace applications.

c) Analysis

To develop skills in methods of analysis and problem solving including mathematical and computational skills and use of contemporary software and information technology tools.

d) Multidisciplinary Teamwork and Leadership

To prepare students with the skills required for successful participation on multi-disciplinary teams and for leadership positions.

e) Communication

To develop skills for oral and written communication including use of the multimedia tools.

f) Pursuit of Advanced Degrees

To expose the students to theory and advances in engineering practice and research as preparation for pursuit of advanced degrees in aerospace engineering and other fields.

Objective #3: Professional ethics and attitudes students will hold

To instill in the students an understanding of the role and importance of life-long learning, professional responsibility, and engineering ethics with awareness of the impact of the engineering on societal and global issues.

### **Student Outcomes**

The AAE program adopts ABET Student Outcomes a-k as its outcomes, in addition to two additional outcomes, hereby named l and m:

- a. An ability to apply knowledge of mathematics, science, and fundamental 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, and process to meet desired needs.
- d. An ability to work effectively in multidisciplinary teams.
- e. An ability to identify, formulate and solve engineering problems.

- f. An understanding of professional and ethical responsibility.
- g. An ability to communicate effectively in written, oral, and graphical forms, including the use of high-quality visual aids.
- 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.
- l. A knowledge of Aerodynamics and Gas Dynamics, Flight Dynamics and Control, Flight Structures, Flight Propulsion, and Astrodynamics as well as Aviation Sciences and Technologies
- m. An ability to integrate aerospace sciences and engineering topics and their application in the design of aerospace systems.

## Requirements for the B.S. Degree in Applied Aerospace Engineering

Every student majoring in Applied Aerospace Engineering must complete the following curriculum:

<b>(a) General Education Requirements (61 credit hours)</b>		<b>Credit Hours</b>
English	ENGL 101, 102, 214	9
Computer Programming	ICS 103	3
Engineering Courses	CE 201, 203, EE 204	9
Mathematics	MATH 101, 102, 201, 202	14
Sciences	PHYS 101, 102, CHEM 101	12
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Physical Education	PE 101, 102	2
		<b>61</b>

<b>(b) Core Requirements (45 credit hours)</b>		
Dynamics	ME 201	3
Thermodynamics	ME 203	3
ME Drawing & Graphics	ME 210	3
Material Science	ME 216, 217	4
Fluid Mechanics	ME 311	3
Introduction to Aerospace Engineering	AE 220	3
AE Design	AE 240	2
AE Systems and Control	AE 313	3
Gas Dynamics	AE 325	3
Flight Structures	AE 328	3
Aerodynamics	AE 333	3
Experimental & Computational Methods for AE	AE 355	1
Aerospace Engineering Labs	AE 420, 421	2
Flight Propulsion	AE 422	3
Flight Dynamics	AE 426	3
Aerospace System Design	AE 427	3
		<b>45</b>

<b>(c) Electives (18 credit hours)</b>		
AE Electives	Two AE xxx Courses	6
Technical Electives (Can be taken from any other department. AE Department approval is required)	Two XXX xxx Courses	6
General Studies (Department approval is required)	Two GS xxx Courses	6
		<b>18</b>

<b>(d) Cooperative Work (9 credit hours)</b>		
Each Coop student must participate in a 28-week program of industrial experience and submit a report.		
Cooperative Work	AE 351	9
		<b>9</b>

**The total number of credit hours required is**

**133**

## Applied Aerospace Engineering Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
<b>Preparatory Year</b>									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		<b>20</b>	<b>10</b>	<b>16</b>			<b>18</b>	<b>12</b>	<b>15</b>
<b>Total credit hours required in Preparatory Program: 31</b>									
<b>First Year (Freshman)</b>									
CHEM 101	General Chemistry I	3	4	4	ENGL 102	Intro. to Report Writing	3	0	3
ENGL 101	Intro. to Academic Discourse	3	0	3	IAS 111	Belief and its Effects	2	0	2
IAS 101	Practical Grammar	2	0	2	ICS 103	Computer Programming in C	2	3	3
MATH 101	Calculus I	4	0	4	MATH 102	Calculus II	4	0	4
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1
PHYS 101	General Physics I	3	3	4	PHYS 102	General Physics II	3	3	4
		<b>15</b>	<b>9</b>	<b>18</b>			<b>14</b>	<b>8</b>	<b>17</b>
<b>Second Year (Sophomore)</b>									
AE 220	Intro. to Aerospace Eng.	3	0	3	AE 240	AE Design	2	0	2
CE 201	Statics	3	0	3	CE 203	Structural Mechanics I	3	0	3
ENGL 214	Academic & Professional Comm.	3	0	3	IAS 201	Objective Writing	2	0	2
MATH 201	Calculus III	3	0	3	MATH 202	Elements of Differential Eq.	3	0	3
ME 203	Thermodynamics I	3	0	3	ME 201	Dynamics	3	0	3
ME 210	Mechanical Eng. Drawing & Graphics	2	3	3	ME 216	Materials Science and Engineering	3	0	3
					ME 217	Materials Lab	0	3	1
		<b>17</b>	<b>3</b>	<b>18</b>			<b>16</b>	<b>3</b>	<b>17</b>
<b>Third Year (Junior)</b>									
EE 204	Fundamentals of Electrical Circuits	2	3	3	AE 313	AE Systems and Control	2	3	3
IAS 212	Professional Ethics	2	0	2	AE 325	Gas Dynamics I	3	0	3
ME 311	Fluid Mechanics	3	0	3	AE 328	Flight Structures I	3	0	3
XXX xxx	Technical Elective I	3	0	3	AE 333	Aerodynamics I	3	0	3
XXX xxx	Technical Elective II	3	0	3	AE 355	Experimental & Comput. Methods for AE	0	3	1
GS xxx	GS Elective I	3	0	3	AE 420	Aerospace Eng. Lab I	0	3	1
					IAS 301	Language Comm. Skills	2	0	2
					GS xxx	GS Elective II	3	0	3
		<b>16</b>	<b>3</b>	<b>17</b>			<b>16</b>	<b>9</b>	<b>19</b>
<b>Summer Session</b>					AE 350	Begin Cooperative Work	<b>0</b>	<b>0</b>	<b>0</b>
<b>Fourth Year (Senior)</b>									
AE 351	Cooperative Work	0	0	9	AE 421	Aerospace Eng. Lab II	0	3	1
					AE 422	Flight Propulsion I	3	0	3
					AE 426	Flight Dynamics I	3	0	3
					AE 427	Aerospace System Design	3	0	3
					AE xxx	AE Elective I	3	0	3
					AE xxx	AE Elective II	3	0	3
					IAS 322	Human Rights in Islam	2	0	2
		<b>0</b>	<b>0</b>	<b>9</b>			<b>17</b>	<b>3</b>	<b>18</b>
<b>Total credit hours required in Degree Program : 133</b>									

# Department of Applied Chemical Engineering

**Chairman: Dr. Mohammed S. Bashammakh**

## **Faculty**

Abo-Ghander  
Abussaud  
Al-Ali  
Al-Amer  
Al-Asiri  
Al-Baghli  
Al-Harthi  
Al-Juhani  
Al-Jundi  
Al-Khattaf

Al-Matar  
Al-Mubaiyedh  
Al-Mutairi  
Al-Saifi  
Al-Shammari  
Al-Yousef  
Amin  
Atieh  
Ba-Aqil  
Ba-Shammakh

Binous  
Hussein  
Mahgoub  
M.Mazhar  
Razzak  
Redhwi  
Shaikh  
Shamsuzzoha  
Shawabkeh  
Shehzad

## **Introduction**

Chemical Engineering is defined as a profession, which uses the sciences of mathematics, physics and chemistry for the benefit of mankind. It employs chemical and physical principles for the design of processes and the conversion of raw materials into valuable products to improve life for the average person. The chemical conversions involve the preparation of useful products in large quantities using basic thermodynamics and chemical kinetics, which govern reactions. Physical conversions utilize unit operations, fluid dynamics, heat transfer, and mass transfer to separate the reactant products into useful pure chemicals. All these subjects are used in the design of chemical plants and refineries.

The undergraduate applied chemical engineering science curriculum has been systematically revised over the years to reflect the emergence of chemical engineering as a modern discipline and its changing role in society. The modern curriculum includes such diverse topics as process control, use of simulation packages, and chemical plant design, with electives in diverse areas.

## **Vision**

The Department of Chemical Engineering will be the undergraduate chemical engineering department of choice in Saudi Arabia and will be recognized as one of the top research and graduate chemical engineering departments in the region.

## **Mission**

The mission of the Department of Chemical Engineering at King Fahd University of Petroleum & Minerals is to provide an innovative educational program that is rigorous and challenging as well as flexible and supportive. The program is designed to meet the challenges that our graduates are likely to face throughout their professional careers and to provide a high level of scholarship and professional capability, with highly-developed skills in lifetime learning, planning, problem-solving, communication and leadership.

## **Program Educational Objectives**

Within few years after graduation, our graduates will be able to:

- Achieve a successful career in oil, gas, petrochemicals, desalination, energy and other process industries.
- Integrate their academic preparation with chemical engineering practice and technology development.
- Pursue a graduate degree in chemical engineering or other related fields.
- Pursue leadership roles in industry, business, and government agencies.

## **Student Outcomes**

As the outcomes of the undergraduate programs in the Department of Chemical Engineering, the students at the time of graduation are expected to demonstrate:

- a. An ability to apply knowledge of mathematics, science, and engineering principles in solving chemical engineering problems.
- b. An ability to design and conduct experiments, as well as to analyze and interpret data on experiments relevant to chemical engineering practice.
- c. An ability to design a system, component, or a chemical process to meet desired needs within realistic constraints such as economic, environmental and safety.
- d. An ability to function and work on multi-disciplinary teams.
- e. An ability to identify, formulate, and solve problems important in chemical engineering practice.
- f. An understanding of professional and ethical responsibility.
- g. An ability to communicate effectively.
- h. An ability to recognize the impact of engineering solutions in a global, economic, environmental and societal context.
- i. A recognition of the need for, and an ability to engage in life-long learning.
- j. A recognition of contemporary issues related to the chemical engineering profession.
- k. An ability to use the techniques, skills, and modern engineering tools necessary for chemical engineering practice.

## **Programs Strategy**

The strategy of the Department of Chemical Engineering to achieve our objectives is to:

1. Attract high-quality students especially those with top university entrance scores to the chemical engineering program.
2. Continually improve and update the quality of the chemical engineering curriculum.
3. Adopt and apply advances in educational technologies to improve teaching and the learning environment.
4. Develop a strong senior capstone design project course. Annual awards are presented by the Saudi Arabian Section of the American Institution of Chemical Engineers and Saudi Arabia Basic Industries Corporation (SABIC) for the best presented projects.
5. Acquire modern computerized laboratory experiments to update our laboratory program in chemical engineering.
6. Attract and retain high-quality faculty and support staff.
7. Continually improve the program through advice of Industrial Advisory Committee.
8. Promote a strong environmental engineering elective program as per the request of our Industrial Advisory Committee.
9. Promote study in Petroleum Refining and Petrochemicals through our Saudi Aramco funded chair professorship.
10. Promote Study of corrosion in industry through our SABIC-funded chair professorship.
11. Assess the program through surveys of graduating seniors, faculty, alumni, and their employers for improvement.



## Requirements for the B.S. Degree in Applied Chemical Engineering

Every student majoring in Applied Chemical Engineering must complete the following curriculum:

<b>(a) General Education Requirements (62 credit hours)</b>		<b>Credit Hours</b>
Sciences	PHYS 101, 102, CHEM 101, 102	16
Mathematics and Statistics	MATH 101, 102, 201, 202, STAT 319	17
Communication Skills	ENGL 101, 102, 214, IAS 101, 201, 301	15
Engineering Skills	ICS 103, CISE 301	6
Islamic and Arabic Studies	IAS 111, 212, 322	6
Physical Education	PE 101, 102	2
		<b>62</b>

<b>(b) Advanced Chemical Sciences Requirements (17 credit hours)</b>		
Chemistry	CHEM 201, 311, 323	11
Material Science	ME 205	3
Biology	BIOL 233	3
		<b>17</b>

<b>(c) Core Requirements (36 credit hours)</b>		
Introduction to Chemical Eng.	CHE 201	3
Thermodynamics	CHE 202, 303	5
Transport Processes	CHE 204, 300, 304	9
Separation Processes	CHE 306	3
Chemical Engineering Lab	CHE 309, 409	4
Process Dynamics and Control	CHE 401	3
Kinetic and Reactor Design	CHE 402	3
Eng. Economics & Design Principles	CHE 425	3
Integrated Design	CHE 495	3
		<b>36</b>

<b>(d) Electives (9 credit hours)</b>		
CHE Electives	CHE 4xx	3
Technical Electives	XE xxx	3
General Studies	GS xxx	3
		<b>9</b>

**(e) Cooperative Work (9 credit hours)**  
Each student must participate in a 28-week program of industrial experience and submit a formal report.

Cooperative Work	CHE 351	9
		<b>9</b>

**The total number of credit hours required is**

**133**

## Applied Chemical Engineering Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2		
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
CHEM 101	General Chemistry I	3	4	4	MATH 102	Calculus II	4	0	4	
ENGL 101	Intro. to Academic Discourse	3	0	3	CHEM 102	General Chemistry II	3	4	4	
ICS 103	Computer Programming in C	2	3	3	PHYS 102	General Physics II	3	3	4	
MATH 101	Calculus I	4	0	4	ENGL 102	Intro. to Report Writing	3	0	3	
PE 101	Health and Physical Educ. I	0	2	1	IAS 101	Practical Grammar	2	0	2	
PHYS 101	General Physics I	3	3	4	PE 102	Health and Physical Educ. II	0	2	1	
		15	12	19				15	9	18
Second Year (Sophomore)										
CHE 201	Principles of Chem. Eng. I	3	2	3	CHE 202	Principles of Chem. Eng. II	2	2	2	
CHEM 201	Organic Chemistry I	3	4	4	CHE 204	Transport Phenomena I	3	0	3	
MATH 201	Calculus III	3	0	3	BIOL 233	Biology for Engineers	2	3	3	
ENGL 214	Academic & Professional Comm.	3	0	3	MATH 202	Elements of Differential Eq.	3	0	3	
IAS 111	Belief and its Effects	2	0	2	ME 205	Materials Science	2	3	3	
					IAS 201	Objective Writing	2	0	2	
		14	6	15				14	8	16
Third Year (Junior)										
CHE 300	Transport Phenomena II	3	0	3	CHE 306	Stagewise Operations	3	0	3	
CHE 303	Chemical Eng. Thermodynamics	3	0	3	CHE 309	Chemical Eng. Laboratory I	0	6	2	
CHE 304	Transport Phenomena III	3	0	3	CHEM 323	Instrumental Chemical Analysis	2	4	3	
CHEM 311	Physical Chemistry II	3	4	4	STAT 319	Probability and Stat. for Eng. and Scientists	2	3	3	
CISE 301	Numerical Methods	3	0	3	IAS 301	Language Comm. Skills	2	0	2	
IAS 212	Professional Ethics	2	0	2	GS xxx	GS Elective	3	0	3	
					CHE 401	Process Dynamics and Control	3	0	3	
		17	4	18				15	13	19
Summer Session					CHE 350	Begin Cooperative Work	0	0	0	
Fourth Year (Senior)										
CHE 351	Cooperative Work	0	0	9	CHE 402	Kinetics and Reactor Design	3	0	3	
					CHE 409	Chemical Eng. Laboratory II	0	6	2	
					CHE 425	Process Design and Economics	3	0	3	
					CHE 495	Integrated Design Course	1	6	3	
					CHE 4xx	CHE Elective	3	0	3	
					XE xxx	Technical Elective	3	0	3	
					IAS 322	Human Rights in Islam	2	0	2	
		0	0	9				15	12	19
Total credit hours required in Degree Program : 133										

## Department of Applied Civil and Environmental Engineering

**Chairman: Dr. Saleh Al-Dulaijan**

### Faculty

Abduljawwad	Alghamdi	Azad
Ahmad	Alhajyaseen	Baig
Aiban	Al-Malack	Baluch
Al-Abdulwahhab	Al-Ofi	Bouchama
Al-Ahmadi	Al-Osta	Bukhari
Al-Amoudi	Al-Senan	Chowdhury
Al-Attas	Al-Sghan	Essa
Al-Dulaijan	Al-Shayea	Ibrahim
Alfarabi	Al-Sughaiyer	Khathlan
Al-Gadhib	Al-Suwaiyan	Ratrout
Al-Gahtani, A	Al-Zahrani, M.A	Vohra
Al-Gahtani, H	Al-Zahrani, M.M	

## **Introduction**

The Civil and Environmental Engineering major is multidisciplinary in nature. It covers aspects of studies that relate to the essential needs of mankind. It embodies the planning, design, construction, maintenance, and operation of facilities such as buildings, structures, geotechnical, transportation, water, wastewater and waste.

The four-year undergraduate curriculum in Applied Civil and Environmental Engineering provides basic knowledge in sciences, mathematics, and engineering in the first two years. Students are required to choose one of the three options within the program, namely *Structural/Materials*, *Geotechnical/Transportation*, or *Water/Environmental Engineering*. Certain civil engineering core and elective courses are required from students in each option. During the third year, the student is also taught civil engineering applications and design. After the completion of his third year, the student undertakes a cooperative program in industry where the on-the-job training provided leads to an appreciation of the practice of civil engineering. The cooperative program, which spans six months, is an important feature of the program. In addition, courses in humanities, social sciences and economics are integrated into the program to broaden the student's knowledge.

The Civil and Environmental Engineering Department is equipped with modern laboratories for teaching and research in the areas of geotechnical engineering, civil engineering materials, strength of materials, structural analysis, design and modeling, highway and transportation, surveying and photogrammetry, hydraulics and hydrology, and environmental engineering. Effective use of the modern computer facilities at the University's Information Technology Center and those available in the department constitutes an essential part of the Applied Civil Engineering undergraduate curriculum.

The program is accredited by the Accreditation Board of Engineering and Technology (ABET) in the USA. The department undertakes a periodic assessment of its program and course learning outcomes for continuous improvement of teaching and learning and to ensure that the educational objectives are met.

## **Vision**

The Vision of the Department of Civil and Environmental Engineering is to establish itself as a leading center of Civil and Environmental Engineering education by supporting academic distinction and seeking excellence in teaching, learning, research and public services in partnership with the University.

## **Mission**

The Mission of the Department of Civil and Environmental Engineering is to maintain a preeminent role in teaching and research by pursuing a policy of rapid adaptation to new knowledge, discoveries, technological advances and emerging economics and to serve the public through the dissemination of knowledge and information. The department seeks to provide an environment of learning within which creative thinking, practical skills and self-development are cultivated and sustained to produce qualified Civil and Environmental Engineers who will challenge the present and enrich the future.

## **Strategic Goals**

The strategic goals set by the department to achieve the vision and mission are:

- To seek continual improvement of the teaching environment and academic programs through an arduous self-evaluation as well as extramural evaluation by peers to provide an education reflective of the essential knowledge, professional competence and skills required of the graduates for successful careers in the Civil Engineering profession.
- To readily adopt and apply advances in educational technologies to improve the teaching and learning environment.
- To make the student community more motivated and responsive to learning and to instill a greater sense of responsibility and accomplishment among the students and to foster personal growth and lifelong learning.

## **Educational Objectives**

The program aims to prepare graduates who, after few years of their career, will have

1. Successfully established themselves as practicing civil engineers
2. Demonstrated in their profession the ability to work as a responsible member of a professional team and take leadership roles
3. Pursued professional career development activities to acquire new knowledge and skills.

## **Program Outcomes**

The eleven program outcomes are:

- a. Students shall have an ability to apply knowledge of mathematics, science, and engineering to engineering problems.
- b. Students shall have an ability to design and conduct experiments, as well as analyze and interpret data.
- c. Students shall have an ability to design a system, component, or process to meet desired needs within constraints.
- d. Students shall have an ability to function on multi-disciplinary teams.
- e. Students shall have an ability to identify, formulate, and solve engineering problems.
- f. Students shall have an understanding of professional and ethical responsibility.
- g. Students shall have an ability to communicate effectively.

- h. Students shall have the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
- i. Students shall have a recognition of the need for, and an ability to engage in lifelong learning.
- j. Students shall have a knowledge of contemporary issues.
- k. Students shall have an ability to use techniques, skills, and modern engineering tools including computational tools necessary for engineering practice.

## Requirements for the B.S. Degree in Applied Civil and Environmental Engineering

Every student majoring in Applied Civil and Environmental Engineering must complete the following curriculum:

<b>(a) General Education Requirements (66 credit hours)</b>		<b>Credit Hours</b>
English	ENGL 101, 102, 214	9
Computer Skill	ICS 103	3
Interdisciplinary Basic Courses	ME 201, EE 204	6
Mathematics	MATH 101, 102, 201, 260	14
Sciences	PHYS 101, 102, CHEM 101, 111	14
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Physical Education	PE 101, 102	2
Others	ISE 307, MGT 301	6
		<b>66</b>

<b>(b) Core Requirements (43 credit hours)</b>		
Computer Graphics	CE 215	3
Surveying	CE 261	2
Mechanics and Structures	CE 201, 203, 305	9
Materials	CE 303	4
Geotechnical	CE 353	4
Transportation	CE 341, 343	4
Fluid Mechanics and Environmental Engineering	CE 230, 330	6
Introduction to CE Design	CE 312	1
Numerical and Statistical Methods in CE	CE 318	3
Construction Methods and Management	CE 421	3
Applied Design Project	CE 413	3
CE Seminar	CE 490	1
		<b>43</b>

<b>(c) Electives (15 credit hours)</b>		
CE Electives	Two CE xxx Courses	6
CE Option Electives (from chosen option)	CE xxx	3
Additional Science XXX xxx	GEOL 201 or GEOL 202 or BIOL xxx	3
General Studies	GS xxx	3
		<b>15</b>

<b>(d) Cooperative Work (9 credit hours)</b>		
A minimum of 28-week program to gain experience; submit and present a report.		
Cooperative Work	CE 351	9
		<b>9</b>

The total number of credit hours required is

**133**

## Applied Civil and Environmental Engineering Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
<b>Preparatory Year</b>									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		<b>20</b>	<b>10</b>	<b>16</b>			<b>18</b>	<b>12</b>	<b>15</b>
<b>Total credit hours required in Preparatory Program: 31</b>									
<b>First Year (Freshman)</b>									
CHEM 101	General Chemistry I	3	4	4	CHEM 111	Basics of Environmental Chemistry	2	0	2
ENGL 101	Intro. to Academic Discourse	3	0	3	PHYS 102	General Physics II	3	3	4
IAS 111	Belief and its Effects	2	0	2	MATH 102	Calculus II	4	0	4
MATH 101	Calculus I	4	0	4	ENGL 102	Intro. to Report Writing	3	0	3
PE 101	Health and Physical Educ. I	0	2	1	IAS 101	Practical Grammar	2	0	2
PHYS 101	General Physics I	3	3	4	PE 102	Health and Physical Educ. II	0	2	1
					ICS 103	Computer Programming in C	2	3	3
		<b>15</b>	<b>9</b>	<b>18</b>			<b>16</b>	<b>8</b>	<b>19</b>
<b>Second Year (Sophomore)</b>									
CE 201	Statics	3	0	3	CE 203	Structural Mechanics I	3	0	3
CE 215	Computer Graphics	2	3	3	CE 230	Eng. Fluid Mechanics	3	0	3
CE 261	Surveying I	1	3	2	MATH 260	Intro. to Differential Eq. & Linear Algebra	3	0	3
ENGL 214	Academic & Professional Comm.	3	0	3	ME 201	Dynamics	3	0	3
MATH 201	Calculus III	3	0	3	IAS 212	Professional Ethics	2	0	2
XXX xxx	Science Elective	3	0	3	EE 204	Fundamentals of Electrical Circuits	2	3	3
		<b>15</b>	<b>6</b>	<b>17</b>			<b>16</b>	<b>3</b>	<b>17</b>
<b>Third Year (Junior)</b>									
CE 303	Structural Materials	3	3	4	CE 312	Intro. to CE Design	1	0	1
CE 305	Structural Analysis I	3	0	3	CE 341	Transportation Eng.	3	0	3
CE 318	Numerical & Statistical Methods in CE	2	3	3	CE 343	Transportation Eng. Laboratory	0	3	1
IAS 201	Objective Writing	2	0	2	CE 353	Geotechnical Eng. I	3	3	4
CE 330	Environmental Eng. Principles	3	0	3	IAS 301	Language Comm. Skills	2	0	2
ISE 307	Eng. Economics Analysis	3	0	3	CE xxx	CE Elective I	3	0	3
					GS xxx	GS Elective	3	0	3
		<b>16</b>	<b>6</b>	<b>18</b>			<b>15</b>	<b>6</b>	<b>17</b>
<b>Summer Session</b>					CE 350	Begin Cooperative Work	<b>0</b>	<b>0</b>	<b>0</b>
<b>Fourth Year (Senior)</b>									
CE 351	Cooperative Work	0	0	9	CE 413	Applied Design Project	0	9	3
					CE 421	Construction Methods and Management	3	0	3
					CE xxx	CE Elective II	3	0	3
					CE xxx	Option Elective	3	0	3
					IAS 322	Human Rights in Islam	2	0	2
					CE 490	Civil Eng. Seminar	1	0	1
					MGT 301	Principles of Management	3	0	3
		<b>0</b>	<b>0</b>	<b>9</b>			<b>15</b>	<b>9</b>	<b>18</b>
<b>Total credit hours required in Degree Program : 133</b>									



# Department of Applied Electrical Engineering

**Chairman: Dr. Ali Al-Shaikhi**

## Faculty

Abdul-Jauwad	Al-Ohali	Kousa
Abido	Al-Qahtani, K	Landolsi
Abu-Al-Saud	Al-Qahtani, M	Mahnashi
Abuelmaatti	Alsaihati	Masoud
Al-Absi	Al-Shahrani	Masoudi
Alahmadi	Al-Shaikhi	Mesbah
Al-Ahmari	Alsunaidi	Mohandes
Al-Akhdar	Al-Suwailem	Mousa
Alawami	Al-Zaher	Muqaibel
Al-Baiyat	Ashraf	Naveed
Al-Battal	Bakhashwain	Nuruzzaman
Al-Dharrab	Balghonaim	Qureshi
Aldohan	Deriche	Ragheb
Al-Duwaish	El-Amin	Shafi
Alghadhban	Habiballah	Sharawi
Alghamdi	Hammi	Sheikh
Al-Hamouz	Hassan	Sorour
Al-Jamid	Hussein	Tasadduq
Al-Maghrabi	Ibrir	Zerguine
Al-Muhaini	Johar	Zidouri
Al-Naffouri	Kassas	Zummo

## **Introduction**

The contribution of electrical engineering to modern society is a fact underlying a large number of products and services. Most modern appliances are electrically powered. Moreover, services such as global communications and large computing facilities are electronically-based. At present, equipment used in medical diagnosis and treatment relying on electrical engineering principles is finding widening applications. In addition to these examples, electrical engineering concepts deriving from such disciplines as control theory and information theory have had applications in economics, management, physiology, energy, and biomedicine.

In training students, the Applied Electrical Engineering program emphasizes three aspects. First, subjects in science such as mathematics, physics, and chemistry enable the student to develop the necessary analytical ability and prepare him with a sound scientific foundation. Second, subjects related to humanities and general studies to ensure excellent skills and a broader outlook. Third, subjects that cover the main disciplines in electrical engineering (Energy, Control, Communications, Signal Processing, Electromagnetics, Electronics, and Digital Systems) ensure a broad knowledge of electrical engineering. Students can acquire greater depth and specialization through the choice of EE electives. These three aspects are supported with laboratories, cooperative training and a senior project. Laboratory experience exposes the students to the instrumentation, design, and construction of electrical and electronic devices and circuits. Team work and design aspects are further emphasized through the senior project. A prominent characteristic of applied electrical engineering is the requirement that students spend 28 weeks in industry, a requirement that is satisfied through the cooperative work program.

The curriculum and the courses in our program undergo continuous evaluation and update to guarantee that our graduates are at the forefront of knowledge in the field. New courses related to wireless communications, renewable energy, etc., have been introduced to match the rapid growth.

After completing the undergraduate program in applied electrical engineering, the student is qualified to take up responsible employment. Numerous work opportunities for applied electrical engineers exist in the Kingdom of Saudi Arabia and overseas, where graduates may work in the areas of communications, including telephony, internet services, radio and television, much of which incorporates the expanding field of microwaves. The areas of power engineering, electrical installation, broadcasting, and education also provide good career opportunities. A large number of graduates are also required by industry for work in information processing, computers, and systems analysis. Other opportunities exist in industrial electronics, instrumentation, manufacturing technology, and training. Some of the graduates go on to pursue their graduate studies towards the MSc or PhD either at KFUPM or at top universities around the world.

## **Vision**

To become the best Electrical Engineering school in the region.

## **Mission**

To provide quality education, research, and service to its constituents.

### **Program Educational Objectives:**

The Electrical Engineering Department has defined a set of Program Educational Objectives that translates its mission into defined tasks. The objectives are measures of the graduates' achievements 3 to 5 years after completing the program. The Applied Electrical Engineering (AEE) program provides broad foundations to achieve the following objectives:

1. Graduates will have a successful career in Electrical Engineering.
2. Graduates will advance to the position of leadership in their profession.
3. Graduates may pursue their professional development through self-learning and advanced degrees.

### **Student Outcomes:**

Student Outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. They are related to skills, knowledge and behavior that students will acquire through the program. The Student Outcomes support the Program Educational Objectives.

The Student Outcomes of the Applied Electrical Engineering (AEE) program are as follows:

- a. Apply knowledge of mathematics, science, and engineering
- b. Design and conduct experiments, as well as to analyze and interpret data
- c. Design a system, component, or process to meet desired needs
- d. Function on multi-disciplinary teams
- e. Identify, formulate, and solve engineering problems
- f. Understand professional and ethical responsibility
- g. Communicate effectively
- h. Acquire the broad education necessary to understand the impact of engineering solutions in a global and societal context
- i. Recognize the need for, and be able to engage in life-long learning
- j. Acquire knowledge of contemporary issues
- k. Use the techniques, skills, and modern engineering tools necessary for engineering practice
- l. Apply the probabilistic methods and statistics to electrical engineering problems
- m. Use effectively hands on experience for handling electrical engineering problems

## Requirement for the B.S. Degree in Applied Electrical Engineering

Every student majoring in Applied Electrical Engineering must complete the following curriculum:

<b>(a) General Education Requirements (58 credit hours)</b>		<b>Credit Hours</b>
Computer Programming	ICS 103	3
English	ENGL 101, 102, 214	9
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Mathematics	MATH 101, 102, 201, 202, 302	17
Physical Education	PE 101, 102	2
Natural Sciences	CHEM 101, PHYS 101, 102	12
Engineering Economic Analysis	ISE 307	3
		<b>58</b>

<b>(b) Core Requirements (51 credit hours)</b>		
Digital Logic Circuit Design	EE 200	4
Electrical Circuits I, II	EE 202, 213	6
Intro. to Electrical Eng.	EE 206	2
Electronics I, II	EE 203, 303	8
Signals and Systems	EE 207	3
Electric Energy Eng.	EE 360	4
Control Eng. I	EE 380	4
Electromagnetics	EE 340	4
Communications Eng. I	EE 370	4
Digital Systems Eng.	EE 390	4
Probabilistic Methods in Electrical Eng.	EE 315	3
Fundamentals of EE Design	EE 311	2
Senior Design Project	EE 411	3
		<b>51</b>

<b>(c) Electives (16 credit hours)</b>		
Electrical Engineering Electives	Two EE 4xx courses	7
Science or Eng. Elective	XXX 2xx	3
General Studies	Two GS xxx Courses	6
		<b>16</b>

<b>(d) Cooperative Work (9 credit hours)</b>		
Cooperative Work	EE 351	9
		<b>9</b>

**The total number of credit hours required is**

**134**

# Applied Electrical Engineering Curriculum

COURSE		TITLE			LT	LB	CR	COURSE		TITLE			LT	LB	CR
Preparatory Year															
ENGL 01-xx	Prep. English I (First Quarter)				15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)				15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)						4	ENGL 04-xx	Prep. English IV (Fourth Quarter)						4
MATH 001	Prep. Math I				3	1	4	MATH 002	Prep. Math II				3	1	4
PYP 001	Prep. Physical Science				2	0	2	PYP 002	Prep. Computer Science				0	2	1
PYP 003	University Study Skills				0	2	1	PYP 004	Prep. Eng. Technology				0	2	1
PE 001	Prep. Health and Physical Educ. I				0	2	1	PE 002	Prep. Health and Physical Educ. II				0	2	1
				20	10	16					18	12	15		
Total credit hours required in Preparatory Program: 31															
First Year (Freshman)															
CHEM 101	General Chemistry I				3	4	4	ENGL 102	Intro. to Report Writing				3	0	3
ENGL 101	Intro. to Academic Discourse				3	0	3	IAS 101	Practical Grammar				2	0	2
PHYS 101	General Physics I				3	3	4	PHYS 102	General Physics II				3	3	4
IAS 111	Belief and its Effects				2	0	2	ICS 103	Computer Programming in C				2	3	3
MATH 101	Calculus I				4	0	4	MATH 102	Calculus II				4	0	4
PE 101	Health and Physical Educ. I				0	2	1	PE 102	Health and Physical Educ. II				0	2	1
				15	9	18					14	8	17		
Second Year (Sophomore)															
EE 200	Digital Logic Circuit Design				3	3	4	EE 203	Electronics I				3	3	4
EE 202	Electrical Circuits I				3	0	3	EE 213	Electrical Circuits II				2	3	3
EE 206	Intro. to Electrical Eng.				2	0	2	EE 207	Signals and Systems				3	0	3
MATH 201	Calculus III				3	0	3	ENGL 214	Academic & Professional Comm.				3	0	3
IAS 212	Professional Ethics				2	0	2	MATH 202	Elements of Differential Eq.				3	0	3
XXX 2xx	Science or Eng. Elective				3	0	3	IAS 201	Objective Writing				2	0	2
				16	3	17					16	6	18		
Third Year (Junior)															
EE 303	Electronics II				3	3	4	EE 340	Electromagnetics				3	3	4
EE 360	Electric Energy Eng.				3	3	4	EE 370	Communications Eng. I				3	3	4
EE 380	Control Eng. I				3	3	4	EE 390	Digital Systems Eng.				3	3	4
ISE 307	Engineering Economic Analysis				3	0	3	EE 315	Probabilistic Methods in Electrical Eng.				3	0	3
MATH 302	Eng. Math				3	0	3	EE 311	Fundamentals of EE Design				2	0	2
								IAS 301	Language Comm. Skills				2	0	2
				15	9	18					16	9	19		
Summer Session								EE 350	Begin Cooperative Work				0	0	0
Fourth Year (Senior)															
EE 351	Cooperative Work				0	0	9	EE 4xx	EE Elective I				3	3	4
								EE 4xx	EE Elective II				3	0	3
								GS xxx	GS Elective I				3	0	3
								GS xxx	GS Elective II				3	0	3
								EE 411	Senior Design Project				1	6	3
								IAS 322	Human Rights in Islam				2	0	2
				0	0	9					15	9	18		
Total credit hours required in Degree Program: 134															

## Department of Applied Mechanical Engineering

Chairman: Dr. Zuhair M.Gasem

### Faculty

Abdulazeem	Badour	Merah
Abdulkhaliq	Bahaidarah	Mezghani
Abualhamayel	Baig	Mohammed
Abu-Dheir	Bashmal	Mokheimer
Ahmed	Bazoune	Muhammad
Akhtar	Binmansoor	Nakla
Al-Aqeeli	El-Shaarawi	Nouari
Al-Athel	Elsharqawy	Ouakad
Albinmousa	Furquan	Pashah
Al-Dini	Gandhidasan	Patel
Al-Farayedhi	Gasem	Raza
Al-Hadhrami	Habib	Sahin
Al-Kaabi	Hassan, F	Said
Al-Marbati	Hassan, M	Shaukat
Al-Nassar	Hawwa	Sheikh
Al-Qahtani, H	Jabbar	Shuaib
Al-Qahtani, M	Khalifa	Shuja
Al-Qutub	Khan, S	Sorour
Alsaeed	Khan, Z	Sunar
Al-Sarkhi	Khulief	Toor
Alsulaiman	Laoui	Yaqub
Anis	Mahmood	Yilbas
Antar	Mansoor	Younas
Arif	Mansour	Zubair
Badr	Mekid	

## Introduction

Mechanical engineering is one of the oldest, broadest, and perhaps the most versatile discipline among all engineering disciplines. Mechanical engineers use the principles of energy, mechanics, and materials to design and manufacture machines and devices of all types, and create the systems and processes that drive technology and virtually every industry. The key characteristics of the mechanical engineering profession are its breadth, flexibility, and individuality. Mechanical Engineering derives its breadth from the need to design and manufacture everything from small individual components and devices to large engineering structures and systems. Its flexibility emanates from its scope involving materials, solid and fluid mechanics, thermodynamics, heat transfer, control, instrumentation, design, and manufacturing. Its individuality lies in the ever-emerging specialized mechanical engineering fields such as biomechanics, robotics, mechatronics, nanomechanics, microfluidics, micropower generation, MEMS and NEMS.

Mechanical engineering encompasses an understanding of core concepts including mechanics, kinematics, thermodynamics, heat transfer, materials science, structural and manufacturing analyses. Mechanical engineers use these core concepts to conceive, design, develop, manufacture, and maintain devices and tools, equipment and machinery, products and plants that run the engineering industry. Mechanical engineers also use these core principles to ensure that the products are manufactured economically, and function safely, efficiently and reliably. Mechanical engineers work in the automotive, aerospace, chemical, computer, power, petrochemical, marine and machine tool manufacturing industries, to name a few. Thus, it may be safely stated that every product or service in the modern world has probably been touched in some way by a mechanical engineer.

With the above in mind, the Applied Mechanical Engineering (AME) curriculum at KFUPM has been designed to provide a broad yet rigorous understanding of core mechanical engineering subjects in thermal sciences, mechanical design, materials science and manufacturing processes in the first three years of study. During these years, the AME curriculum aims at developing critical thinking and problem-solving skills using the principles of science and mathematics. In the second semester of the junior year each AME student is required to go on a 28-week program of co-op industry experience. After completion of his co-op training each student is required to submit a formal co-op report and make an oral presentation of his co-op experience. In the senior year the students have sufficient flexibility to select ME Electives from a broad spectrum of courses in the areas of thermo fluids, design and dynamics, or materials and manufacturing. A senior Capstone Design project spread over two semesters provides each student with the opportunity to integrate his knowledge of the previous three years, exercise his creativity, enhance his individuality, and develop entrepreneurship skills. The AME program is evaluated by ABET every five years and has received its latest accreditation in 2010.

The employment opportunities for AME graduates from KFUPM have been very good and are expected to become even better with the rapid pace of industrialization in the Kingdom of Saudi Arabia. Large-scale expansions in the petrochemical, chemical process, and power-generation industries will require a growing influx of AME graduates. Also, many ambitious programs in clean water, clean energy, nanotechnology, and nuclear power generation will result in a substantial increase in the demand for AME graduates in both the short and long term.

## **Mission**

The Mechanical Engineering Department is committed to providing the highest quality education in mechanical engineering, conducting world-class basic and applied research, addressing the evolving needs of industry and society, and supporting the development of more competitive and new industry in the Kingdom of Saudi Arabia.

## **Vision**

The Mechanical Engineering Department at KFUPM will seek distinction as a leader in providing world-class mechanical engineering education to the Kingdom of Saudi Arabia and the Gulf region. The graduates of the Department will be at the forefront of establishing, advancing, and expanding an indigenous knowledge base, which can be solidly relied upon for accepting future challenges, providing proper directions for industrial growth, and furnishing reliable solutions to engineering problems.

## **Goals**

1. Be preeminent in developing and providing the highest quality undergraduate learning environment in Mechanical Engineering education.
2. Be a world reputed Mechanical Engineering Department in graduate education, and basic and applied research.
3. Be preeminent on international level for academic, basic, and applied research.
4. Be a preeminent and leading institution for supporting the technological advancement and economic growth of the local, national, and Gulf area industry.
5. Be a leading university in human-resource development and effective and efficient infrastructure utilization.



## Requirements for the B.S. Degree in Applied Mechanical Engineering

Every student majoring in Applied Mechanical Engineering must complete the following curriculum:

<b>(a) General Education Requirements (67 credit hours)</b>		<b>Credit Hours</b>
Computer Programming in C	ICS 103	3
English	ENGL 101, 102, 214	9
Engineering Courses	CE 201, 203, EE 204, 306	12
Islamic & Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Mathematics	MATH 101, 102, 201, 202, 301	17
Physical Education	PE 101, 102	2
Sciences	CHEM 101, PHYS 101, 102	12
		<b>67</b>

<b>(b) Core Requirements (49 credit hours)</b>		
Mechanical Engineering Drawing & Graphics	ME 210	3
Intro. to Mechanical Engineering Design	ME 218	2
Dynamics, Control, Mechanics of Machines	ME 201, 309, 413	9
Thermodynamics	ME 203, 204	6
Materials Science and Engineering	ME 216	3
Materials Lab	ME 217	1
Manufacturing Processes	ME 322	3
Manufacturing Lab	ME 323	1
Fluid Mechanics	ME 311	3
Heat Transfer	ME 315	3
Machine Design	ME 307, 308	7
Thermofluids Lab	ME 316	1
Manufacturing and Design	ME 406	3
Advanced Manufacturing Lab	ME 407	1
Design Project	ME 414, 416	3
		<b>49</b>

<b>(c) Electives (9 credit hours)</b>		
Mechanical Engineering Elective	ME 4xx	3
General Studies	Two GS xxx Courses	6
		<b>9</b>

<b>(d) Cooperative Work (9 credit hours)</b>		
Cooperative Work	ME 351	9
		<b>9</b>

**The total number of credit hours required is**

**134**

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
Preparatory Year									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		20	10	16			18	12	15
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
CHEM 101	General Chemistry I	3	4	4	IAS 101	Practical Grammar	2	0	2
PHYS 101	General Physics I	3	3	4	PHYS 102	General Physics II	3	3	4
MATH 101	Calculus I	4	0	4	MATH 102	Calculus II	4	0	4
ENGL 101	Intro. to Academic Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3
IAS 111	Belief and its Effects	2	0	2	ICS 103	Computer Programming in C	2	3	3
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1
		15	9	18			14	8	17
Second Year (Sophomore)									
ME 203	Thermodynamics I	3	0	3	ME 218	Intro. to Mechanical Eng. Design	1	3	2
MATH 201	Calculus III	3	0	3	ME 201	Dynamics	3	0	3
ME 210	Mechanical Eng. Drawing & Graphics	2	3	3	ME 204	Thermodynamics II	3	0	3
ME 216	Materials Science and Eng.	3	0	3	MATH 202	Elements of Differential Eq.	3	0	3
ME 217	Materials Lab	0	3	1	CE 203	Structural Mechanics I	3	0	3
CE 201	Statics	3	0	3	EE 204	Fundamentals of Electrical Circuits	2	3	3
ENGL 214	Academic & Professional Comm.	3	0	3	IAS 201	Objective Writing	2	0	2
		17	6	19			17	6	19
Third Year (Junior)									
ME 322	Manufacturing Processes	3	0	3	ME 309	Mechanics of Machines	3	0	3
ME 323	Manufacturing Lab	0	3	1	ME 308	Machine Design II	3	3	4
IAS 212	Professional Ethics	2	0	2	ME 315	Heat Transfer	3	0	3
ME 307	Machine Design I	3	0	3	ME 316	Thermofluids Lab	0	3	1
ME 311	Fluid Mechanics	3	0	3	MATH 301	Methods of Applied Math	3	0	3
EE 306	Electromechanical Devices	2	3	3	GS xxx	GS Elective I	3	0	3
IAS 301	Language Comm. Skills	2	0	2	ME 414	Design Project I	1	0	1
		15	6	17			16	6	18
Summer Session					ME 350	Begin Cooperative Work	0	0	0
Fourth Year (Senior)									
ME 351	Cooperative Work	0	0	9	ME 416	Design Project II	0	6	2
					ME 406	Manufacturing and Design	3	0	3
					ME 407	Advanced Manufacturing Lab	0	3	1
					ME 413	Systems Dynamics and Control	2	3	3
					ME 4xx	ME Elective	3	0	3
					IAS 322	Human Rights in Islam	2	0	2
					GS xxx	GS Elective II	3	0	3
		0	0	9			13	12	17
Total credit hours required in Degree Program : 134									

# **COLLEGE OF ENGINEERING SCIENCES**

**Dean: Dr. Omar A.Al-Suwailem**

## **UNDERGRADUATE DEPARTMENTS**

AEROSPACE ENGINEERING  
CHEMICAL ENGINEERING  
CIVIL AND ENVIRONMENTAL ENGINEERING  
ELECTRICAL ENGINEERING  
MECHANICAL ENGINEERING  
PETROLEUM ENGINEERING

## **Vision**

To be a leading college in engineering education, research, and profession.

## **Mission**

- To attract and graduate talented, broadly educated, and globally competitive engineers empowered to be future leaders
- To conduct top-quality research, in engineering sciences & technology, of high relevance to the nation and the region
- To engage in outreach programs which serve the needs of the local industry and the community

## **Philosophy**

The programs of the College of Engineering Sciences are designed to meet the challenges of the 21<sup>st</sup> century through the enhancement of students' preparation for professional careers, life-long learning, and responsible participation as members of society. Emphasis is placed on religious, general, and sociological education to make today's engineer aware of environmental, sociological, and other "human concerns" in addition to safety, aesthetics, economics and the cost of energy in their decision-making. Clear and precise communication skills, oral and written, are required of the engineer who delivers judgments, plans and decisions. A sound knowledge of engineering and related disciplines is required so that the engineer can work effectively with other engineers, scientists and technicians, in fulfilling engineering assignments.

## **College Programs**

The undergraduate programs of the College of Engineering Sciences provide students with a range of educational opportunities by which they may achieve competence in major branches of engineering. Equipped with the knowledge of mathematics, physical sciences, computational techniques, and statistical analysis of data, the engineer can engage in creative design and construction, synthesis of systems, and in research and development. Thus the engineer serves as a bridge between meeting human needs and the storehouse of theoretical knowledge. The College of Engineering Sciences continues to provide flexibility in different programs through a spectrum of electives, which allows the College graduate to exercise a limited choice in tailoring his program to fit his personal goals, whether for immediate employment or for graduate work.

All programs of the College of Engineering Sciences met the Accreditation Criteria of the Board for Engineering and Technology (ABET) in January 2008.

## **Curricular Requirements**

The general engineering sciences curriculum includes the following features:

***Virtually Common Freshman Year:*** In spite of the fact that students are required to declare their fields of major study at the Freshman level, the various specialty departments have a virtually common Freshman year.

**Basic Sciences:** The curriculum of each major in Engineering Sciences contains a number of specially designed courses in basic sciences to provide students with a firm background in the physical sciences and mathematics. Courses in general chemistry and physics, a three-semester sequence of mathematics courses, a course on differential equations and on computer programming are offered as a necessary foundation in science and computational skills.

**General Education Courses:** Several courses are designed within the framework of a curriculum to broaden the students' general education. Among the fields covered are Islamic history and culture, Arabic language and literature, English and economics.

**Engineering Breadth:** Several courses are required to give the student some breadth of study in science and technology. Courses in the application of computers in engineering and statistical analysis of engineering data are clear features of the programs. In addition, under the heading of "Technical Electives", students are permitted to extend their study into more advanced courses in science, mathematics, computer technology, the fields of engineering other than their major, or even from their own major.

**Engineering Depth:** About one full year of study is devoted to the student's major field of engineering. Most of the courses in this category are specified courses designed to give the student the essential subject materials in his major. However, two to four departmental electives are left open to the student so that he can extend his knowledge in his own area of interest. Finally, every student takes a course leading to an integrated design project where the student uses his engineering and design skills in planning and designing a real world engineering project. The design should take into consideration appropriate constraints such as economic factors, safety, reliability, ethics, and environmental and social impacts.

## **Graduation Requirements**

In order to qualify for graduation, Engineering students must

1. complete all required and elective courses in the selected degree program (133 credit hours minimum) with a cumulative GPA of 2.00 or better;
2. achieve a major GPA of 2.00 or better;
3. complete successfully after the third year an 8-week program working in industry.

# Department of Aerospace Engineering

**Chairman: Dr. Ahmed Al-Garni**

## Faculty

Abdelrahman  
Ahmed  
Al-Fifi

Al-Garni  
Edi  
Iraqi

Saeed

## **Introduction**

Aerospace Engineering is one of the most important strategic fields in the world from at least two aspects: first, its effect on the infrastructure of the country such as fast communication, air transportation, civil aviation, industry, and economy; second, its relevance to defense issues including Air Force and Air Defense.

Due to the importance of this field to the Kingdom of Saudi Arabia (KSA) and the region, an aerospace engineering program was established in 1419H (1998G) to serve two branches: Aeronautics Engineering and Astronautics Engineering. This program is the first and only program in KSA and the Arabian Gulf and Peninsula region that offers the two branches. It developed from the Aeronautical Engineering option which was offered in the Mechanical Engineering Department (ME) from 1406H (1986G). The current Aerospace Engineering Department was established in 1423H (2002G). Although, the Department has only recently been established, it has to its credit the highest number of publications per faculty, among the Arabian countries, in leading aerospace journals (such as AIAA, Canadian, British and Japanese aerospace journals). Moreover, the AE Department faculty have received many awards, such as the King Abdul-Aziz Al-Saud Legion of Honor Medal in the first degree for a Scientific Patent, the Distinguished Engineering Scientist Award for Saudis and Non-Saudis, which is supervised by King Abdul-Aziz City for Science and Technology (KACST), the Distinguished Award in Teaching and Academic Advising by KFUPM, the Distinguished Research Award by KFUPM, and the American Romanian Academy of Arts and Sciences Book Award.

## **Curriculum**

The Aerospace Engineering (AE) Program is designed to cover all fundamental aspects of aerospace engineering. The curriculum includes general education courses in Mathematics, Chemistry, Physics, Engineering, Computer Science, Islamic and Arabic Studies, English, and Physical Education. The program also provides the students with a strong base in the main areas of Aerospace Engineering: Aerodynamics and Gas Dynamics, Flight Dynamics and Control, Aerospace Structures, Flight Propulsion and other related fields such as Aerospace Systems Maintenance, Helicopter, Avionics, Flight Traffic Control, Flight Safety, Electronic Warfare and Radar, and Astronautics. Moreover, the curriculum is also augmented by a number of elective courses in various branches of Aerospace Engineering. A student has the opportunity to take the appropriate elective courses (two from Aerospace Engineering, two from other engineering fields, and two from General Studies subjects) to broaden his knowledge of aerospace and in areas of his interest. It balances theory with application and provides practical experience through appropriate laboratory sessions. The program includes a senior project, a capstone design course, which provides the student with an opportunity to work with a design team that exposes him to unstructured problem-solving situations. Every Aerospace Engineering student is required to spend 8 weeks in summer training to make use of his knowledge and to acquire valuable experience in an industrial environment.

## **Employment Opportunities**

The employment opportunities for aerospace engineers in KSA, the Arabian Gulf and Peninsula region have been very good and will be brighter in this age of ever-changing technology. These opportunities exist because of the rapid pace of industrialization, technological development in the aerospace engineering field, the establishment of aviation departments in private organizations, and the procurement of new aerospace-related systems

in defense and commercial aviation sectors. Moreover, the Kingdom's well-established technological infrastructure has set the stage for the subsequent, very advanced, and expanding, phase of research and development, e.g., satellite development in the Space Institute of KACST (King Abdul-Aziz City of Science and Technology). In view of all these developments, well-qualified aerospace engineers are in great demand.

## **Vision**

To Position KFUPM into a "leading and preminent" institution by developing a full range of competitive aerospace degrees (undergraduate, graduate) and conducting cutting edge research programs of to meet the Kingdom's and region's needs for education, manpower, and technical expertise in aerospace engineering and related fields including renewable energy utilization.

## **Mission**

1. To provide high quality education at International level in Aerospace Engineering, well grounded in the fundamental principles of engineering, in order to inspire and prepare the students for leadership positions with the understanding of the strategic value of their work, so they can effectively participate in the development and operation of the aerospace industries and achieve successful careers in other engineering fields to serve the Kingdom and the region.
2. To conduct and promote original scientific research and its application for the advancement of aerospace industry and related industries, disseminate new knowledge through publications, conferences, seminars and workshops.
3. To participate effectively in community services and provide a source of leadership and professional expertise for KFUPM, the Kingdom and the region through continuing education programs, short courses, and consulting services by establishing close partnerships that make a difference with the industry, alumni, government, and other academia in order to develop and support innovation and economic well-being.

## **Program Educational Objectives**

The educational objectives of the Aerospace Engineering Program are three-fold:

Objective #1: Fundamentals and knowledge students will have

To provide students with a strong foundation in basic sciences, mathematics, and engineering fundamentals; in-depth knowledge of Aerodynamics and Gas Dynamics, Flight Dynamics and Control, Flight Propulsion, Flight Structures and Astrodynamics as well as Aviation Sciences and Technologies.

Objective #2: Skills and abilities students will possess

To prepare students for professional careers in Aerospace Engineering or related fields by developing skills and abilities pertinent to:

- a) Design and Integration



To educate students in the methodology and tools of design, fundamentals of the open-ended design process including synthesis and integration of information from fundamental and interdisciplinary area necessary to carry out the design of aerospace and related multidisciplinary systems.

b) Experiment

To provide students with the necessary skills to use experimental and data analysis techniques required for aerospace applications.

c) Analysis

To develop skills in methods of analysis and problem solving including mathematical and computational skills and use of contemporary software and information technology tools.

d) Multidisciplinary Teamwork and Leadership

To prepare students with the skills required for successful participation on multi-disciplinary teams and for leadership positions.

e) Communication

To develop skills for oral and written communication including use of the multimedia tools.

f) Pursuit of Advanced Degrees

To expose the students to theory and advances in engineering practice and research as preparation for pursuit of advanced degrees in aerospace engineering and other fields.

Objective #3: Professional ethics and attitudes students will hold

To instill in the students an understanding of the role and importance of life-long learning, professional responsibility, and engineering ethics with awareness of the impact of the engineering on societal and global issues.

### **Student Outcomes**

The AE program adopts ABET Student Outcomes a-k as its outcomes, in addition to two additional outcomes, hereby named l and m:

- a. An ability to apply knowledge of mathematics, science, and fundamental 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, and process to meet desired needs.
- d. An ability to work effectively in multidisciplinary teams.
- e. An ability to identify, formulate and solve engineering problems.
- f. An understanding of professional and ethical responsibility.
- g. An ability to communicate effectively in written, oral, and graphical forms, including the use of high-quality visual aids.

- 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.
- l. A knowledge of Aerodynamics and Gas Dynamics, Flight Dynamics and Control, Flight Structures, Flight Propulsion, and Astrodynamics as well as Aviation Sciences and Technologies
- m. An ability to integrate aerospace sciences and engineering topics and their application in the design of aerospace systems.

## Requirements for the B.S. Degree in Aerospace Engineering

Every student majoring in Aerospace Engineering must complete the following curriculum:

<b>(a) General Education Requirements (67 credit hours)</b>		<b>Credit Hours</b>
English	ENGL 101, 102, 214	9
Computer Programming	ICS 103	3
Engineering Courses	CE 201, 203, EE 204, CISE 301	12
Mathematics	MATH 101, 102, 201, 202, 301	17
Sciences	PHYS 101, 102, CHEM 101	12
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Physical Education	PE 101, 102	2
		<b>67</b>

<b>(b) Core Requirements (48 credit hours)</b>		
Dynamics	ME 201	3
Thermodynamics	ME 203	3
ME Drawing & Graphics	ME 210	3
Material Science	ME 216, 217	4
Fluid Mechanics	ME 311	3
Introduction to Aerospace Engineering	AE 220	3
AE Design	AE 240	2
AE Systems and Control	AE 313	3
Gas Dynamics	AE 325	3
Flight Structures	AE 328	3
Aerodynamics	AE 333	3
Experimental & Computational Methods for AE	AE 355	1
Senior Design Project	AE 411, 412	3
Aerospace Engineering Labs	AE 420, 421	2
Flight Propulsion	AE 422	3
Flight Dynamics	AE 426	3
Aerospace System Design	AE 427	3
		<b>48</b>

<b>(c) Electives (18 credit hours)</b>		
AE Electives	Two AE xxx Courses	6
Technical Electives (Can be taken from any other department. AE Department approval is required)	Two XE xxx Courses	6
General Studies (Department approval is required)	Two GS xxx Courses	6
		<b>18</b>

### **(d) Summer Training (0 credit hours)**

Each student must participate in an eight-week program of industrial experience and submit a formal report at the end of the training period.

Summer Training	AE 399	0
		<b>0</b>

**The total number of credit hours required is**

**133**

# Aerospace Engineering Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1	
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
CHEM 101	General Chemistry I	3	4	4	ENGL 102	Intro. to Report Writing	3	0	3	
ENGL 101	Intro. to Academic Discourse	3	0	3	IAS 111	Belief and its Effects	2	0	2	
IAS 101	Practical Grammar	2	0	2	ICS 103	Computer Programming in C	2	3	3	
MATH 101	Calculus I	4	0	4	MATH 102	Calculus II	4	0	4	
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1	
PHYS 101	General Physics I	3	3	4	PHYS 102	General Physics II	3	3	4	
		15	9	18				14	8	17
Second Year (Sophomore)										
AE 220	Intro. to Aerospace Eng.	3	0	3	AE 240	AE Design	2	0	2	
CE 201	Statics	3	0	3	CE 203	Structural Mechanics I	3	0	3	
ENGL 214	Academic & Professional Comm.	3	0	3	IAS 201	Objective Writing	2	0	2	
MATH 201	Calculus III	3	0	3	MATH 202	Elements of Differential Eq.	3	0	3	
ME 203	Thermodynamics I	3	0	3	ME 201	Dynamics	3	0	3	
ME 210	Mechanical Eng. Drawing & Graphics	2	3	3	ME 216	Materials Science and Engineering	3	0	3	
					ME 217	Materials Lab	0	3	1	
		17	3	18				16	3	17
Third Year (Junior)										
EE 204	Fundamentals of Electrical Circuits	2	3	3	AE 313	AE Systems and Control	2	3	3	
IAS 212	Professional Ethics	2	0	2	AE 325	Gas Dynamics I	3	0	3	
MAT H 301	Methods of Applied Math	3	0	3	AE 328	Flight Structures I	3	0	3	
ME 311	Fluid Mechanics	3	0	3	AE 333	Aerodynamics I	3	0	3	
CISE 301	Numerical Methods	3	0	3	AE 355	Experimental & Comput. Methods for AE	0	3	1	
GS xxx	GS Elective I	3	0	3	IAS 301	Language Comm. Skills	2	0	2	
		16	3	17				13	6	15
Summer Session					AE 399	Summer Training	0	0	0	
Fourth Year (Senior)										
AE 411	Senior Design Project I	1	0	1	AE 412	Senior Design Project II	2	0	2	
AE 420	Aerospace Eng. Lab I	0	3	1	AE 421	Aerospace Eng. Lab II	0	3	1	
AE 426	Flight Dynamics I	3	0	3	AE 422	Flight Propulsion I	3	0	3	
AE xxx	AE Elective I	3	0	3	AE 427	Aerospace System Design	3	0	3	
IAS 322	Human Rights in Islam	2	0	2	AE xxx	AE Elective II	3	0	3	
XE xxx	Technical Elective I	3	0	3	XE xxx	Technical Elective II	3	0	3	
GS xxx	GS Elective II	3	0	3						
		15	3	16				14	3	15
Total credit hours required in Degree Program : 133										



# Department of Chemical Engineering

**Chairman: Dr. Mohammed S. Bashammakh**

## **Faculty**

Abo-Ghander  
Abussaud  
Al-Ali  
Al-Amer  
Al-Asiri  
Al-Baghli  
Al-Harthi  
Al-Juhani  
Al-Jundi  
Al-Khattaf

Al-Matar  
Al-Mubaiyedh  
Al-Mutairi  
Al-Saifi  
Al-Shammari  
Al-Yousef  
Amin  
Atieh  
Ba-Aqil  
Ba-Shammakh

Binous  
Hussein  
Mahgoub  
M.Mazhar  
Razzak  
Redhwi  
Shaikh  
Shamsuzzoha  
Shawabkeh  
Shehzad

## **Introduction**

Chemical Engineering is defined as a profession which uses the sciences of mathematics, physics and chemistry for the benefit of mankind. It employs chemical and physical principles for the design of processes and the conversion of raw materials into valuable products to improve life for the average person. The chemical conversions involve the preparation of useful products in large quantities using basic thermodynamics and chemical kinetics, which govern reactions. Physical conversions utilize unit operations, fluid dynamics, heat transfer, and mass transfer to separate the reactant products into useful pure chemicals. All these subjects are used in the design of chemical plants and refineries.

The undergraduate chemical engineering science curriculum has been systematically revised over the years to reflect the emergence of chemical engineering as a modern discipline and its changing role in society. The modern curriculum includes such diverse topics as process control, use of simulation packages, and chemical plant design, with electives in diverse areas.

## **Vision**

The Department of Chemical Engineering will be the undergraduate chemical engineering department of choice in Saudi Arabia and will be recognized as one of the top research and graduate chemical engineering departments in the region.

## **Mission**

The mission of the Department of Chemical Engineering at King Fahd University of Petroleum & Minerals is to provide an innovative educational program that is rigorous and challenging as well as flexible and supportive. The program is designed to meet the challenges that our graduates are likely to face throughout their professional careers and to provide a high level of scholarship and professional capability, with highly developed skills in lifetime learning, planning, problem-solving, communication and leadership.

## **Program Educational Objectives**

Within few years after graduation, our graduates will be able to:

- Achieve a successful career in oil, gas, petrochemicals, desalination, energy and other process industries.
- Integrate their academic preparation with chemical engineering practice and technology development.
- Pursue a graduate degree in chemical engineering or other related fields.
- Pursue leadership roles in industry, business, and government agencies.

## **Student Outcomes**

As the outcomes of the undergraduate programs in the Department of Chemical Engineering, the students at the time of graduation are expected to demonstrate:

- a. An ability to apply knowledge of mathematics, science, and engineering principles in solving chemical engineering problems.
- b. An ability to design and conduct experiments, as well as to analyze and interpret data on experiments relevant to chemical engineering practice.
- c. An ability to design a system, component, or a chemical process to meet desired needs within realistic constraints such as economic, environmental and safety.
- d. An ability to function and work on multi-disciplinary teams.
- e. An ability to identify, formulate, and solve problems important in chemical engineering practice.
- f. An understanding of professional and ethical responsibility.
- g. An ability to communicate effectively.
- h. An ability to recognize the impact of engineering solutions in a global, economic, environmental and societal context.
- i. A recognition of the need for, and an ability to engage in, life-long learning.
- j. A recognition of contemporary issues related to the chemical engineering profession.
- k. An ability to use the techniques, skills, and modern engineering tools necessary for chemical engineering practice.

## **Program Strategy**

The strategy of the Department of Chemical Engineering to achieve our objectives is to:

1. Attract high-quality students, especially those with top university entrance scores, to the chemical engineering program.
2. Continually improve and update the chemical engineering curriculum.
3. Adopt and apply advances in educational technologies to improve teaching and the learning environment.
4. Develop a strong senior capstone design project course. Annual awards are presented by the Saudi Arabian Section of the American Institution of Chemical Engineers and Saudi Arabia Basic Industries Corporation (SABIC) for the best presented projects.
5. Acquire modern computerized laboratory experiments to update our laboratory program in chemical engineering.
6. Attract and retain high-quality faculty and support staff.
7. Continually improve the program through the advice of the Industrial Advisory Committee.
8. Promote a strong environmental engineering elective program as per the request of our Industrial Advisory Committee.
9. Promote study in Petroleum Refining and Petrochemicals through our Saudi Aramco-funded chair professorship.
10. Promote the study of corrosion in industry through our SABIC-funded chair professorship.
11. Assess the program through surveys of graduating seniors, faculty, alumni, and their employers for improvement.



## Requirements for the B.S. Degree in Chemical Engineering

Every student majoring in Chemical Engineering must complete the following curriculum:

<b>(a) General Education Requirements (62 credit hours)</b>		<b>Credit Hours</b>
Sciences	PHYS 101, 102, CHEM 101, 102	16
Mathematics and Statistics	MATH 101, 102, 201, 202, STAT 319	17
Communication Skills	ENGL 101, 102, 214, IAS 101, 201, 301	15
Engineering Skills	ICS 103, CISE 301	6
Islamic and Arabic Studies	IAS 111, 212, 322	6
Physical Education	PE 101, 102	2
		<b>62</b>

<b>(b) Advanced Chemical Sciences Requirements (17 credit hours)</b>		
Chemistry	CHEM 201, 311, 323	11
Material Science	ME 205	3
Biology	BIOL 233	3
		<b>17</b>

<b>(c) Core Requirements (36 credit hours)</b>		
Introduction to Chemical Eng.	CHE 201	3
Thermodynamics	CHE 202, 303	5
Transport Processes	CHE 204, 300, 304	9
Separation Processes	CHE 306	3
Chemical Engineering Lab	CHE 309, 409	4
Process Dynamics and Control	CHE 401	3
Kinetic and Reactor Design	CHE 402	3
Eng. Economics & Design Principles	CHE 425	3
Integrated Design	CHE 495	3
		<b>36</b>

<b>(d) Electives (18 credit hours)</b>		
CHE Electives	Two CHE 4xx Courses	6
Technical Electives	Two XE xxx Courses	6
General Studies	Two GS xxx Courses	6
		<b>18</b>

### **(e) Summer Training (0 credit hours)**

Each student must participate in an eight-week program of industrial experience and submit a formal report.

Summer Training	CHE 399	0
		<b>0</b>

**The total number of credit hours required is**

**133**

## Chemical Engineering Curriculum

Chemical Engineering Curriculum										
COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2		
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
CHEM 101	General Chemistry I	3	4	4	MATH 102	Calculus II	4	0	4	
ENGL 101	Intro. to Academic Discourse	3	0	3	CHEM 102	General Chemistry II	3	4	4	
ICS 103	Computer Programming in C	2	3	3	PHYS 102	General Physics II	3	3	4	
MATH 101	Calculus I	4	0	4	ENGL 102	Intro. to Report Writing	3	0	3	
PE 101	Health and Physical Educ. I	0	2	1	IAS 101	Practical Grammar	2	0	2	
PHYS 101	General Physics I	3	3	4	PE 102	Health and Physical Educ. II	0	2	1	
		15	12	19				15	9	18
Second Year (Sophomore)										
CHE 201	Principles of Chem. Eng. I	3	2	3	CHE 202	Principles of Chem. Eng. II	2	2	2	
CHEM 201	Organic Chemistry I	3	4	4	CHE 204	Transport Phenomena I	3	0	3	
MATH 201	Calculus III	3	0	3	BIOL 233	Biology for Engineers	2	3	3	
ENGL 214	Academic & Professional Comm.	3	0	3	MATH 202	Elements of Differential Eq.	3	0	3	
IAS 111	Belief and its Effects	2	0	2	ME 205	Materials Science	2	3	3	
					IAS 201	Objective Writing	2	0	2	
		14	6	15				14	8	16
Third Year (Junior)										
CHE 300	Transport Phenomena II	3	0	3	CHE 306	Stagewise Operations	3	0	3	
CHE 303	Chemical Eng. Thermodynamics	3	0	3	CHE 309	Chemical Eng. Laboratory I	0	6	2	
CHE 304	Transport Phenomena III	3	0	3	CHEM 323	Instrumental Chemical Analysis	2	4	3	
CHEM 311	Physical Chemistry II	3	4	4	STAT 319	Probability and Stat. for Eng. and Scientists	2	3	3	
CISE 301	Numerical Methods	3	0	3	IAS 301	Language Comm. Skills	2	0	2	
IAS 212	Professional Ethics	2	0	2	GS xxx	GS Elective I	3	0	3	
		17	4	18				15	13	19
Summer Session					CHE 399	Summer Training	0	0	0	
Fourth Year (Senior)										
CHE 401	Process Dynamics and Control	3	0	3	CHE 495	Integrated Design Course	1	6	3	
CHE 402	Kinetics and Reactor Design	3	0	3	CHE 409	Chemical Eng. Laboratory II	0	6	2	
CHE 425	Process Design and Economics	3	0	3	CHE 4xx	CHE Elective II	3	0	3	
CHE 4xx	CHE Elective I	3	0	3	XE xxx	Technical Elective II	3	0	3	
XE xxx	Technical Elective I	3	0	3	GS xxx	GS Elective II	3	0	3	
IAS 322	Human Rights in Islam	2	0	2						
		17	0	17				10	12	14
Total credit hours required in Degree Program : 133										

# Department of Civil and Environmental Engineering

**Chairman: Dr. Saleh Al-Dulaijan**

## Faculty

Abduljauwad	Alghamdi	Azad
Ahmad	Alhajyaseen	Baig
Aiban	Al-Malack	Baluch
Al-Abdulwahhab	Al-Ofi	Bouchama
Al-Ahmadi	Al-Osta	Bukhari
Al-Amoudi	Al-Senan	Chowdhury
Al-Attas	Al-Sghan	Essa
Al-Dulaijan	Al-Shayea	Ibrahim
Alfarabi	Al-Sughaiyer	Khathlan
Al-Gadhib	Al-Suwaiyan	Ratrout
Al-Gahtani, A	Al-Zahrani, M.A	Vohra
Al-Gahtani, H	Al-Zahrani, M.M	

## **Introduction**

The Civil and Environmental Engineering major is multidisciplinary in nature. It covers aspects of studies that relate to the essential needs of mankind. It embodies the planning, design, construction, maintenance, and operation of facilities such as buildings, structures, geotechnical, transportation, water, wastewater and waste.

The four-year undergraduate curriculum in civil and Environmental engineering science provides basic knowledge in sciences, mathematics, and engineering in the first two years. Students are required to choose one of the three options within the program, namely *Structural/Materials*, *Geotechnical/Transportation*, or *Water/Environmental Engineering*. Certain civil engineering core and elective courses are required from students in each of the different options. During the third year, the student is introduced to different options in civil engineering with the emphasis on applications and design. After the completion of his third year, the student undertakes a summer training program in industry, where the on-the-job training provided leads to an appreciation of the practice of civil engineering. Appropriate electives are also offered to further the student's knowledge in one or more of the areas of civil engineering. In addition, courses in humanities, social sciences and economics are integrated into the program to broaden the student's knowledge.

The Civil and Environmental Engineering Department is equipped with modern laboratories for teaching and research in the areas of geotechnical engineering, civil engineering materials, strength of materials, structural analysis, design and modeling, highway and transportation, surveying and photogrammetry, hydraulics and hydrology, and environmental engineering. Effective use of the modern computer facilities at the University's Information Technology Center and those available in the department constitutes an essential part of the civil engineering undergraduate curriculum.

The civil and environmental engineering science program is accredited by the Accreditation Board of Engineering and Technology (ABET) in the USA. The department undertakes a periodic assessment of its program and course learning outcomes for the continuous improvement of teaching and learning, and to ensure that the educational objectives are met.

## **Vision**

The vision of the Department of Civil and Environmental Engineering is to establish itself as a leading center of Civil and Environmental Engineering education by supporting academic distinction and seeking excellence in teaching, learning, research and public services in partnership with the University.

## **Mission**

The mission of the Department of Civil and Environmental Engineering is to maintain a preeminent role in teaching and research by pursuing a policy of rapid adaptation to new knowledge, discoveries, technological advances and emerging economics and to serve the public through the dissemination of knowledge and information. The department seeks to provide an environment of learning within which creative thinking, practical skills and self development are cultivated and sustained to produce qualified Civil and Environmental Engineers who will challenge the present and enrich the future.

## **Strategic Goals**

The strategic goals set by the department to achieve the vision and mission are:

- To seek continual improvement of the teaching environment and academic programs through an arduous self-evaluation as well as extramural evaluation by peers to provide an education reflective of the essential knowledge, professional competence and skills required of the graduates for successful careers in the Civil Engineering profession.
- To readily adopt and apply advances in educational technologies to improve teaching and learning environment.
- To make the student community more motivated and responsive to learning and to instill a greater sense of responsibility and accomplishment among the students and to foster personal growth and lifelong learning.

## **Educational Objectives**

The program aims to prepare graduates who, after few years of their career, will have

1. Successfully established themselves as practicing civil engineers
2. Demonstrated in their profession the ability to work as a responsible member of a professional team and take leadership role
3. Pursued professional career development activities to acquire new knowledge and skills.

## **Program Outcomes**

The eleven program outcomes are:

- a. Students shall have an ability to apply knowledge of mathematics, science, and engineering to engineering problems.
- b. Students shall have an ability to design and conduct experiments, as well as analyze and interpret data.
- c. Students shall have an ability to design a system, component, or process to meet desired needs within constraints.
- d. Students shall have an ability to function on multi-disciplinary teams.
- e. Students shall have an ability to identify, formulate, and solve engineering problems.
- f. Students shall have an understanding of professional and ethical responsibility.
- g. Students shall have an ability to communicate effectively.

- h. Students shall have the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
- i. Students shall have a recognition of the need for, and an ability to engage in lifelong learning.
- j. Students shall have a knowledge of contemporary issues.
- k. Students shall have an ability to use techniques, skills, and modern engineering tools including computational tools necessary for engineering practice.

## Requirements for the B.S. Degree in Civil and Environmental Engineering

Every student majoring in Civil and Environmental Engineering must complete the following curriculum:

<b>(a) General Education Requirements (69 credit hours)</b>		<b>Credit Hours</b>
English	ENGL 101, 102, 214	9
Computer Skill	ICS 103	3
Interdisciplinary Basic Courses	ME 201, 203, EE 204	9
Mathematics	MATH 101, 102, 201, 260	14
Sciences	PHYS 101, 102, CHEM 101, 111	14
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Physical Education	PE 101, 102	2
Others	ISE 307, MGT 301	6
		<b>69</b>

<b>(b) Core Requirements (43 credit hours)</b>		
Computer Graphics	CE 215	3
Surveying	CE 261	2
Mechanics and Structures	CE 201, 203, 305	9
Materials	CE 303	4
Geotechnical	CE 353	4
Transportation	CE 341, 343	4
Fluid Mechanics and Environmental Engineering	CE 230, 330	6
Introduction to CE Design	CE 312	1
Numerical and Statistical Methods in CE	CE 318	3
Construction Methods and Management	CE 421	3
Senior Design Project	CE 410, 412	3
CE Seminar	CE 490	1
		<b>43</b>

<b>(c) Electives (21 credit hours)</b>		
CE Electives	Two CE xxx Courses	6
CE Option Electives (from chosen option)	CE xxx, CE 4xx	6
Additional Science XXX xxx	GEOL 201 or GEOL 202 or BIOL xxx	3
General Studies	GS xxx	3
Technical Elective (from approved list)	XE xxx	3
		<b>21</b>

<b>(d) Summer Training (0 credit hours)</b>		
A minimum of 8-week program to gain experience; submit and present a report.		
Summer Training	CE 399	0
		<b>0</b>

The total number of credit hours required is

**133**

## Civil and Environmental Engineering Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1	
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
CHEM 101	General Chemistry I	3	4	4	CHEM 111	Basics of Environmental Chemistry	2	0	2	
ENGL 101	Intro. to Academic Discourse	3	0	3	PHYS 102	General Physics II	3	3	4	
IAS 111	Belief and its Effects	2	0	2	MATH 102	Calculus II	4	0	4	
MATH 101	Calculus I	4	0	4	ENGL 102	Intro. to Report Writing	3	0	3	
PE 101	Health and Physical Educ. I	0	2	1	IAS 101	Practical Grammar	2	0	2	
PHYS 101	General Physics I	3	3	4	PE 102	Health and Physical Educ. II	0	2	1	
					ICS 103	Computer Programming in C	2	3	3	
		15	9	18				16	8	19
Second Year (Sophomore)										
CE 201	Statics	3	0	3	CE 203	Structural Mechanics I	3	0	3	
CE 215	Computer Graphics	2	3	3	CE 230	Eng. Fluid Mechanics	3	0	3	
CE 261	Surveying I	1	3	2	MATH 260	Intro. to Differential Eq. & Linear Algebra	3	0	3	
ENGL 214	Academic & Professional Comm.	3	0	3	ME 201	Dynamics	3	0	3	
MATH 201	Calculus III	3	0	3	IAS 212	Professional Ethics	2	0	2	
XXX xxx	Science Elective	3	0	3	ME 203	Thermodynamics I	3	0	3	
		15	6	17				17	0	17
Third Year (Junior)										
CE 303	Structural Materials	3	3	4	CE 312	Intro. to CE Design	1	0	1	
CE 305	Structural Analysis I	3	0	3	CE 341	Transportation Eng.	3	0	3	
CE 318	Numerical & Statistical Methods in CE	2	3	3	CE 343	Transportation Eng. Laboratory	0	3	1	
IAS 201	Objective Writing	2	0	2	CE 353	Geotechnical Eng. I	3	3	4	
CE 330	Environmental Eng. Principles	3	0	3	IAS 301	Language Comm. Skills	2	0	2	
					CE xxx	CE Elective I	3	0	3	
					EE 204	Fundamentals of Electrical Circuits	2	3	3	
		13	6	15				14	9	17
Summer Session					CE 399	Summer Training	0	0	0	
Fourth Year (Senior)										
CE xxx	CE Elective II	3	0	3	CE 412	Senior Design Project	0	6	2	
CE xxx	Option Elective I	3	0	3	CE 421	Construction Methods and Management	3	0	3	
ISE 307	Eng. Economics Analysis	3	0	3	CE 4xx	Option Elective II	3	0	3	
GS xxx	GS Elective	3	0	3	XE xxx	Technical Elective	3	0	3	
MGT 301	Principles of Management	3	0	3	IAS 322	Human Rights in Islam	2	0	2	
CE 410	Senior Design Project Preparation	0	3	1	CE 490	Civil Eng. Seminar	1	0	1	
		15	3	16				12	6	14
Total credit hours required in Degree Program : 133										



# Department of Electrical Engineering

**Chairman: Dr. Ali Al-Shaikhi**

## Faculty

Abdul-Jauwad	Al-Ohali	Kousa
Abido	Al-Qahtani, K	Landolsi
Abu-Al-Saud	Al-Qahtani, M	Mahnashi
Abuelmaatti	Alsaihati	Masoud
Al-Absi	Al-Shahrani	Masoudi
Alahmadi	Al-Shaikhi	Mesbah
Al-Ahmari	Alsunaidi	Mohandes
Al-Akhdar	Al-Suwailem	Mousa
Alawami	Al-Zaher	Muqaibel
Al-Baiyat	Ashraf	Naveed
Al-Battal	Bakhashwain	Nuruzzaman
Al-Dharrab	Balghonaim	Qureshi
Aldohan	Deriche	Ragheb
Al-Duwaish	El-Amin	Shafi
Alghadhban	Habiballah	Sharawi
Alghamdi	Hammi	Sheikh
Al-Hamouz	Hassan	Sorour
Al-Jamid	Hussein	Tasadduq
Al-Maghrabi	Ibrir	Zerguine
Al-Muhaini	Johar	Zidouri
Al-Naffouri	Kassas	Zummo

## **Introduction**

Many of the products and services utilized all over the world are based on the work of electrical engineers. The availability of electric power for domestic and industrial use, the extensive, fast and reliable communications, and the large computational capacity achieved with modern computers are only some examples of the contributions of electrical engineers to human advancement. In addition to this, contributions by electrical engineers to the development of concepts in signals and systems, communications, simulation, analysis and control are applied in areas such as economics, management, psychology, and physiology.

In training students, the electrical engineering program emphasizes three aspects. First, subjects in science such as mathematics, physics, and chemistry enable the student to develop the necessary analytical ability and prepare him with a sound scientific foundation. Second, subjects related to humanities and general studies ensure excellent skills and a broader outlook. Third, subjects that cover the main disciplines in electrical engineering (Energy, Control, Communications, Signal Processing, Electromagnetics, Electronics, and Digital Systems) ensure a broad knowledge of electrical engineering. Students can acquire greater depth and specialization through the choice of EE electives. These three aspects are supported with laboratories, summer training and a senior project. Laboratory experience exposes the students to the instrumentation, design, engineering practice, and construction of electrical and electronic devices and circuits. Our laboratories are equipped with state-of-the-art equipment. This is complemented by a summer employment program in which the student undergoes industrial training. Team work and design aspects are further emphasized through the senior project.

The curriculum and the courses in our program undergo continuous evaluation and updating to guarantee that our graduates are at the forefront of knowledge in the field. New courses related to wireless communications, renewable energy, etc., have been introduced to match the rapid growth.

After completing the undergraduate program in electrical engineering, the student is qualified to take up responsible employment or engage in higher studies by enrolling in a graduate program. Numerous work opportunities for electrical engineers exist in the Kingdom of Saudi Arabia and overseas, where graduates may work in the areas of communications – including telephony, internet services, and point-to-point radio and television, as well as the areas of power engineering, electrical installation, broadcasting, microwave, satellite, and mobile communications. Graduates are also employed by industry for work in information processing, computers, and in systems analysis. Other opportunities exist in industrial electronics, instrumentation, manufacturing technology, and training. Some of the graduates go on to pursue their graduate studies towards the MSc or PhD either at KFUPM or at top universities around the world.

## **Vision**

To become the best Electrical Engineering school in the region.

## **Mission**

To provide quality education, research, and service to its constituents.

## **Program Educational Objectives**

The Electrical Engineering Department has defined a set of Program Educational Objectives that translates its mission into defined tasks. The objectives are measures of the graduates' achievements 3 to 5 years after completing the program. The Electrical Engineering Science program provides broad foundations to achieve the following objectives:

1. Graduates will have a successful career in Electrical Engineering.
2. Graduates will advance to the position of leadership in their profession.
3. Graduates may pursue their professional development through self-learning and advanced degrees.

## **Student Outcomes:**

Student Outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. They are related to skills, knowledge and behavior that students will acquire through the program. The Student Outcomes support the Program Educational Objectives. The Student Outcomes of the Electrical Engineering Science Program are as follows:

- (a) Apply knowledge of mathematics, science, and engineering
- (b) Design and conduct experiments, as well as to analyze and interpret data
- (c) Design a system, component, or process to meet desired needs
- (d) Function on multi-disciplinary teams
- (e) Identify, formulate, and solve engineering problems
- (f) Understand professional and ethical responsibility
- (g) Communicate effectively
- (h) Acquire the broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) Recognize the need for, and be able to engage in life-long learning
- (j) Acquire knowledge of contemporary issues
- (k) Use the techniques, skills, and modern engineering tools necessary for engineering practice
- (l) Apply the probabilistic methods and statistics to electrical engineering problems
- (m) Use effectively the information technology tools to design, develop, and implement electrical systems.

## Requirements for the B.S. Degree in Electrical Engineering

Every student majoring in Electrical Engineering must complete the following curriculum:

<b>(a) General Education Requirements (58 credit hours)</b>		<b>Credit Hours</b>
Computer Programming	ICS 103	3
English	ENGL 101, 102, 214	9
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Mathematics	MATH 101, 102, 201, 202, 302	17
Physical Education	PE 101, 102	2
Natural Sciences	CHEM 101, PHYS 101, 102	12
Engineering Economic Analysis	ISE 307	3
		<b>58</b>

<b>(b) Core Requirements (51 credit hours)</b>		
Digital Logic Circuit Design	EE 200	4
Electrical Circuits I, II	EE 202, 213	6
Intro. to Electrical Eng.	EE 206	2
Electronics I, II	EE 203, 303	8
Signals and Systems	EE 207	3
Electric Energy Eng.	EE 360	4
Control Eng. I	EE 380	4
Electromagnetics	EE 340	4
Communications Eng. I	EE 370	4
Digital Systems Eng.	EE 390	4
Probabilistic Methods in Electrical Eng.	EE 315	3
Fundamentals of EE Design	EE 311	2
Senior Design Project	EE 411	3
		<b>51</b>

<b>(c) Electives (25 credit hours)</b>		
Electrical Engineering Electives	Four EE 4xx Courses	13
Science or Eng. Elective	XXX 2xx	3
Technical Elective	XE xxx	3
General Studies	Two GS xxx Courses	6
		<b>25</b>

<b>(d) Summer Training (0 credit hours)</b>		
Summer Training	EE 399	0
		<b>0</b>

The total number of credit hours required is

**134**

# Electrical Engineering Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1	
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
CHEM 101	General Chemistry I	3	4	4	ENGL 102	Intro. to Report Writing	3	0	3	
ENGL 101	Intro. to Academic Discourse	3	0	3	IAS 101	Practical Grammar	2	0	2	
PHYS 101	General Physics I	3	3	4	PHYS 102	General Physics II	3	3	4	
IAS 111	Belief and its Effects	2	0	2	ICS 103	Computer Programming in C	2	3	3	
MATH 101	Calculus I	4	0	4	MATH 102	Calculus II	4	0	4	
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1	
		15	9	18				14	8	17
Second Year (Sophomore)										
EE 200	Digital Logic Circuit Design	3	3	4	EE 203	Electronics I	3	3	4	
EE 202	Electrical Circuits I	3	0	3	EE 213	Electrical Circuits II	2	3	3	
EE 206	Intro. to Electrical Eng.	2	0	2	EE 207	Signals and Systems	3	0	3	
MATH 201	Calculus III	3	0	3	ENGL 214	Academic & Professional Comm.	3	0	3	
IAS 212	Professional Ethics	2	0	2	MATH 202	Elements of Differential Eq.	3	0	3	
XXX 2xx	Science or Eng. Elective	3	0	3	IAS 201	Objective Writing	2	0	2	
		16	3	17				16	6	18
Third Year (Junior)										
EE 303	Electronics II	3	3	4	EE 340	Electromagnetics	3	3	4	
EE 360	Electric Energy Eng.	3	3	4	EE 370	Communications Eng. I	3	3	4	
EE 380	Control Eng. I	3	3	4	EE 390	Digital Systems Eng.	3	3	4	
IAS 301	Language Comm. Skills	2	0	2	EE 315	Probabilistic Methods in Electrical Eng.	3	0	3	
MATH 302	Eng. Math	3	0	3	EE 311	Fundamentals of EE Design	2	0	2	
		14	9	17				14	9	17
Summer Session					EE 399	Summer Training	0	0	0	
Fourth Year (Senior)										
EE 4xx	EE Elective I	3	0	3	EE 4xx	EE Elective III	3	0	3	
EE 4xx	EE Elective II	3	0	3	EE 4xx	EE Elective IV	3	3	4	
EE 411	Senior Design Project	1	6	3	XE xxx	Technical Elective	3	0	3	
ISE 307	Engineering Economic Analysis	3	0	3	GS xxx	GS Elective II	3	0	3	
GS xxx	GS Elective I	3	0	3	IAS 322	Human Rights in Islam	2	0	2	
		13	6	15				14	3	15
Total credit hours required in Degree Program : 134										

# Department of Mechanical Engineering

**Chairman: Dr Zuhair M. Gasem**

## Faculty

Abdulazeem	Badour	Merah
Abdulkhaliq	Bahaidarah	Mezghani
Abualhamayel	Baig	Mohammed
Abu-Dheir	Bashmal	Mokheimer
Ahmed	Bazoune	Muhammad
Akhtar	Binmansoor	Nakla
Al-Aqeeli	El-Shaarawi	Nouari
Al-Athel	Elsharqawy	Ouakad
Albinmousa	Furquan	Pashah
Al-Dini	Gandhidasan	Patel
Al-Farayedhi	Gasem	Raza
Al-Hadhrami	Habib	Sahin
Al-Kaabi	Hassan, F	Said
Al-Marbati	Hassan, M	Shaukat
Al-Nassar	Hawwa	Sheikh
Al-Qahtani, H	Jabbar	Shuaib
Al-Qahtani, M	Khalifa	Shuja
Al-Qutub	Khan, S	Sorour
Alsaeed	Khan, Z	Sunar
Al-Sarkhi	Khulief	Toor
Alsulaiman	Laoui	Yaqub
Anis	Mahmood	Yilbas
Antar	Mansoor	Younas
Arif	Mansour	Zubair
Badr	Mekid	

## **Introduction**

Mechanical engineering is one of the oldest, broadest, and perhaps most versatile discipline among all engineering disciplines. Mechanical engineers use the principles of energy, mechanics, and materials to design and manufacture machines and devices of all types, and create the systems and processes that drive technology and virtually every industry. The key characteristics of the mechanical engineering profession are its breadth, flexibility, and individuality. Mechanical engineering derives its breadth from the need to design and manufacture everything from small individual components and devices to large engineering structures and systems. Its flexibility emanates from its scope involving materials, solid and fluid mechanics, thermodynamics, heat transfer, control, instrumentation, design, and manufacturing. Its individuality lies in the ever-emerging specialized mechanical engineering fields such as biomechanics, robotics, mechatronics, nanomechanics, microfluidics, micropower generation, MEMS and NEMS.

Mechanical engineering encompasses an understanding of core concepts including mechanics, kinematics, thermodynamics, heat transfer, materials science, structural and manufacturing analyses. Mechanical Engineers use these core concepts to conceive, design, develop, manufacture, and maintain devices and tools, equipment and machinery, products and plants that run the engineering industry. Mechanical engineers also use these core principles to ensure that the products are manufactured economically, and function safely, efficiently and reliably. Mechanical engineers work in the automotive, aerospace, chemical, computer, power, petrochemical, marine and machine tool manufacturing industries, to name a few. Thus, it may be safely stated that every product or service in the modern world has probably been touched in some way by a mechanical engineer.

With the above in mind, the mechanical engineering curriculum at KFUPM has been designed to provide a broad yet rigorous understanding of core mechanical engineering subjects in thermal sciences, mechanical design, materials science and manufacturing processes in the first three years of study. During these years the ME curriculum aims to develop critical thinking and problem-solving skills using the principles of science and mathematics. ME students have to take an 8-week Summer Training Program in industry. After completion of his summer training each student is required to submit a formal summer training report. In the senior year, the students have sufficient flexibility to select ME and Technical Electives from a broad spectrum of courses in the areas of thermo-fluids, design and dynamics, or materials and manufacturing. A senior Capstone Design project taken over the two final semesters provides each student with the opportunity to integrate his knowledge of the previous three years, exercise his creativity, enhance his individuality, and develop entrepreneurship skills. The ME program is evaluated by ABET every five years and received its latest accreditation in 2010.

The employment opportunities for ME graduates from KFUPM have been very good and are expected to become even better with the rapid pace of industrialization in the Kingdom of Saudi Arabia. Large-scale expansions in the petrochemical, chemical process, and power generation industries will require a growing influx of ME graduates. Also, many ambitious programs in clean water, clean energy, nanotechnology, and nuclear power generation will result in a substantial increase in the demand for ME graduates in the short and long term.

## **Mission**

The Mechanical Engineering Department is committed to providing the highest quality education in mechanical engineering, conducting world-class basic and applied research, addressing the evolving needs of industry and society, and supporting the development of more competitive and new industries in the Kingdom of Saudi Arabia.

### **Vision**

The Mechanical Engineering Department at KFUPM will seek distinction as a leader in providing world-class mechanical engineering education to the Kingdom of Saudi Arabia and the Gulf region. The graduates of the Department will be at the forefront of establishing, advancing, and expanding an indigenous knowledge base, which can be solidly relied upon accepting future challenges, providing proper directions for industrial growth, and furnishing reliable solutions to engineering problems.

### **Goals**

1. Be preeminent in developing and providing the highest quality undergraduate learning environment in Mechanical Engineering education.
2. Be a world reputed Mechanical Engineering Department in graduate education, and basic and applied research.
3. Be preeminent on international level for academic, basic, and applied research.
4. Be a preeminent and leading institution for supporting the technological advancement and economic growth of the local, national, and Gulf area industry.
5. Be a leading university in human-resource development and effective and efficient infrastructure utilization.



## Requirements for the B.S. Degree in Mechanical Engineering

Every student majoring in Mechanical Engineering must complete the following curriculum:

<b>(a) General Education Requirements (67 credit hours)</b>		<b>Credit Hours</b>
Computer Programming in C	ICS 103	3
English	ENGL 101, 102, 214	9
Engineering Courses	CE 201, 203, EE 204, 306	12
Islamic & Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Mathematics	MATH 101, 102, 201, 202, 301	17
Physical Education	PE 101, 102	2
Sciences	CHEM 101, PHYS 101, 102	12
		<b>67</b>

<b>(b) Core Requirements (49 credit hours)</b>		
Mechanical Engineering Drawing & Graphics	ME 210	3
Intro. to Mechanical Engineering Design	ME 218	2
Dynamics, Control, Mechanics of Machines	ME 201, 309, 413	9
Thermodynamics	ME 203, 204	6
Materials Science and Engineering	ME 216	3
Materials Lab	ME 217	1
Manufacturing Processes	ME 322	3
Manufacturing Lab	ME 323	1
Fluid Mechanics	ME 311	3
Heat Transfer	ME 315	3
Machine Design	ME 307, 308	7
Thermofluids Lab	ME 316	1
Design and Analysis of Engineering Experiments	ME 451	3
Measurements and Lab Project	ME 452	1
Senior Design Project	ME 411, 412	3
		<b>49</b>

<b>(c) Electives (18 credit hours)</b>		
Technical (Free) Elective	Two XE xxx courses	6
Mechanical Engineering Elective I (Design)	ME 4xx	3
Mechanical Engineering Elective II (Free)	ME 4xx	3
General Studies	Two GS xxx Courses	6
		<b>18</b>

<b>(d) Summer Training (0 credit hours)</b>		
Summer Training	ME 399	0
		<b>0</b>

**The total number of credit hours required is**

**134**

# Mechanical Engineering Curriculum

Mechanical Engineering Curriculum															
COURSE		TITLE			LT	LB	CR	COURSE		TITLE			LT	LB	CR
Preparatory Year															
ENGL 01-xx		Prep. English I (First Quarter)			15	5	4	ENGL 03-xx		Prep. English III (Third Quarter)			15	5	4
ENGL 02-xx		Prep. English II (Second Quarter)					4	ENGL 04-xx		Prep. English IV (Fourth Quarter)					4
MATH 001		Prep. Math I			3	1	4	MATH 002		Prep. Math II			3	1	4
PYP 001		Prep. Physical Science			2	0	2	PYP 002		Prep. Computer Science			0	2	1
PYP 003		University Study Skills			0	2	1	PYP 004		Prep. Eng. Technology			0	2	1
PE 001		Prep. Health and Physical Educ. I			0	2	1	PE 002		Prep. Health and Physical Educ. II			0	2	1
					20	10	16						18	12	15
Total credit hours required in Preparatory Program: 31															
First Year (Freshman)															
CHEM 101		General Chemistry I			3	4	4	IAS 101		Practical Grammar			2	0	2
PHYS 101		General Physics I			3	3	4	PHYS 102		General Physics II			3	3	4
MATH 101		Calculus I			4	0	4	MATH 102		Calculus II			4	0	4
ENGL 101		Intro. to Academic Discourse			3	0	3	ENGL 102		Intro. to Report Writing			3	0	3
IAS 111		Belief and its Effects			2	0	2	ICS 103		Computer Programming in C			2	3	3
PE 101		Health and Physical Educ. I			0	2	1	PE 102		Health and Physical Educ. II			0	2	1
					15	9	18						14	8	17
Second Year (Sophomore)															
ME 203		Thermodynamics I			3	0	3	ME 218		Intro. to Mechanical Eng. Design			1	3	2
MATH 201		Calculus III			3	0	3	ME 201		Dynamics			3	0	3
ME 210		Mechanical Eng. Drawing & Graphics			2	3	3	ME 204		Thermodynamics II			3	0	3
ME 216		Materials Science and Eng.			3	0	3	MATH 202		Elements of Differential Eq.			3	0	3
ME 217		Materials Lab			0	3	1	CE 203		Structural Mechanics I			3	0	3
CE 201		Statics			3	0	3	EE 204		Fundamentals of Electrical Circuits			2	3	3
								IAS 201		Objective Writing			2	0	2
					14	6	16						17	6	19
Third Year (Junior)															
ME 322		Manufacturing Processes			3	0	3	ME 309		Mechanics of Machines			3	0	3
ME 323		Manufacturing Lab			0	3	1	ME 308		Machine Design II			3	3	4
IAS 212		Professional Ethics			2	0	2	ME 315		Heat Transfer			3	0	3
ME 307		Machine Design I			3	0	3	ME 316		Thermofluids Lab			0	3	1
ME 311		Fluid Mechanics			3	0	3	MATH 301		Methods of Applied Math			3	0	3
EE 306		Electromechanical Devices			2	3	3	IAS 301		Language Comm. Skills			2	0	2
ENGL 214		Academic & Professional Comm.			3	0	3								
					16	6	18						14	6	16
Summer Session								ME 399		Summer Training			0	0	0
Fourth Year (Senior)															
ME 413		Systems Dynamics and Control			2	3	3	ME 412		Senior Design Project II			0	6	2
ME 451		Design and Analysis of Eng. Experiments			3	0	3	XE 4xx		Technical Elective I			3	0	3
ME 452		Measurements and Lab Project			0	3	1	XE 4xx		Technical Elective II			3	0	3
ME 411		Senior Design Project I			1	0	1	ME 4xx		ME Elective II			3	0	3
ME 4xx		ME Elective I			3	0	3	IAS 322		Human Rights in Islam			2	0	2
GS xxx		GS Elective I			3	0	3	GS xxx		GS Elective II			3	0	3
					12	6	14						14	6	16
Total credit hours required in Degree Program : 134															

# **COLLEGE OF COMPUTER SCIENCES & ENGINEERING**

**Dean: Dr. Adel Ahmed**

## **UNDERGRADUATE DEPARTMENTS**

COMPUTER ENGINEERING  
INFORMATION & COMPUTER SCIENCE  
SYSTEMS ENGINEERING

The College of Computer Sciences & Engineering was established in 1986. It symbolizes the desire to make computing a centerpiece of its education and research activities in the 21st century. Its main lines of business include: Computer Sciences and Engineering, Information Technology, Computer Networks and Communications, Systems Engineering, Control and Instrumentation, and Industrial Engineering.

### **Vision**

To be a globally recognized college in Computer Sciences and Engineering Systems known for its distinguished graduates and world class research.

### **Mission**

The College of Computer Sciences and Engineering is committed to:

- Graduate competent professionals.
- Conduct innovative research that advances the frontiers of knowledge and addresses local problems.
- Engage with society in value-adding activities.

### **Strategic Objectives**

1. Prepare competent qualified graduates in the areas in the college line of business that exceed customer requirements.
2. Provide up to date current academic programs that meet international standards and satisfy market needs.
3. Provide a student focused integrated educational experience.
4. Build a strong, motivated and highly committed faculty community.
5. Attract, maintain and develop a qualified pool of undergraduate and graduate students.
6. Conduct research at the frontiers of knowledge in the areas specified in the college line of business with emphasis on areas that serve and sustain the Kingdom's economic development.
7. Create and encourage partnership with industry, government, local/ international institutions and alumni.
8. Continuously build and modernize the college infrastructure including computing facilities, laboratories.

The college maintains partnerships with IT technology providers and prestigious universities for the sake of being on the top of the technology and research. Areas like Information Security, Arabization and Computer Networking are among the areas of excellence. Other allied areas in the college, such as maintenance engineering and supply chain management, have gained international recognition in partnership with local petroleum and petrochemical industries.

The college has acquired special computing facilities and computer networks with state-of-the-art technologies able to provide services that are compatible with capabilities and

expectations of faculty and students. It also provides technical support with a team of highly qualified engineers and technicians.

To serve its mission the college has three administrative departments.

### **1. Computer Engineering Department (COE)**

The department offers programs in Computer Engineering. It grants B.S., M.S. and PhD degrees in Computer Engineering. The department also grants an M.S. degree in Computer Networks.

### **2. Information & Computer Science Department (ICS)**

The department offers two B.S programs; one in Computer Science and the other in Software Engineering. The department also grants an M.S. degree in Computer Science, Software Engineering, and Information Security, and a PhD degree in Computer Science.

### **3. Systems Engineering Department (SE)**

The department offers two undergraduate programs in Control and Instrumentation Systems Engineering, and in Industrial and Systems Engineering. The department also grants M.S. and PhD degrees in both areas. The department also has MS programs in Supply Chain Management and in Maintenance Engineering. It has established centers of excellence in these areas as well.

These programs prepare students for challenging science and engineering careers in the high technology areas of computing and industrial systems.

## **College Requirements**

### ***Common Freshman Year***

College BS programs have a common freshman curriculum which is similar to the engineering programs in KFUPM. This helps students to select their major area of study as late as the beginning of the sophomore year.

### ***Common Core Subjects***

Common core subjects cover courses in basic sciences, Mathematics, English, Islamic history and culture, Arabic language and literature, Physical Education, social and behavioral sciences, and program core subjects.

### ***Requirements for Graduation***

All university graduation requirements and academic policies apply to the college.

## Department of Computer Engineering

**Chairman: Dr. Ahmad Almulhem**

### Faculty

Abdel-Aal  
AbuAmara  
Adiche  
Alawami  
Alkharobi  
Al-Madani  
Almulhem  
Al-Mouhamed  
Al-Najjar  
Amin

Baig  
Barnawi  
Baroudi  
Chenaoua  
El-Maleh  
Elrabaa  
Garba  
Hasan  
Khayyat  
Mahmoud, A.

Mahmoud, M.  
Mohammed  
Mudawar  
Osais  
Raad  
Rowaihy  
Selmi  
Sheltami

## **Introduction**

The Computer Engineering Department (COE) was established in 1986 in the College of Computer Sciences and Engineering (CCSE) at King Fahd University of Petroleum and Minerals (KFUPM). It offers a program leading to a BS degree in Computer Engineering, a program leading to an MS degree in Computer Engineering, a program leading to an MS degree in Computer Networks, and a joint PhD program with the Information and Computer Science Department.

Computer Engineering (COE) is the discipline concerned with the design, analysis, modeling and implementation of computers and networks systems. Both the software and the hardware aspects of these systems are studied in a balanced and coherent manner. As such, it is of interest and in demand locally in Saudi Arabia, regionally in the Middle East, and internationally worldwide.

The Computer Engineering program at KFUPM develops the necessary skills and competences required to design and implement computer systems and networks. The two focus areas of computer systems and computer networks are deemed as most important for the local job market (present and future). All COE core courses establish the required foundation for these two areas. Students can pursue one or a combination of these areas through electives which are all aligned with these two areas. In addition, sufficient emphasis is given to the study of computer science to provide a coherent view of computer systems and an understanding of the interdependencies of hardware and software components and their interfaces and tradeoffs. Furthermore, the COE program equips the students with many non-technical engineering skills and knowledge essential for their professional practice.

The Computer Engineering program is serving the Kingdom's critical need for computer professionals who can design and implement computer systems and networks. The graduates of the COE program are expected to play a key role in the Kingdom's transition to a *knowledge-based* economy by harnessing the benefits of IT technology in the different fields of governmental administrations, and manufacturing and service sectors.

## **Vision**

The vision of the COE Department is to become a recognized center of excellence in providing quality education and technical services, as well as in advancing computing technologies through innovative research.

## **Mission**

The mission of the Computer Engineering Department is:

1. To prepare competent professionals in the area of Computer Engineering who are competitive worldwide and prepared to be the leaders in the Saudi industry, academia and government.
2. To conduct original research that contributes to the advancement of computing technologies worldwide, solves local problems and leads to the transfer and dissemination of knowledge to the Saudi society at large.
3. To provide the Saudi society with high-quality technical services in areas related to computer engineering in terms of consultation, training and applied projects.

## **Program Educational Objectives**

The Program Educational Objectives of the COE program is to produce graduates who, after few years from graduation, will have:

1. established themselves as successful professional computer engineers with demonstrated leadership capabilities,
2. demonstrated an ability to pursue a successful professional and career growth, and
3. enrolled and succeeded in graduate and professional studies/programs if they chose to do so

## **Student Outcomes**

The Computer Engineering Student Outcomes are:

- 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 (Our interpretation of multidisciplinary teams includes teams of individuals with similar educational backgrounds focusing on different aspects of a project as well as teams of individuals with different educational backgrounds).
- 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 (Our interpretation of this includes teaching students that the underlying theory is important because the technology changes, coupled with enhancing their self-learning ability).
- j. knowledge of contemporary issues (Our interpretation of this includes presenting students with issues such as the impact of globalization, the outsourcing of both engineering and other support jobs as practiced by modern international companies).
- k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

With the following additional Student Outcome:



- I. The ability to design a system that involves the integration of hardware and software components.

## Requirements for the B.S. Degree in Computer Engineering

### Option I: With Summer Training

Every student majoring in Computer Engineering (Summer Training Option) must complete the following curriculum:

<b>(a) General Education Requirements (52 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENGL 214, IAS 101, 201, 301	9
Computer Programming	ICS 102	3
Chemistry	CHEM 101	4
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 101, 102, 201, 260	14
Physical Education	PE 101, 102	2
Physics	PHYS 101, 102	8
		<b>52</b>

<b>(b) Core Requirements (53 credit hours)</b>		
COE	COE 202, 203, 241, 300, 301, 306, 344, 485	24
ICS	ICS 201, 202, 253, 431	15
EE	EE 202, 212, 203	8
ISE	ISE 307	3
STAT	STAT 319	3
		<b>53</b>

<b>(c) Electives (27 credit hours)</b>		
COE Depth Elective	COE 405 or CE 444	3
COE Electives	Four COE 4xx Courses	12
Technical Electives	Two XE xxx Courses from Department's List	6
General Elective	Two GS xxx Courses	6
		<b>27</b>

<b>(d) Summer Training (0 credit hours)</b>		
Summer Training	COE 399	0
		<b>0</b>

**The total number of credit hours required is** **132**

## Computer Engineering Curriculum – Summer Training Option

Computer Engineering Curriculum - Summer Training Option										
COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2		
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
CHEM 101	General Chemistry I	3	4	4	PHYS 102	General Physics II	3	3	4	
ENGL 101	Intro. to Academic Discourse	3	0	3	ICS 102	Intro. to Computing I	2	3	3	
IAS 111	Belief and its Effects	2	0	2	MATH 102	Calculus II	4	0	4	
MATH 101	Calculus I	4	0	4	ENGL 102	Intro. to Report Writing	3	0	3	
PHYS 101	General Physics I	3	3	4	IAS 101	Practical Grammar	2	0	2	
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1	
		15	9	18				14	8	17
Second Year (Sophomore)										
COE 202	Digital Logic Design	3	0	3	ICS 202	Data Structures	3	3	4	
COE 203	Digital Logic Design Lab	0	3	1	EE 203	Electronics I	3	3	4	
ICS 201	Intro. to Computing II	3	3	4	IAS 212	Professional Ethics	2	0	2	
EE 202	Electrical Circuits I	3	0	3	COE 241	Data and Computer Comm.	3	0	3	
EE 212	Electrical Circuits Laboratory	0	3	1	STAT 319	Probability and Stat. for Eng. and Scientists	2	3	3	
MATH 201	Calculus III	3	0	3						
IAS 201	Objective Writing	2	0	2						
		14	9	17				13	9	16
Third Year (Junior)										
MATH 260	Intro. to Differential Eq. & Linear Algebra	3	0	3	COE 306	Intro. to Embedded Systems	3	3	4	
ICS 253	Discrete Structures I	3	0	3	IAS 301	Language Comm. Skills	2	0	2	
ENGL 214	Academic & Professional Comm.	3	0	3	COE 4xx	COE Depth Elective	3	0	3	
COE 301	Computer Organization	3	3	4	XE xxx	Technical Elective I	3	0	3	
COE 344	Computer Networks	3	3	4	COE 300	Principles of Computer Eng. Design	1	3	2	
					ISE 307	Eng. Economic Analysis	3	0	3	
		15	6	17				15	6	17
Summer Session					COE 399	Summer Training	0	0	0	
Fourth Year (Senior)										
ICS 431	Operating Systems	3	3	4	COE 485	Senior Design Project	1	6	3	
COE 4xx	COE Elective I	3	0	3	IAS 322	Human Rights in Islam	2	0	2	
COE 4xx	COE Elective II	3	0	3	COE 4xx	COE Elective III	3	0	3	
XE xxx	Technical Elective II	3	0	3	COE 4xx	COE Elective IV	3	0	3	
GS xxx	GS Elective I	3	0	3	GS xxx	GS Elective II	3	0	3	
		15	3	16				12	6	14
Total credit hours required in Degree Program : 132										

## Requirements for the B.S. Degree in Computer Engineering

### Option II: With Cooperative Work

Every student majoring in Computer Engineering (Cooperative Work Option) must complete the following curriculum:

<b>(a) General Education Requirements (52 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENGL 214, IAS 101, 201, 301	9
Computer Programming	ICS 102	3
Chemistry	CHEM 101	4
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 101, 102, 201, 260	14
Physical Education	PE 101, 102	2
Physics	PHYS 101, 102	8
		<b>52</b>

<b>(b) Core Requirements (57 credit hours)</b>		
COE	COE 202, 203, 241, 300, 301, 306, 344, 485	24
ICS	ICS 201, 202, 253, 324, 431	19
EE	EE 202, 212, 203	8
ISE	ISE 307	3
STAT	STAT 319	3
		<b>57</b>

<b>(c) Electives (15 credit hours)</b>		
COE Depth Elective	COE 405 or CE 444	3
COE Electives	Two COE 4xx Courses	6
General Elective	Two GS xxx Courses	6
		<b>15</b>

<b>(d) Cooperative Work (9 credit hours)</b>		
Cooperative Work	COE 351	9
		<b>9</b>

**The total number of credit hours required is**

**133**

## Computer Engineering Curriculum – Cooperative Work Option

Computer Engineering Curriculum - Cooperative Work Option					Computer Engineering Curriculum - Cooperative Work Option				
COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
<b>Preparatory Year</b>									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	
		<b>20</b>	<b>10</b>	<b>16</b>			<b>18</b>	<b>12</b>	<b>15</b>
<b>Total credit hours required in Preparatory Program: 31</b>									
<b>First Year (Freshman)</b>									
CHEM 101	General Chemistry I	3	4	4	PHYS 102	General Physics II	3	3	4
ENGL 101	Intro. to Academic Discourse	3	0	3	ICS 102	Intro. to Computing I	2	3	3
IAS 111	Belief and its Effects	2	0	2	MATH 102	Calculus II	4	0	4
MATH 101	Calculus I	4	0	4	ENGL 102	Intro. to Report Writing	3	0	3
PHYS 101	General Physics I	3	3	4	IAS 101	Practical Grammar	2	0	2
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1
		<b>15</b>	<b>9</b>	<b>18</b>			<b>14</b>	<b>8</b>	<b>17</b>
<b>Second Year (Sophomore)</b>									
COE 202	Digital Logic Design	3	0	3	ICS 202	Data Structures	3	3	4
COE 203	Digital Logic Design Lab	0	3	1	ICS 253	Discrete Structures I	3	0	3
ICS 201	Intro. to Computing II	3	3	4	EE 203	Electronics I	3	3	4
EE 202	Electrical Circuits I	3	0	3	IAS 212	Professional Ethics	2	0	2
EE 212	Electrical Circuits Laboratory	0	3	1	COE 241	Data and Computer Comm.	3	0	3
MATH 201	Calculus III	3	0	3	STAT 319	Probability and Stat. for Eng. and Scientists	2	3	3
IAS 201	Objective Writing	2	0	2					
		<b>14</b>	<b>9</b>	<b>17</b>			<b>16</b>	<b>9</b>	<b>19</b>
<b>Third Year (Junior)</b>									
MATH 260	Intro. to Differential Eq. & Linear Algebra	3	0	3	COE 306	Intro. to Embedded Systems	3	3	4
ENGL 214	Academic & Professional Comm.	3	0	3	COE 4xx	COE Depth Elective	3	0	3
IAS 301	Language Comm. Skills	2	0	2	GS xxx	GS Elective I	3	0	3
COE 301	Computer Organization	3	3	4	COE 300	Principles of Computer Eng. Design	1	3	2
COE 344	Computer Networks	3	3	4	ICS 324	Database Systems	3	3	4
ISE 307	Eng. Economic Analysis	3	0	3	IAS 322	Human Rights in Islam	2	0	2
		<b>17</b>	<b>6</b>	<b>19</b>			<b>15</b>	<b>9</b>	<b>18</b>
<b>Summer Session</b>					COE 350	Begin Cooperative Work	<b>0</b>	<b>0</b>	<b>0</b>
<b>Fourth Year (Senior)</b>									
COE 351	Cooperative Work	0	0	9	COE 485	Senior Design Project	1	6	3
					ICS 431	Operating Systems	3	3	4
					COE 4xx	COE Elective I	3	0	3
					COE 4xx	COE Elective II	3	0	3
					GS xxx	GS Elective II	3	0	3
		<b>0</b>	<b>0</b>	<b>9</b>			<b>13</b>	<b>9</b>	<b>16</b>
<b>Total credit hours required in Degree Program : 133</b>									

## Department of Information and Computer Science

**Chairman: Dr. Abdulaziz Al-Khoraidly**

### **FACULTY**

Ahmed, B	Al-Suhaim	Hassan
Ahmed, F	Al-Turki	Hassine
Ahmed, M	Alvi	Mahmood
Alfagih	Arafat	Mohammed, A
Al-Hashim	Aslam	Muhammed, S
Al-Herz	Azzedin	Mlaih
Al-Jamaan	Balah	Niazi
Al-Jasser	Darwish	Ramadan
Al-Khatib	El-Alfy	Sabri, M
Al-Khoraidly	El-Attar	Yahya
Al-Mohammadi	El-Bassuny	Yazdani
Al-Muhtaseb	Elish	Zhioua
Al-Mulhem	Faisal	
Al-Shayeb	Ghouti	

## **Introduction**

The Information and Computer Science (ICS) Department at KFUPM was established in September 1979 and it developed and evolved over the years to become one of the most active departments of the University in teaching, research, and service to the University. Moreover, the ICS Department is recognized throughout the Gulf region and many parts of the world for its excellence in education and research. The Department provides two 4-year undergraduate programs leading to a Bachelor of Science degree in Computer Science and a Bachelor of Science degree in Software Engineering.

The two programs can be broadly defined as the study of the phenomena surrounding computing and computers. It involves the study of the theoretical principles, design and implementation of computer systems. As computers have become part of day-to-day activities, the demand for specialized professionals in the area has increased significantly .

To help meet these demands, KFUPM has established undergraduate programs that relate directly to computer science and focus on theory, design, and applications. The programs have both academic and professional orientations. Thus, they enable graduates to meet the challenges they will face in real-life applications, research and advanced studies in computer science. The programs are designed to provide several important features:

1. Breadth and depth. The programs have a set of core courses that provide breadth in the field. Additional specialized courses and electives are chosen to provide depth in the programs.
2. Balance. Theoretical core courses and software/hardware are joined in theory and in practice through integrated lecture and laboratory sequences.
3. Flexibility. The curricula are flexible and provide opportunities for students to emphasize specific areas of interest through their choice of appropriate technical and ICS elective courses.

## **Vision**

To be a regional leader that is recognized worldwide in education, research and professional development in the areas of Computer Science and Software Engineering.

## **Mission**

- To provide high quality undergraduate and graduate educational programs in Computer science and Software Engineering,
- To contribute significantly to the research and the discovery of new knowledge and methods in computing,
- To offer expertise, resources, and services to the community, and
- To keep its faculty members current by providing opportunities for professional development.

## **B.S. IN COMPUTER SCIENCE PROGRAM**

The BS in Computer Science program was revised and approved by the KFUPM University Board in 2006. The program is mainly based on the ACM/IEEE-CS Joint Curriculum Task Force report titled “Computing Curricula 2001”. General education requirements, core requirements, and elective courses have been carefully selected. The program gained full ABET accreditation effective July 2010.

### **Program Mission**

The mission of the CS program is to provide high-quality education in computer science that prepares students for professional careers and lifelong learning in developing/managing computational processes and systems, with emphasis on net-centric computing, information management, and intelligent systems.

### **Program Objectives**

The educational objectives of the CS program are stated as follows:

1. Prepare graduates, who are entering immediately into professions upon graduation, to be capable of performing duties on an entry-level computing-related position.
2. Prepare graduates to pursue graduate studies to successfully complete an advanced degree.
3. Prepare graduates to work as individuals with minimum guidance and as leaders or members of a team.
4. Prepare graduates to follow appropriate practices within a professional, legal, and ethical framework.
5. Prepare graduates to recognize the need for and be capable of pursuing life-long learning.

### **Program Learning Outcomes**

The CS program enables students to acquire, by the time of graduation, the following learning outcomes:

- a) An ability to apply knowledge of computing and mathematics appropriate to the discipline;
- b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;
- c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs;
- d) An ability to function effectively as team members to accomplish a common goal;
- e) An understanding of professional, ethical, legal, security and social issues and responsibilities;
- f) An ability to communicate effectively with a range of audiences;
- g) An ability to analyze the local and global impact of computing on individuals, organizations, and society;
- h) An ability to recognize the need for, and to engage in, continuing professional development;
- i) An ability to use current techniques, skills, and tools necessary for computing practice;



- j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; and
- k) An ability to apply design and development principles in the construction of software systems of varying complexity.

### **The CS Program**

The department is offering the computer science program with two options:

- Option I:** B.S. in Computer Science with summer training.
- Option II:** B.S. in Computer Science with Coop.

## ***Requirements for the B.S. Degree in Computer Science***

### **Option I: With Summer Training**

Every student majoring in Computer Science (Summer Training Option) must complete the following curriculum:

<b>(a) General Education Requirements (52 credit hours)</b>		<b>Credit Hours</b>
Basic Science	CHEM 101, PHYS 101, 102	12
Mathematics and Statistics	MATH 101, 102, 201, 260, STAT 319	17
English	ENGL 101, 102, 214	9
Physical Education	PE 101, 102	2
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
		<b>52</b>

<b>(b) Core Requirements (55 credit hours)</b>		
ICS	ICS 102, 201, 202, 233, 253, 254, 309, 324, 343, 353, 381, 410, 411, 431	47
COE	COE 202, 203	4
SWE	SWE 311	4
		<b>55</b>

<b>(c) Electives (24 credit hours)</b>		
ICS Electives	Four ICS/SWE xxx Courses	12
Technical Electives	Four XE xxx Courses	12
		<b>24</b>

### **(d) Summer Training (0 credit hours)**

Every student is required to participate in a summer training program of genuine practical experience and submit a formal written report.

Summer Training	ICS 399	0
		<b>0</b>

**The total number of credit hours required is**

**131**

COURSE		TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year											
ENGL 01-xx		Prep. English I (First Quarter)	15	5	4	ENGL 03-xx		Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx		Prep. English II (Second Quarter)			4	ENGL 04-xx		Prep. English IV (Fourth Quarter)			4
MATH 001		Prep. Math I	3	1	4	MATH 002		Prep. Math II	3	1	4
PYP 001		Prep. Physical Science	2	0	2	PYP 002		Prep. Computer Science	0	2	1
PYP 003		University Study Skills	0	2	1	PYP 004		Prep. Eng. Technology	0	2	1
PE 001		Prep. Health and Physical Educ. I	0	2	1	PE 002		Prep. Health and Physical Educ. II	0	2	1
			20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31											
First Year (Freshman)											
MATH 101		Calculus I	4	0	4	MATH 102		Calculus II	4	0	4
PHYS 101		General Physics I	3	3	4	PHYS 102		General Physics II	3	3	4
ENGL 101		Intro. to Academic Discourse	3	0	3	ENGL 102		Intro. to Report Writing	3	0	3
CHEM 101		General Chemistry I	3	4	4	ICS 102		Intro. to Computing I	2	3	3
IAS 101		Practical Grammar	2	0	2	IAS 111		Belief and its Effects	2	0	2
						PE 101		Health and Physical Educ. I	0	2	1
			15	7	17				14	8	17
Second Year (Sophomore)											
ICS 201		Intro. to Computing II	3	3	4	ICS 202		Data Structures	3	3	4
ICS 253		Discrete Structures I	3	0	3	ICS 233		Computer Architecture & Assembly Lang.	3	3	4
COE 202		Digital Logic Design	3	0	3	ICS 254		Discrete Structures II	3	0	3
MATH 201		Calculus III	3	0	3	MATH 260		Intro. to Differential Eq. & Linear Algebra	3	0	3
PE 102		Health and Physical Educ. II	0	2	1	COE 203		Digital Logic Laboratory	0	3	1
IAS 212		Professional Ethics	2	0	2	ENGL 214		Academic & Professional Comm.	3	0	3
			14	5	16				15	9	18
Third Year (Junior)											
ICS 309		Computing and Society	2	0	2	ICS 343		Fundamentals of Computer Networks	3	3	4
ICS 324		Database Systems	3	3	4	ICS 381		Principles of Artificial Intelligence	3	0	3
ICS 353		Design and Analysis of Algorithms	3	0	3	ICS xxx		ICS Elective I	3	0	3
SWE 311		Principles of Software Eng.	3	3	4	IAS 322		Human Rights in Islam	2	0	2
IAS 201		Objective Writing	2	0	2	XE xxx		Free Elective I	3	0	3
STAT 319		Probability and Stat. for Eng. and Scientists	2	3	3						
			15	9	18				14	3	15
Summer Session						ICS 399		Summer Training	0	0	0
Fourth Year (Senior)											
ICS 410		Programming Languages	3	0	3	ICS 411		Senior Project	1	6	3
ICS 431		Operating Systems	3	3	4	ICS xxx		ICS Elective III	3	0	3
ICS xxx		ICS Elective II	3	0	3	ICS xxx		ICS Elective IV	3	0	3
XE xxx		Free Elective II	3	0	3	IAS 301		Language Comm. Skills	2	0	2
XE xxx		Free Elective III	3	0	3	XE xxx		Free Elective IV	3	0	3
			15	3	16				12	6	14
Total credit hours required in Degree Program : 131											

## Requirements for the B.S. Degree in Computer Science

### Option II: With Cooperative Work

Every student majoring in Computer Science (Cooperative Work Option) must complete the following curriculum:

<b>(a) General Education Requirements (52 credit hours)</b>		<b>Credit Hours</b>
Basic Science	CHEM 101, PHYS 101, 102	12
Mathematics and Statistics	MATH 101, 102, 201, 260, STAT 319	17
English	ENGL 101, 102, 214	9
Physical Education	PE 101, 102	2
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
		<b>52</b>

<b>(b) Core Requirements (52 credit hours)</b>		
ICS	ICS 102, 201, 202, 233, 253, 254, 309, 324, 343, 353, 381, 410, 431	44
COE	COE 202, 203	4
SWE	SWE 311	4
		<b>52</b>

<b>(c) Electives (18 credit hours)</b>		
ICS Electives	Four ICS xxx Courses	12
Technical Electives	Two XE xxx Courses	6
		<b>18</b>

<b>(d) Cooperative Work (9 credit hours)</b>		
Every student is required to work for 28 weeks in industry for real practical experience and submit a formal written report.		
Cooperative Work	ICS 351	9
		<b>9</b>

**The total number of credit hours required is** **131**

## Computer Science Curriculum – Cooperative Work Option

Computer Science Curriculum - Cooperative Work Option															
COURSE		TITLE			LT	LB	CR	COURSE		TITLE			LT	LB	CR
Preparatory Year															
ENGL 01-xx		Prep. English I (First Quarter)			15	5	4	ENGL 03-xx		Prep. English III (Third Quarter)			15	5	4
ENGL 02-xx		Prep. English II (Second Quarter)					4	ENGL 04-xx		Prep. English IV (Fourth Quarter)					4
MATH 001		Prep. Math I			3	1	4	MATH 002		Prep. Math II			3	1	4
PYP 001		Prep. Physical Science			2	0	2	PYP 002		Prep. Computer Science			0	2	1
PYP 003		University Study Skills			0	2	1	PYP 004		Prep. Eng. Technology			0	2	1
PE 001		Prep. Health and Physical Educ. I			0	2	1	PE 002		Prep. Health and Physical Educ. II			0	2	
					20	10	16					18	12	15	
Total credit hours required in Preparatory Program: 31															
First Year (Freshman)															
MATH 101		Calculus I			4	0	4	MATH 102		Calculus II			4	0	4
PHYS 101		General Physics I			3	3	4	PHYS 102		General Physics II			3	3	4
ENGL 101		Intro. to Academic Discourse			3	0	3	ENGL 102		Intro. to Report Writing			3	0	3
CHEM 101		General Chemistry I			3	4	4	ICS 102		Intro. to Computing I			2	3	3
IAS 101		Practical Grammar			2	0	2	IAS 111		Belief and its Effects			2	0	2
								PE 101		Health and Physical Educ. I			0	2	1
					15	7	17					14	8	17	
Second Year (Sophomore)															
ICS 201		Intro. to Computing II			3	3	4	ICS 202		Data Structures			3	3	4
ICS 253		Discrete Structures I			3	0	3	ICS 233		Computer Architecture & Assembly Lang.			3	3	4
COE 202		Digital Logic Design			3	0	3	ICS 254		Discrete Structures II			3	0	3
MATH 201		Calculus III			3	0	3	MATH 260		Intro. to Differential Eq. & Linear Algebra			3	0	3
PE 102		Health and Physical Educ. II			0	2	1	COE 203		Digital Logic Laboratory			0	3	1
IAS 212		Professional Ethics			2	0	2	ENGL 214		Academic & Professional Comm.			3	0	3
					14	5	16					15	9	18	
Third Year (Junior)															
ICS 309		Computing and Society			2	0	2	ICS 343		Fundamentals of Computer Networks			3	3	4
ICS 324		Database Systems			3	3	4	ICS 381		Principles of Artificial Intelligence			3	0	3
ICS 353		Design and Analysis of Algorithms			3	0	3	ICS 431		Operating Systems			3	3	4
SWE 311		Principles of Software Eng.			3	3	4	ICS xxx		ICS Elective I			3	0	3
IAS 201		Objective Writing			2	0	2	ICS xxx		ICS Elective II			3	0	3
STAT 319		Probability and Stat. for Eng. and Scientists			2	3	3	IAS 322		Human Rights in Islam			2	0	2
					15	9	18					17	6	19	
Summer Session								ICS 350		Begin Cooperative Work			0	0	0
Fourth Year (Senior)															
ICS 351		Cooperative Work			0	0	9	ICS 410		Programming Languages			3	0	3
								ICS xxx		ICS Elective III			3	0	3
								ICS xxx		ICS Elective IV			3	0	3
								IAS 301		Language Comm. Skills			2	0	2
								XE xxx		Free Elective I			3	0	3
								XE xxx		Free Elective II			3	0	3
					0	0	9					17	0	17	
Total credit hours required in Degree Program : 131															

## **B.S. IN SOFTWARE ENGINEERING**

The program is broad-based and covers the main aspects of the software engineering discipline, namely requirements analysis, design, testing and project management. It also covers the computer science fundamentals such as computer architecture, operating systems and computer networks. The curriculum is designed to strengthen both the conceptual and practical talents of students, thereby equipping graduates with a solid background to take-up assignments in industry and to pursue higher education programs.

The software engineering program is accredited by the Accreditation Board of Engineering & Technology (ABET) of the USA.

### **Mission**

To bring forth competent software engineers with a strong understanding of computer science bodies of knowledge and theories, who can apply sound engineering principles and methods to the cost-effective creation, development, operation and maintenance of high-quality software and are prepared for lifelong learning.

### **Objectives**

1. **Contributing Citizens**  
Graduates of the SWE program at KFUPM will meet the needs of local software engineering industry and will be contributing member of the society.
2. **Leadership**  
Graduates of the SWE program at KFUPM will exhibit leadership in technical and business environment.
3. **Self Professional Development**  
Graduates of the SWE program at KFUPM will be adapting and adjusting to the rapid advancements and technical changes in the software engineering discipline.

## Requirements for the B.S. Degree in Software Engineering

Every student majoring in Software Engineering must complete the following curriculum:

<b>(a) General Education Requirements (52 credit hours)</b>		<b>Credit Hours</b>
Basic Science	CHEM 101, PHYS 101, 102	12
Mathematics and Statistics	MATH 101, 102, 201, STAT 319	14
English	ENGL 101, 102, 214	9
Physical Education	PE 101, 102	2
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Systems Engineering	ISE 307	3
		<b>52</b>

<b>(b) Core Requirements (65 credit hours)</b>		
SWE	SWE 205, 215, 312, 316, 326, 363, 387, 417, 418	26
ICS	ICS 102, 201, 202, 233, 253, 254, 324, 343, 353, 431	36
COE	COE 202	3
		<b>65</b>

<b>(c) Electives (15 credit hours)</b>		
SWE/ICS Electives	Three SWE/ICS xxx Courses	9
Technical Electives	Two XE xxx Courses	6
		<b>15</b>

### **(d) Summer Training (0 credit hours)**

Every student is required to participate in a summer training program of real practical experience and submit a formal written report.

Summer Training	SWE 399	0
		<b>0</b>

**The total number of credit hours required is** **132**

# Software Engineering Curriculum

Software Engineering Curriculum																
COURSE		TITLE			LT	LB	CR	COURSE		TITLE			LT	LB	CR	
Preparatory Year																
ENGL 01-xx	Prep. English I (First Quarter)				15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)				15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)						4	ENGL 04-xx	Prep. English IV (Fourth Quarter)						4	
MATH 001	Prep. Math I				3	1	4	MATH 002	Prep. Math II				3	1	4	
PYP 001	Prep. Physical Science				2	0	2	PYP 002	Prep. Computer Science				0	2	1	
PYP 003	University Study Skills				0	2	1	PYP 004	Prep. Eng. Technology				0	2	1	
PE 001	Prep. Health and Physical Educ. I				0	2	1	PE 002	Prep. Health and Physical Educ. II				0	2		
				20	10	16					18	12	15			
Total credit hours required in Preparatory Program: 31																
First Year (Freshman)																
MATH 101	Calculus I				4	0	4	MATH 102	Calculus II				4	0	4	
PHYS 101	General Physics I				3	3	4	PHYS 102	General Physics II				3	3	4	
ENGL 101	Intro. to Academic Discourse				3	0	3	ENGL 102	Intro. to Report Writing				3	0	3	
CHEM 101	General Chemistry I				3	4	4	ICS 102	Intro. to Computing I				2	3	3	
IAS 101	Practical Grammar				2	0	2	IAS 111	Belief and its Effects				2	0	2	
PE 101	Health and Physical Educ. I				0	2	1	PE 102	Health and Physical Educ. II				0	2	1	
				15	9	18					14	8	17			
Second Year (Sophomore)																
SWE 205	Intro. to Software Eng.				3	0	3	ICS 202	Data Structures				3	3	4	
ICS 201	Intro. to Computing II				3	3	4	SWE 215	Software Requirements Eng.				2	3	3	
COE 202	Digital Logic Design				3	0	3	ICS 233	Computer Architecture & Assembly Lang.				3	3	4	
MATH 201	Calculus III				3	0	3	ICS 254	Discrete Structures II				3	0	3	
ICS 253	Discrete Structures I				3	0	3	IAS 201	Objective Writing				2	0	2	
				15	3	16					13	9	16			
Third Year (Junior)																
SWE 312	User Interface Design				3	0	3	SWE 326	Software Testing and Quality Assurance				3	0	3	
SWE 316	Software Design and Architecture				3	0	3	SWE 363	Web Eng. and Development				3	0	3	
ICS 324	Database Systems				3	3	4	SWE 387	Software Project Management				3	0	3	
STAT 319	Probability and Stat. for Eng. and Scientists				2	3	3	ICS 343	Fundamentals of Computer Networks				3	3	4	
IAS 212	Professional Ethics				2	0	2	IAS 322	Human Rights in Islam				2	0	2	
								ENGL 214	Academic & Professional Comm.				3	0	3	
				13	6	15					17	3	18			
Summer Session							SWE 399	Summer Training				0	0	0		
Fourth Year (Senior)																
SWE 417	Software Eng. Project I				1	6	3	SWE 418	Software Eng. Project II				0	6	2	
XE xxx	Technical Elective I				3	0	3	ICS 431	Operating Systems				3	3	4	
ICS 353	Design and Analysis of Algorithms				3	0	3	SWE xxx	SWE/ICS Elective II				3	0	3	
ISE 307	Eng. Economic Analysis				3	0	3	SWE xxx	SWE/ICS Elective III				3	0	3	
SWE xxx	SWE/ICS Elective I				3	0	3	XE xxx	Technical Elective II				3	0	3	
								IAS 301	Language Comm. Skills				2	0	2	
				13	6	15					14	9	17			
Total credit hours required in Degree Program : 132																



# Department of Systems Engineering

**Chairman: Dr. Hesham K. Al-Fares**

## Faculty

Abouheaf	Al-Turki	Kara
Al-Amer	Al-Yagoub	Mahmoud
Al-Dajani	Andijani	Mysorewala
Aldheefallah	An	Nahas
Aldurgam	Ayar	Osman
Al-Fares	Bendaya	Pirim
Al-Ghamdi	Cheded	Rahim
Al-Ghazi	Duffuaa	Saif
Al-Habboubi	El-Ferik	Saleh
Al-Moghathawi	Elshafei	Vaqar
Alotaibi	Fahdel	Shokri
Al-Shareef	Haroun	
Al-Sunni	Meraj	

## **Introduction**

The Systems Engineering department offers two programs: Control and Instrumentation Systems Engineering (CISE) and Industrial and Systems Engineering (ISE). The first program covers analysis, design, and control of engineering systems. The second program focuses on the science and technology of industrial systems. It emphasizes the analysis and design of systems to produce goods and services efficiently. Particular attention is devoted to both the physical processes involved and the environment.

Both programs are offered in two options: the summer training option or Coop option. Coop programs are implemented in many technical universities worldwide. The student usually leaves the school for one or more semesters and joins a relevant industry, where he is exposed to real life applications of what has been taught in the school. This exposure provides the student with a more mature outlook and has a significant effect on his understanding of his role as a practicing engineer.

## **Vision**

**Regional:** To be the leader in the Arab region in the areas of Automation and Control, Industrial Engineering and Operations Research.

**Global :** To be recognized worldwide as a center of excellence in education and research in the areas of Automation and Control, Industrial Engineering and Operations Research.

## **Employment Opportunities**

In Saudi Arabia, there is an abundance of capital but limited human resources. Automation provides ways of reducing manpower requirements in industry, agriculture, and other services. In fact, the leading petrochemical and related industries, desalination plants, and power systems within the Kingdom are already using modern automation techniques. Furthermore, Industrial Engineering and Operations Research are essential to any country embarked on an ambitious industrialization plan. Indeed, the effectiveness of an enterprise is heavily influenced by the physical arrangement of people, equipment, and materials. The industrial engineer designs many types of systems, from material handling systems to the layout of factories and offices; he determines storage needs and space requirements for manufacturing systems, provides work measurement services, calculates labor requirements, estimates the performance of proposed systems, and measures and improves the effectiveness of existing systems.

Graduates of both programs in the Systems Engineering Department are trained to use engineering principles in the solution of problems encountered in environments and situations where a quantitative basis for decision making is desirable.

Both programs provide the preparation necessary for admission to graduate programs in highly respected universities. Details of the two programs are given below.

## **B.S. IN INDUSTRIAL AND SYSTEMS ENGINEERING**

This program is concerned with the design, improvement, and installation of integrated systems of people, materials, and equipment; it draws upon specialized knowledge and skill in the mathematical, physical, and social sciences, together with the principles and methods of engineering analysis and design; its goals are specifying, predicting, and evaluating the results to be obtained from such systems.

### **Mission**

The mission of the Industrial and Systems Engineering program is to provide high-quality education, research and community services in the areas of industrial and systems engineering. Specific components of the mission are:

- To provide a high-quality, state-of-the-art education in Industrial and Systems Engineering that produces professionals capable of performing jobs in their fields of specialization at the highest level of quality, competitiveness and professionalism.
- To conduct research that expands knowledge in the areas of Industrial and Systems Engineering and to provide a high-quality graduate program that gives students a solid foundation in their areas of specialty.
- To provide industry with a high-quality professional training, applied projects, and consultation services in the area of Industrial and Systems Engineering that are up-to-date and competitive worldwide.

### **ISE Program Educational Objectives**

ISE graduates are expected to be, within a few years of graduation:

Objective 1: Successful professionals in ISE related areas

Objective 2: Leaders in their organizations

Objective 3: Pursuers of new knowledge to ever changing environment .

### **ISE Program Outcomes**

The graduates of the program should be able to:

- a. apply knowledge of mathematics, science, and engineering;
- b. design and conduct experiments, as well as analyze and interpret data;
- c. design and improve integrated systems of people, materials, information, facilities, and technology;
- d. function as a member of a multi-disciplinary team;
- e. identify, formulate, and solve industrial and Systems engineering problems;
- f. understand and respect professional and ethical responsibilities;
- g. communicate effectively both orally and in writing;
- h. understand the impact of engineering solutions in a global and societal contexts;
- i. recognize the need for life-long learning, and an ability to engage in it;
- j. have a knowledge of contemporary issues;
- k. use up to date techniques, skills and tools of Industrial and Systems Engineering throughout their professional careers.

The main study areas involved are:

**Operations Research and Statistics**

Optimization Methods, Queuing Systems, Decision Making, Design of Experiments, Theory of Stochastic Systems, Special Topics in Operations Research.

**Production and Quality control**

Sequencing & Scheduling, Computer Aided Manufacturing and Robotics, Supply Chain Systems Modeling, Industrial Information Systems, Advanced Quality Methods, Special Topics in Production and Quality Control.

**Reliability and Maintenance**

Maintenance Planning and Control, Reliability and Maintainability, Industrial Safety, Special Topics in Reliability and Maintenance.

**Productivity and Process Improvement**

Human Factors Engineering, Industrial Safety, Productivity Engineering and Management, Process Reengineering, Industrial Strategic Planning, Special Topics in IE/OR.

**Automation and Control**

Design of Digital Systems, Computer Control Systems, Industrial Automation, Computer Numerical Control, Special Topics in Automation and Control.

## Requirements for the B.S. Degree in Industrial and Systems Engineering

The degree requirements for the ISE program can be grouped into five broad sets of requirements as shown below:

<b>(a) General Education Requirements (49 credit hours)</b>		<b>Credit Hours</b>
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
English Language	ENGL 101, 102, 214	9
Mathematics	MATH 101, 102, 201, 260	14
Sciences	CHEM 101, PHYS 101, 102	12
Physical Education	PE 101, 102	2
		<b>49</b>

<b>(b) General Engineering Fundamentals (26 credit hours)</b>		
Engineering Graphics	CE 101	2
Computer Programming in C	ICS 103	3
Electric Circuits	EE 202, 212	4
Probability and Statistics	ISE 205	3
Material Science	ME 216, 217	4
Numerical Methods	CISE 301	3
Linear Control Systems	CISE 302	4
Engineering Economic Analysis	ISE 307	3
		<b>26</b>

<b>(c) Core Requirements (40 for Summer Training and 37 for Cooperative Work)</b>		
Introduction to ISE	ISE 201	1
Operations Research I	ISE 303	3
Industrial Costing	ISE 304	3
Industrial Quality Control	ISE 320	3
Manufacturing Technology	ME 322, 323	4
Work Systems and Methods	ISE 323	3
Engineering Statistics	ISE 325	3
Data Base Design	ISE 361	3
Seminar	ISE 390	0
Industrial Engineering Design	ISE 391	2
Production Systems	ISE 402	3
Stochastic Systems Simulation	ISE 405	3
Operations Research II	ISE 421	3
Facility Layout and Location	ISE 422	3
Senior Project ( <i>only for summer training option</i> )	ISE 490	3
		<b>40 or 37</b>

<b>(d) Electives (18 for Summer Training and 12 for Cooperative Work)</b>		
Summer Training Option	12 credits of ISE courses and 6 free credits	18
Cooperative Work Option	9 credits of ISE courses and 3 free credits	12
		<b>18 or 12</b>

**(e) Summer Training or Cooperative Work (0 or 9 credit hours)**

Students taking the summer training option must spend 8 weeks of training in a facility approved by the department. Each student needs to submit a report and make an oral presentation. For cooperative work option, students must join a 28-week long industrial training program approved by the department.

Summer Training	ISE 399	0
Cooperative Work	ISE 351	9
		<b>0 or 9</b>

**The total number of credit hours required is**

**133**

## Industrial and Systems Engineering Curriculum – Summer Training Option

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
<b>Preparatory Year</b>									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		<b>20</b>	<b>10</b>	<b>16</b>			<b>18</b>	<b>12</b>	<b>15</b>
<b>Total credit hours required in Preparatory Program: 31</b>									
<b>First Year (Freshman)</b>									
MATH 101	Calculus I	4	0	4	MATH 102	Calculus II	4	0	4
PHYS 101	General Physics I	3	3	4	PHYS 102	General Physics II	3	3	4
ENGL 101	Intro. to Academic Discourse	3	0	3	ICS 103	Computer Programming in C	2	3	3
CHEM 101	General Chemistry I	3	4	4	ENGL 102	Intro. to Report Writing	3	0	3
IAS 101	Practical Grammar	2	0	2	IAS 111	Belief and its Effects	2	0	2
					PE 101	Health and Physical Educ. I	0	2	1
		<b>15</b>	<b>7</b>	<b>17</b>			<b>14</b>	<b>8</b>	<b>17</b>
<b>Second Year (Sophomore)</b>									
MATH 201	Calculus III	3	0	3	ISE 205	Eng. Probability and Statistics	3	0	3
MATH 260	Intro. to Differential Eq. & Linear Algebra	3	0	3	ME 322	Manufacturing Processes	3	0	3
ISE 201	Intro. to Industrial and Systems Eng.	1	0	1	ME 323	Manufacturing Lab	0	3	1
CE 101	Eng. Graphics	1	3	2	EE 202	Electrical Circuits I	3	0	3
ME 216	Materials Science and Engineering	3	0	3	EE 212	Electrical Circuits Laboratory	0	3	1
ME 217	Materials Lab	0	3	1	ENGL 214	Academic & Professional Comm.	3	0	3
IAS 201	Objective Writing	2	0	2	IAS 212	Professional Ethics	2	0	2
					PE 102	Health and Physical Educ. II	0	2	1
		<b>13</b>	<b>6</b>	<b>15</b>			<b>14</b>	<b>8</b>	<b>17</b>
<b>Third Year (Junior)</b>									
ISE 303	Operations Research I	3	0	3	ISE 304	Principles of Industrial Costing	3	0	3
ISE 323	Work and Process Improvements	2	3	3	ISE 307	Eng. Economic Analysis	3	0	3
ISE 325	Eng. Statistics	3	0	3	ISE 320	Quality Control and Industrial Statistics	3	0	3
CISE 301	Numerical Methods	3	0	3	ISE 391	Industrial Eng. Design	1	3	2
IAS 301	Language Comm. Skills	2	0	2	IAS 322	Human Rights in Islam	2	0	2
ISE 361	Fundamentals of Data Base Systems	2	3	3	CISE 302	Linear Control Systems	3	3	4
					ISE 390	Seminars	0	0	0
		<b>15</b>	<b>6</b>	<b>17</b>			<b>15</b>	<b>6</b>	<b>17</b>
<b>Summer Session</b>					ISE 399	Summer Training	<b>0</b>	<b>0</b>	<b>0</b>
<b>Fourth Year (Senior)</b>									
ISE 402	Production Systems and Inventory Control	3	0	3	ISE 421	Operations Research II	3	0	3
ISE 405	Stochastic Systems Simulation	2	3	3	ISE 422	Facility Layout and Location	3	0	3
ISE 490	Senior Design Project	0	0	3	ISE 4xx	ISE Elective III	x	x	3
ISE 4xx	ISE Elective I	x	x	3	ISE 4xx	ISE Elective IV	x	x	3
ISE 4xx	ISE Elective II	x	x	3	XXX xxx	Free Elective II	x	x	3
XXX xxx	Free Elective I	x	x	3					
		<b>5+</b>	<b>3+</b>	<b>18</b>			<b>6+</b>	<b>0+</b>	<b>15</b>
<b>Total credit hours required in Degree Program : 133</b>									

## Industrial and Systems Engineering Curriculum – Cooperative Work Option

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
<b>Preparatory Year</b>									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		<b>20</b>	<b>10</b>	<b>16</b>			<b>18</b>	<b>12</b>	<b>15</b>
<b>Total credit hours required in Preparatory Program: 31</b>									
<b>First Year (Freshman)</b>									
MATH 101	Calculus I	4	0	4	MATH 102	Calculus II	4	0	4
PHYS 101	General Physics I	3	3	4	PHYS 102	General Physics II	3	3	4
ENGL 101	Intro. to Academic Discourse	3	0	3	ICS 103	Computer Programming in C	2	3	3
CHEM 101	General Chemistry I	3	4	4	ENGL 102	Intro. to Report Writing	3	0	3
IAS 101	Practical Grammar	2	0	2	IAS 111	Belief and its Effects	2	0	2
					PE 101	Health and Physical Educ. I	0	2	1
		<b>15</b>	<b>7</b>	<b>17</b>			<b>14</b>	<b>8</b>	<b>17</b>
<b>Second Year (Sophomore)</b>									
MATH 201	Calculus III	3	0	3	MATH 260	Intro. to Differential Eq. & Linear Algebra	3	0	3
ME 216	Materials Science and Engineering	3	0	3	ISE 205	Eng. Probability and Statistics	3	0	3
ME 217	Materials Lab	0	3	1	ME 322	Manufacturing Processes	3	0	3
ISE 201	Intro. to Industrial and Systems Eng.	1	0	1	ME 323	Manufacturing Lab	0	3	1
CE 101	Eng. Graphics	1	3	2	ENGL 214	Academic & Professional Comm.	3	0	3
EE 202	Electrical Circuits I	3	0	3	CISE 301	Numerical Methods	3	0	3
EE 212	Electrical Circuits Laboratory	0	3	1	IAS 301	Language Comm. Skills	2	0	2
IAS 201	Objective Writing	2	0	2	PE 102	Health and Physical Educ. II	0	2	1
IAS 212	Professional Ethics	2	0	2					
		<b>15</b>	<b>9</b>	<b>18</b>			<b>17</b>	<b>5</b>	<b>19</b>
<b>Third Year (Junior)</b>									
ISE 303	Operations Research I	3	0	3	ISE 304	Principles of Industrial Costing	3	0	3
ISE 307	Eng. Economic Analysis	3	0	3	ISE 320	Quality Control and Industrial Statistics	3	0	3
ISE 323	Work and Process Improvements	2	3	3	ISE 391	Industrial Eng. Design	1	3	2
ISE 325	Eng. Statistics	3	0	3	ISE 402	Production Systems and Inventory Control	3	0	3
ISE 361	Fundamentals of Data Base Systems	2	3	3	ISE 405	Stochastic Systems Simulation	2	3	3
CISE 302	Linear Control Systems	3	3	4	IAS 322	Human Rights in Islam	2	0	2
					ISE 390	Seminars	0	0	0
		<b>16</b>	<b>9</b>	<b>19</b>			<b>14</b>	<b>6</b>	<b>16</b>
<b>Summer Session</b>					ISE 350	Begin Cooperative Work	<b>0</b>	<b>0</b>	<b>0</b>
<b>Fourth Year (Senior)</b>									
ISE 351	Cooperative Work	0	0	9	ISE 421	Operations Research II	3	0	3
					ISE 422	Facility Layout and Location	3	0	3
					ISE 4xx	ISE Elective I	x	x	3
					ISE 4xx	ISE Elective II	x	x	3
					ISE 4xx	ISE Elective III	x	x	3
					XXX xxx	Free Elective	x	x	3
		<b>0</b>	<b>0</b>	<b>9</b>			<b>6+</b>	<b>0+</b>	<b>18</b>
<b>Total credit hours required in Degree Program : 133</b>									



## **B.S. IN CONTROL AND INSTRUMENTATION SYSTEMS ENGINEERING**

The primary thrust of this program is to graduate engineers who can carry out modern automation technology of industrial systems existing in all engineering disciplines such as the petrochemical industry, the steel industry, power systems, and the like, as well as non-industrial systems such as the automation of water supply systems and irrigation systems. This program emphasizes the analysis, design, synthesis, and optimization of control systems in order to provide the best means of controlling their dynamic behavior to produce favorable or specified outputs.

### **Mission**

The mission of the Control and Instrumentation Systems Engineering program is to provide high-quality education, research and community services in the areas of Control and Instrumentation. Specific components of the mission are:

- To provide a high-quality, state-of-the-art education in Control, Automation, and Instrumentation Engineering that produces professionals capable of performing jobs in their fields of specialization at the highest level of quality, competitiveness and professionalism.
- To conduct research that expands knowledge in the areas of Control, Automation, and Instrumentation and to provide a high-quality graduate program that gives students a solid foundation in their areas of specialty.
- To provide industry with a high-quality professional training, applied projects, and consultation services in the area of Control, Automation, and Instrumentation that is up-to-date and competitive worldwide.

### **CISE Program Educational Objectives**

CISE graduates are expected to be, within a few years of graduation:

**Objective 1:** Successful professionals in CISE related areas

**Objective 2:** Leaders in their organizations

**Objective 3:** Pursuers of new knowledge to ever changing environment .

### **CISE Program Outcomes**

The graduates of the CISE program should have the ability to:

- a. apply knowledge of mathematics, science, and engineering;
- b. design and conduct experiments, as well as analyze and interpret data;
- c. design a system component, or process to meet desired needs within realistic constraints;
- d. function as a member of a multi-disciplinary team;
- e. identify, formulate, and solve Control and Instrumentation Systems Engineering problems;
- f. understand and respect professional and ethical responsibility;
- g. communicate effectively both orally and in writing;
- h. understand the impact of engineering solutions in a global and societal context;
- i. recognize the need for life-long learning, and an ability to engage in it;
- j. have a knowledge of contemporary issues;
- k. use up to date techniques, skills and tools of Control and Instrumentation Systems Engineering throughout their professional careers.

## Requirements for the B.S. Degree in Control and Instrumentation Systems Engineering

The degree requirements for the CISE program can be grouped into five broad sets of requirements as shown below:

<b>(a) General Education Requirements</b>		<b>Credit Hours</b>
<b>(52 for Summer Training and 49 for Cooperative Work)</b>		
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
English Language	ENGL 101, 102, 214	9
Mathematics	MATH 101, 102, 201, 260	14
Sciences	CHEM 101, PHYS 101, 102	12
Physical Education	PE 101, 102	2
Principles of Management ( <i>only for summer training option</i> )	MGT 301	3
		<b>52 or 49</b>

<b>(b) General Engineering Fundamentals (26 credit hours)</b>		
Probability and Statistics	ISE 205	3
Engineering Economic Analysis	ISE 307	3
Electric Circuit I	EE 202, 212	4
Production Systems	ISE 402	3
Thermodynamics I	ME 203	3
Computer Programming in C	ICS 103	3
Electronics I	EE 203	4
Numerical Methods	CISE 301	3
		<b>26</b>

<b>(c) Core Requirements (40 credit hours)</b>		
Introduction to CISE	CISE 201	1
Design of Digital Systems	CISE 204	3
Introduction to Information Technology	CISE 209	2
Linear Control Systems	CISE 302	4
Instrumentation Engineering	CISE 312	3
Automation Devices and Electronics	CISE 313	3
Signals and Systems	CISE 315	3
Control Systems Design	CISE 316	3
Computer Control Systems	CISE 318	3
Seminars	CISE 390	0
Mechatronics	CISE 412	3
Embedded Control Systems	CISE 414	3
Industrial Process Control	CISE 418	3
Instrumentation for Process Control	CISE 438	3
Senior Design Project	CISE 490	3
		<b>40</b>

<b>(d) Electives (14 for Summer Training and 8 for Cooperative Work)</b>		
Summer Training Option	9 credits of ISE courses and 5 credits free	14
Cooperative Work Option	6 credits of ISE courses and 2 credits free	8
		<b>14 or 8</b>

**(e) Summer Training or Cooperative Work (0 or 9 credit hours)**

Students taking the summer training option must spend 8 weeks of training in a facility approved by the department. Each student needs to submit a report and make an oral presentation. For cooperative work option, students must join a 28-week long industrial training program approved by the department.

Summer Training	CISE 399	0
Cooperative Work	CISE 351	9
		<b>0 or 9</b>

**The total number of credit hours required is**

**132**

## Control and Instrumentation Systems Engineering Curriculum Summer Training Option

Summer Training Option									
COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
<b>Preparatory Year</b>									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		<b>20</b>	<b>10</b>	<b>16</b>			<b>18</b>	<b>12</b>	<b>15</b>
<b>Total credit hours required in Preparatory Program: 31</b>									
<b>First Year (Freshman)</b>									
MATH 101	Calculus I	4	0	4	MATH 102	Calculus II	4	0	4
PHYS 101	General Physics I	3	3	4	PHYS 102	General Physics II	3	3	4
ENGL 101	Intro. to Academic Discourse	3	0	3	ICS 103	Computer Programming in C	2	3	3
CHEM 101	General Chemistry I	3	4	4	ENGL 102	Intro. to Report Writing	3	0	3
IAS 101	Practical Grammar	2	0	2	IAS 111	Belief and its Effects	2	0	2
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1
		<b>15</b>	<b>9</b>	<b>18</b>			<b>14</b>	<b>8</b>	<b>17</b>
<b>Second Year (Sophomore)</b>									
MATH 201	Calculus III	3	0	3	MATH 260	Intro. to Differential Eq. & Linear Algebra	3	0	3
CISE 201	Intro. to Control and Instrumentation	1	0	1	CISE 204	Digital Systems Design	2	3	3
EE 202	Electrical Circuits I	3	0	3	EE 203	Electronics I	3	3	4
EE 212	Electrical Circuits Laboratory	0	3	1	ISE 205	Eng. Probability and Statistics	3	0	3
CISE 209	Intro. to Information Technology	2	0	2	ENGL 214	Academic & Professional Comm.	3	0	3
ME 203	Thermodynamics I	3	0	3					
IAS 201	Objective Writing	2	0	2					
		<b>14</b>	<b>3</b>	<b>15</b>			<b>14</b>	<b>6</b>	<b>16</b>
<b>Third Year (Junior)</b>									
CISE 302	Linear Control Systems	3	3	4	CISE 312	Instrumentation Eng.	2	3	3
CISE 313	Automation Devices and Electronics	2	3	3	CISE 316	Control Systems Design	2	3	3
CISE 315	Signals and Systems	3	0	3	CISE 318	Computer Control Systems	2	3	3
CISE 301	Numerical Methods	3	0	3	CISE 4xx	CISE Elective I	x	x	3
IAS 301	Language Comm. Skills	2	0	2	ISE 402	Production Systems and Inventory Control	3	0	3
XXX xxx	Free Elective I	x	x	3	IAS 212	Professional Ethics	2	0	2
		<b>13+</b>	<b>6+</b>	<b>18</b>			<b>11+</b>	<b>9+</b>	<b>17</b>
<b>Summer Session</b>					CISE 399	Summer Training	<b>0</b>	<b>0</b>	<b>0</b>
<b>Fourth Year (Senior)</b>									
CISE 490	Senior Design Project	0	9	3	CISE 412	Mechatronics	2	3	3
CISE 4xx	CISE Elective II	x	x	3	CISE 414	Embedded Control Systems	2	3	3
CISE 4xx	CISE Elective III	x	x	3	CISE 418	Industrial Process Control	3	0	3
ISE 307	Eng. Economic Analysis	3	0	3	CISE 438	Instrumentation for Process Control	2	3	3
MGT 301	Principles of Management	3	0	3	IAS 322	Human Rights in Islam	2	0	2
CISE 390	Seminars	0	0	0					
XXX xxx	Free Elective II	x	x	2					
		<b>6+</b>	<b>9+</b>	<b>17</b>			<b>11</b>	<b>9</b>	<b>14</b>
<b>Total credit hours required in Degree Program : 132</b>									

## Cooperative Work Option

**Total credit hours required in Degree Program : 132**

# **COLLEGE OF ENVIRONMENTAL DESIGN**

**Dean: Dr. Adel S. Aldosary**

## **UNDERGRADUATE DEPARTMENTS**

ARCHITECTURAL ENGINEERING  
ARCHITECTURE  
CITY PLANNING

The College of Environmental Design was established during the 1400 – 1401 (1980-1981) academic year to meet the large demand for professionals in the construction industry, resulting from the extensive ongoing construction program throughout the Kingdom of Saudi Arabia. The College was established to bring together the academic programs that are mainly concerned with the built environment, both natural and man-made and to prepare students for professional practice in Architecture, Architectural Engineering, Construction Engineering and Management and City Planning. The College has four departments: Architectural Engineering, Architecture, Construction Engineering & Management and City & Regional Planning, and offers Bachelor's degrees in Architectural Engineering, Architecture, City Planning, and Master's degrees in Architectural Engineering, Construction Engineering and Management and City and Regional Planning.

The Architectural Engineering Department was established in 1975 as a part of the College of Engineering Sciences. In 1980, the program formed the nucleus of the newly established College of Environmental Design. The Architectural Engineering undergraduate program emphasizes the importance of structural mechanical and environmental factors in the design of building systems. Additionally, it emphasizes building construction, operation, and maintenance.

The Architecture Department was established in 1981. It offers a Bachelor's degree in Architecture with emphasis on Architectural Design. Apart from design, however, students also have the option of a minor in one of the areas of Computer Aided Architectural Design, Urban Design, and Regional Architecture. The Architecture Department has evolved into a leading school of architecture in the region.

The City Planning Department was established in 1989. The ultimate goal of this program is to provide students with a coherent understanding of contemporary planning, such as combining a good theoretical background with the dynamics of professional practices and the society at large. In addition to special technical skills, the program helps each student to acquire an interdisciplinary education that leads to an understanding of the physical and social environments, their problems, and their potentialities for enriching human life. The main objectives of the program are, therefore:

- Offer a program leading to the degree of Bachelor of Science in City Planning.
- Equip the prospective students with the professional capability to sustain and enhance the quality of life in cities and regions.
- Meet the growing demands in the local market for qualified graduates with GIS background.

The Construction Engineering and Management Department was established in 1984. It offers a graduate program in Construction Engineering and Management with the aim of providing professional managers for the construction industry or for further study at the doctoral level leading to careers in teaching and research. In addition, a Master of Engineering Management was established in 2010. The program's objectives are to provide engineers with advancement opportunities as managers in the areas of engineering, design, research and development projects; to assist professional engineering managers to help research competitiveness in the global marketplace; to teach the skills and mechanisms necessary to deal with changes associated with managing new and breakthrough technologies; and to train engineers to plan, design, manage, and control complex technological projects.

## **Mission and Philosophy**

The mission of the College of Environmental Design is to be the leading institution in the region that prepares students for leadership roles in the professions that plan, design, construct and manage the built environment. Consistent with the above mission, the educational philosophy of the College of Environmental Design, as its name suggests, is to develop interdisciplinary relations between professionals who share a common concern for the design of the built environment. In recognition of this commonality, the college has been organized as one unit with shared common facilities and resources. The realization of this philosophy comes by allowing students, whatever their chosen specialty is, to share knowledge and classroom experience received from highly qualified instructors. Each undergraduate program requires five years of study, with the first year providing preparatory English and Mathematics. The College requires all students to attend a summer session or a coop program as an introduction to professional practice.

In harmony with the nature of KFUPM as a technological university and in consideration of the present and future needs of Saudi Arabia, all the programs in the College introduce basic science courses and are heavily oriented towards the teaching of physical design principles and the application of advanced technology.

## **Features**

The College is housed in building 19, adjacent to both the KFUPM Conference Center and the Information Technology Center. An important feature of the design of the facilities is the inclusion of studios as well as offices, laboratories, and support areas.

## **Graduation Requirements**

To qualify for the B.S. degree from one of the programs in the College of Environmental Design, the candidate must:

- (1) complete all curricular requirements for the degree as outlined in this bulletin;
- (2) achieve a cumulative GPA of 2.00 or more in all courses taken in or offered by Major department;
- (3) achieve a cumulative GPA of 2.00 or more in all credit courses taken at KFUPM as an undergraduate; and
- (4) complete a summer internship/cooperative program.



# Department of Architectural Engineering

**Chairman: Dr. Baqer Al-Ramadan**

## **Faculty**

Abdou  
Al-Hammad  
Al-Homoud  
Al-Shibani

Asif  
Budaiwi  
Hassanain  
Khaiyat

Khan  
Kim  
Nair

## **Introduction**

The KFUPM Architectural Engineering Department was established in 1975 under the College of Engineering Sciences. In 1980, the program formed the nucleus of the newly established College of Environmental Design. As the name implies, Architectural Engineering is related to both architecture as well as engineering. However, Architectural Engineering as a discipline is distinguished from Architecture by its emphasis on the technology and engineering aspects related to Building Design, Construction and Operation. Since its establishment, the Department has successfully supplied both government and private sectors with many high-quality Architectural Engineers. In order to maintain world-class education, the program has been reviewed by the Accreditation Board of Engineering and Technology (ABET). This organization, which evaluates engineering schools in the US, has declared that the KFUPM Architectural Engineering Program is accredited.

The curriculum places strong emphasis on studies related to each of the building technology and engineering areas such as: Building Structural and Environmental Control Systems. The curriculum also requires courses in building materials, construction systems and architectural design, construction management, building economics and computer applications in building design. Within the above general framework, the student can orient his study in the senior year to concentrate on one of the following specific areas:

1. Building Structural Systems
2. Building Environmental Control Systems
3. Construction and Maintenance Management
4. Computer-Aided Building Design

The emphasis is selected by the student and is made at the beginning of the senior year by which time he would have completed most of the fundamental courses in all the above areas.

The plan of study in Architectural Engineering consists of 133 credit hours of course work, which include essentially the same basic requirements as other engineering programs in the areas of physics, chemistry, mathematics, engineering science and social science and humanities. The program is composed of 57 credit hours as general education requirements, 70 credit hours as core requirements and 6 credit hours as electives. The student is offered two opportunities to gain practical experience during his study. He can spend 8 weeks during summer or he may choose to spend 28 weeks in a more intensive Coop program in the building industry. The student is expected to finish the B.S. degree in 4 years in addition to one year spent in the Orientation Program.

## **Vision**

To be a leader in providing outstanding Architectural Engineering education, research, and community services to create sustainable built environment in Saudi Arabia and beyond.

## **Mission**

To create sustainable built environment in Saudi Arabia and beyond through:

- A lifelong learning environment and graduating leaders in Architectural Engineering
- Conducting outstanding research

- Imparting professional services to the industry and community at large.

### **Program Educational Objectives**

The undergraduate program in Architectural Engineering is designed to produce graduates who, in few (3-5) years after graduation, will be:

1. Practicing the design of building systems, managing building projects and solving related problems based on sound engineering principles, and ethics as demanded by the work and the profession.
2. Qualified to meet the challenges of working in a multi-disciplinary environment and assuming leadership responsibilities in diverse areas of the profession.
3. Advancing professionally, and educationally (as desired) to meet the changing local and global demands and emerging technologies.
4. Engaged effectively in consulting and service activities related to the built environment / building industry to serve the profession and the society at large.

**Requirements for the B.S. Degree in Architectural Engineering**  
**Option I: With Summer Training**

Every student majoring in Architectural Engineering (Summer Training Option) must complete the following curriculum:

<b>(a) General Education Requirements (57 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENGL 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
History of Architecture I	ARC 110	2
Islamic Studies	IAS 111, 212, 322	6
Mathematics and Statistics	MATH 101, 102, 201, 202, 321, STAT 319	20
Natural Sciences	PHYS 101, 102, CHEM 101	12
Physical Education	PE 101, 102	2
		<b>57</b>

<b>(b) Core Requirements (70 credit hours)</b>		
Building Materials & Construction	ARE 211, 212, 303	9
Computer Sciences	ICS 102, ARE 222	5
Construction Management	ARE 413, 431	6
Building Environmental Systems	ARE 320, 322, 325, 345, EE 308	12
General Engineering	CE 230, 261, 353, ME 203, EE 204	15
Graphics & Architectural Design	ARE 101, 202, 301	8
Senior Project	ARE 400	3
Structural Engineering	CE 201, 203, 305, 315	12
		<b>70</b>

<b>(c) Electives (6 credit hours)</b>		
Any two courses of:	ARE 440, 442, 443, 444, 445, 446, 450, 452, 455, 456, 457, 458, 490, CE 408, 415	6
		<b>6</b>

**(d) Summer Training (0 credit hours)**

Each student must undergo an eight week training in a consulting office or construction office/site.

Summer Training	ARE 399	0
		<b>0</b>

**The total number of credit hours required is**

**133**

## Architectural Engineering Curriculum – Summer Training Option

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1	
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
ARE 101	Architectural Graphics	0	6	2	CHEM 101	General Chemistry I	3	4	4	
MATH 101	Calculus I	4	0	4	ICS 102	Intro. to Computing I	2	3	3	
PHYS 101	General Physics I	3	3	4	MATH 102	Calculus II	4	0	4	
ENGL 101	Intro. to Academic Discourse	3	0	3	PHYS 102	General Physics II	3	3	4	
IAS 101	Practical Grammar	2	0	2	ENGL 102	Intro. to Report Writing	3	0	3	
IAS 111	Belief and its Effects	2	0	2	PE 102	Health and Physical Educ. II	0	2	1	
PE 101	Health and Physical Educ. I	0	2	1						
		14	11	18				15	12	19
Second Year (Sophomore)										
ARE 211	Building Materials	2	3	3	ARE 202	Architectural Design I	0	9	3	
ARE 222	Computer Applications in Building Design	1	3	2	ARE 212	Construction Systems	3	0	3	
ARC 110	History of Architecture I	2	0	2	MATH 202	Elements of Differential Eq.	3	0	3	
MATH 201	Calculus III	3	0	3	EE 204	Fundamentals of Electrical Circuits	2	3	3	
ME 203	Thermodynamics I	3	0	3	CE 203	Structural Mechanics I	3	0	3	
CE 201	Statics	3	0	3	CE 230	Eng. Fluid Mechanics	3	0	3	
CE 261	Surveying I	1	3	2						
		15	9	18				14	12	18
Third Year (Junior)										
ARE 303	Working Drawings	0	9	3	ARE 301	Architectural Design II	0	9	3	
ARE 322	Building Mechanical Systems	2	3	3	ARE 325	Building Illumination	1	3	2	
MATH 321	Intro. to Numerical Computing	3	0	3	ARE 345	Principles of Heating, Ventilating, and AC	3	0	3	
CE 305	Structural Analysis I	3	0	3	CE 315	Reinforced Concrete I	2	3	3	
EE 308	Building Electrical Systems Design	2	0	2	STAT 319	Probability and Stat. for Eng. and Scientists	2	3	3	
ENGL 214	Academic & Professional Comm.	3	0	3	IAS 201	Objective Writing	2	0	2	
					IAS 212	Professional Ethics	2	0	2	
		13	12	17				12	18	18
Summer Session					ARE 399	Summer Training	0	0	0	
Fourth Year (Senior)										
ARE 320	Architectural Acoustics	1	3	2	ARE 413	Construction Management	3	0	3	
ARE 400	Senior Design Project	0	9	3	ARE 431	Building Economy	3	0	3	
ARE 4xx	ARE Elective I	3	0	3	ARE 4xx	ARE Elective II	3	0	3	
IAS 301	Language Comm. Skills	2	0	2	CE 353	Geotechnical Eng. I	3	3	4	
IAS 322	Human Rights in Islam	2	0	2						
		8	12	12				12	3	13
Total credit hours required in Degree Program : 133										

**Requirements for the B.S. Degree in Architectural Engineering**  
**Option II: With Cooperative Work**

Every student majoring in Architectural Engineering (Cooperative Work Option) must complete the following curriculum:

<b>(a) General Education Requirements (57 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENGL 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
History of Architecture I	ARC 110	2
Islamic Studies	IAS 111, 212, 322	6
Mathematics and Statistics	MATH 101, 102, 201, 202, 321, STAT 319	20
Natural Sciences	PHYS 101, 102, CHEM 101	12
Physical Education	PE 101, 102	2
		<b>57</b>

<b>(b) Core Requirements (67 credit hours)</b>		
Building Materials & Construction	ARE 211, 212, 303	9
Computer Sciences	ICS 102, ARE 222	5
Construction Management	ARE 413, 431	6
Building Environmental Systems	ARE 320, 322, 325, 345, EE 308	12
General Engineering	CE 230, 261, 353, ME 203, EE 204	15
Graphics & Architectural Design	ARE 101, 202, 301	8
Structural Engineering	CE 201, 203, 305, 315	12
		<b>67</b>

**(d) Cooperative Work (9 credit hours)**

Each student must participate in a 28-week program of industrial training approved by the department and must submit a comprehensive report on his work during that period.

Cooperative Work	ARE 351	9
		<b>9</b>

**The total number of credit hours required is**

**133**

## Architectural Engineering Curriculum – Cooperative Work Option

Architectural Engineering Curriculum - Cooperative Work Option										
COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1	
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
ARE 101	Architectural Graphics	0	6	2	CHEM 101	General Chemistry I	3	4	4	
MATH 101	Calculus I	4	0	4	ICS 102	Intro. to Computing I	2	3	3	
PHYS 101	General Physics I	3	3	4	MATH 102	Calculus II	4	0	4	
ENGL 101	Intro. to Academic Discourse	3	0	3	PHYS 102	General Physics II	3	3	4	
IAS 101	Practical Grammar	2	0	2	ENGL 102	Intro. to Report Writing	3	0	3	
IAS 111	Belief and its Effects	2	0	2	PE 102	Health and Physical Educ. II	0	2	1	
PE 101	Health and Physical Educ. I	0	2	1						
		14	11	18				15	12	19
Second Year (Sophomore)										
ARE 211	Building Materials	2	3	3	ARE 202	Architectural Design I	0	9	3	
ARE 222	Computer Applications in Building Design	1	3	2	ARE 212	Construction Systems	3	0	3	
ARC 110	History of Architecture I	2	0	2	MATH 202	Elements of Differential Eq.	3	0	3	
MATH 201	Calculus III	3	0	3	EE 204	Fundamentals of Electrical Circuits	2	3	3	
ME 203	Thermodynamics I	3	0	3	CE 203	Structural Mechanics I	3	0	3	
CE 201	Statics	3	0	3	CE 230	Eng. Fluid Mechanics	3	0	3	
CE 261	Surveying I	1	3	2						
		15	9	18				14	12	18
Third Year (Junior)										
ARE 303	Working Drawings	0	9	3	ARE 301	Architectural Design II	0	9	3	
ARE 320	Architectural Acoustics	1	3	2	ARE 325	Building Illumination	1	3	2	
ARE 322	Building Mechanical Systems	2	3	3	ARE 345	Principles of Heating, Ventilating, and AC	3	0	3	
MATH 321	Intro. to Numerical Computing	3	0	3	CE 315	Reinforced Concrete I	2	3	3	
CE 305	Structural Analysis I	3	0	3	STAT 319	Probability and Stat. for Eng. and Scientists	2	3	3	
EE 308	Building Electrical Systems Design	2	0	2	IAS 201	Objective Writing	2	0	2	
ENGL 214	Academic & Professional Comm.	3	0	3	IAS 212	Professional Ethics	2	0	2	
		14	15	19				12	18	18
Summer Session					ARE 350	Begin Cooperative Work	0	0	0	
Fourth Year (Senior)										
ARE 351	Cooperative Work	0	0	9	ARE 413	Construction Management	3	0	3	
					ARE 431	Building Economy	3	0	3	
					CE 353	Geotechnical Eng. I	3	3	4	
					IAS 301	Language Comm. Skills	2	0	2	
					IAS 322	Human Rights in Islam	2	0	2	
		0	0	9				13	3	14
Total credit hours required in Degree Program : 133										

## Department of Architecture

**Chairman: Dr. Mohammad Babsail**

### Faculty

Abd El Fattah  
Al-Abbad  
Al-Khabbaz  
Al-Kharoubi

Al-Mahdy  
Al-Najjar  
Al-Nazhah  
Al-Qawasmi

Ashmeel  
Ashour  
Babsail  
Zami



## **Vision**

The vision of the Department of Architecture is to become the premiere School of Architecture in the region and establish an outstanding international presence.

## **Mission**

The mission of the Department of Architecture, College of Environmental Design at KFUPM, is pursued in the highest academic tradition of the University through: 1) Excellence in Teaching, 2) Exploration and Dissemination of Knowledge through Scholarly Research and Exemplary Artistic Production, and 3) the Advancement and Application of Professional Knowledge and Expertise through Community Service.

## **Goals**

To graduate architects with highly developed skills in the areas of programming, planning and design of buildings. Additionally, the program seeks to familiarize students with the information technology, needed for planning and managing complex processes and information systems needed for managing the built environment. It is also part of the goal of the program to graduate architects who contribute to the preservation of the architectural heritage of Saudi Arabia and to the development of an architectural identity for the country.

## **Strategies for achieving the program goals**

The goals of the architecture program are achieved through regular review and assessment of the program and associated educational processes to improve and ensure quality, the introduction of courses and minor areas of concentration in the curriculum to ensure the acquisition of specific skills, expanding the program of information technology investment and renewal to ensure availability of state of the art systems for information technology instruction; focus in design exercises on heritage and local issues, and regular educational field trips and heritage exhibitions.

## **Curriculum Emphasis**

The emphasis of the architecture program is on architectural design and the application of information technology in design. This emphasis is reflected in the curriculum which includes eight sequential semesters of Design Studios backed by lectures in the following essential subject groups:

- ◆ Theory and History of Architecture
- ◆ Structures and Building Systems
- ◆ Construction Materials, Methods, and Systems
- ◆ Mechanical and Environmental Support Systems
- ◆ Computer Aided Design
- ◆ Professional Practice
- ◆ Electives

The program also offers the opportunity for minor specialization in the areas of Computer Aided Design, Urban Design and Regional Architecture through the selection of elective courses and the choice of studio projects. The senior project selection must also reflect the choice of minor.

## Requirements for the B.S. Degree in Architecture

Every student majoring in Architecture must complete the following curriculum:

<b>(a) General Education Requirements (30 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENG 214, IAS 101, 201, 301	9
English	ENG 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Natural Sciences	PHYS 133	4
Mathematics	MATH 132	3
Physical Education	PE 101, 102	2
		<b>30</b>

<b>(b) Core Requirements (107 credit hours)</b>		
Design Studios & Projects	ARC 101, 202, 203, 304, 305, 400, 406, 408	42
Architectural Graphics	ARC 100	5
Construction Documents	ARC 407	3
History and Theory of Architecture	ARC 110, 112, 210, 313, 314	10
Urban Design	ARC 251	2
Architecture of Saudi Arabia	ARC 281	2
Design Determinants for Arid Regions	ARC 435	2
Man and Built Environment	ARC 132	2
Professional Practice	ARC 426	3
Perception, Geometry and Color	ARC 315	2
----- Cognate Studies -----	-----	-----
Building Materials and Construction	ARE 211, 212	6
Mechanical Systems, Acoustics, Illumination	ARE 322, 328	6
Computer Studies	ARC 124, 225	6
Structures and Surveying	ARC 221, 222, 323, CE 261	11
Housing Design	ARC 353	2
Building Economy	ARE 431	3
		<b>107</b>

<b>(c) Electives (9 credit hours)</b>		
Option Electives	Two ARC xxx Courses	4
Architecture Elective	ARC xxx	2
Free Elective	XXX xxx	3
		<b>9</b>

<b>(d) Summer Training (1 credit hour)</b>		
Summer Training	ARC 399	1
		<b>1</b>

The total number of credit hours required is

**147**

## Architecture Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
Preparatory Year									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		20	10	16			18	12	15
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
ARC 100	Architectural Graphics	0	10	5	ARC 101	Design Studio I	0	10	5
ARC 110	History of Architecture I	2	0	2	ARC 112	History of Architecture II	2	0	2
ARC 132	Man and Built Environment	2	0	2	ARC 124	Computer Aided Architectural Design	2	3	3
ENGL 101	Intro. to Academic Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3
MATH 132	Applied Calculus	3	0	3	PHYS 133	Principles of Physics	3	3	4
IAS 111	Belief and its Effects	2	0	2	PE 102	Health and Physical Educ. II	0	2	1
PE 101	Health and Physics Educ. I	0	2	1					
		12	12	18			10	18	18
Summer Session					IAS 101	Practical Grammar	2	0	2
Second Year (Sophomore)									
ARC 202	Design Studio II	0	10	5	ARC 203	Design Studio III	0	10	5
ARC 210	History of Architecture III	2	0	2	ARC 222	Structures in Architecture II	3	0	3
ARC 221	Structures in Architecture I	3	0	3	ARC 251	Intro. to Urban Design Concepts	2	0	2
ARC 225	Virtual Reality in Architecture	2	3	3	ARC 281	Architecture of Saudi Arabia	2	0	2
ARE 211	Building Materials	2	3	3	ARE 212	Construction Systems	3	0	3
IAS 212	Professional Ethics	2	0	2	ARE 328	Architectural Acoustics & Illumination	3	0	3
		11	16	18			13	10	18
Summer Session					ENGL 214	Acad. & Professional Comm.	3	0	3
					CE 261	Surveying I	1	3	2
Third Year (Junior)									
ARC 304	Design Studio IV	0	12	6	ARC 305	Design Studio V	0	12	6
ARC 313	Theory of Architecture I	2	0	2	ARC 314	Theory of Architecture II	2	0	2
ARC 315	Perception, Geometry and Color	2	0	2	ARC 353	Housing Policy and Design	2	0	2
ARC 323	Structures in Architecture III	3	0	3	ARC xxx	ARC Option Elective I	2	0	2
ARE 322	Building Mechanical Systems	2	3	3	ARE 431	Building Economy	3	0	3
IAS 201	Objective Writing	2	0	2	XXX xxx	Free Elective	3	0	3
		11	15	18			12	12	18
Summer Session					ARC 399	Summer Training	0	0	1
Fourth Year (Senior)									
ARC 400	Senior Project Preparation and Program.	2	0	2	ARC 408	Senior Project	0	14	7
ARC 406	Design Studio VI	0	12	6	ARC 426	Professional Practice	3	0	3
ARC 407	Construction Documents	0	6	3	ARC xxx	ARC Elective	2	0	2
ARC 435	Design Determinants for Arid Regions	2	0	2	IAS 322	Human Rights in Islam	2	0	2
ARC xxx	ARC Option Elective II	2	0	2					
IAS 301	Language Comm. Skills	2	0	2					
		8	18	17			7	14	14
Total credit hours required in Degree Program : 147									

## Department of City and Regional Planning

**Chairman: Dr. Adel S. Aldosary**

### **Faculty**

Aldosary

Al-Naser

Al-Ramadan

Alshuwaikhat

Gim

Kadrin

Nahiduzzaman

Tauhidur Rahman

## **Introduction**

The field of City Planning attempts to investigate and provide solutions to planning problems with a view towards shaping the current and future urban environment. Thus, city planners develop such solutions by moving systematically through a time-related process which requires defining goals, analyzing information, formulating plans, setting priorities, and designing programs of actions.

To deal with the complex problems of the urban environment, city planners require considerable skills, knowledge and insight, plus the ability to understand the social, economic, physical, and political interrelationships, which characterize urban goals and problems. Beyond the nature of such plans, city planners must also be prepared to make day-to-day decisions that affect the well being of urban inhabitants. The ability to surmount the increasing challenges of planning can be greatly assisted by considering geographic information system (GIS) and related information technology, early in planning education.

Undergraduate city planning education leads to diverse careers through professional employment or graduate studies in the same field or related professions. In the public sector, city planners are found in municipalities and numerous government agencies. Increasingly, city planners are moving into various private sector jobs, such as consultant firms, utility companies, development companies, financial institutions, national and regional commercial corporations, research organizations, and special interest groups. Being able to work in these different areas is thus assisted by the knowledge of GIS which is an intermediary platform that mediates various disciplines and professions.

## **Program Objectives**

The ultimate goal of this program is to provide students with a coherent understanding of contemporary planning, such as combining a good theoretical background with the dynamics of professional practices and the society at large. In addition to special technical skills, the program helps each student to acquire an interdisciplinary education that leads to an understanding of the physical and social environment, their problems, and their potentialities for enriching human life. The main objectives of the program are, therefore, to:

- Offer a program leading to the degree of Bachelor of Science in City Planning.
- Equip the prospective students with the professional capability to sustain and enhance the quality of life in cities and regions.
- Meet the growing demands in the local market for qualified graduates with GIS background.

## **The Program**

The Department of City and Regional Planning at KFUPM offers a program leading to the degree of Bachelor of Science in “City Planning.” This degree is granted after the completion of 125 credit hours. The department is offering this program with two options:

**Option I:** B.S. in City Planning with Summer Training.

**Option II:** B.S. in City Planning with Cooperative Work.

The curriculum, in each option, consists of four major requirements: General Education requirements (38 credit hours for both options), Core requirements (73 credit hours for Option I; 64 credit hours for Option II), a Summer Training (for Option I only; 0 credit hours) or Cooperative Work (for Option II only; 9 credit hours), and elective courses (14 credit hours for both options).

General Education requirement courses focus on vital basic areas such as communication skills, mathematics, and natural sciences. Core requirement courses cover planning theory and history, planning workshops, environmental planning, policies and public works, land use and transportation, sustainable development and impact assessment, analytical methods, computer applications, as well as socio-economic dynamics of urban societies.

**Requirements for the B.S. Degree in City and Regional Planning**  
**Option I: With Summer Training**

Every student majoring in City and Regional Planning (Summer Training Option) must complete the following curriculum:

<b>(a) General Education Requirements (38 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENGL 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Architectural Graphics	ARC 100	5
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 131, 132	6
Natural Sciences	PHYS 133	4
Physical Education	PE 101, 102	2
		<b>38</b>

<b>(b) Core Requirements (73 credit hours)</b>		
Introduction to City Planning and Theory	CP 101, 201	6
Planning Workshops	CP 210, 310, 315, 410	16
Senior Planning Project and Preparation	CP 401, 499	5
Analytical Methods	STAT 211, CP 301, 306	9
GIS and IT	ICS 102, CP 203, 206, 308	12
Socio-Economics	CP 205, ARC 482	5
Policies and Housing	CP 202, ARC 353	5
Land Use and Transportation	CP 204, 307	6
Environmental Plan. & Sustainable Development	CP 302, 402	4
Surveying and Remote Sensing	CE 261, CP 303	5
		<b>73</b>

<b>(c) Electives (14 credit hours)</b>		
CP Electives	6 credit hours from: CP 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 490	6
Free Electives	6 credit hours of 300 level or above courses from any other department	6
IAS Elective	IAS 4xx	2
		<b>14</b>

**(d) Summer Training (0 credit hours)**

Each student in this option must undergo eight-week training in a professional planning office.

Summer Training	CP 399	0
		<b>0</b>

**The total number of credit hours required is**

**125**

## City Planning Curriculum – Summer Training Option

City Planning Curriculum - Summer Training Option										
COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1	
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
ARC 100	Architectural Graphics	0	10	5	CP 101	Intro. to City Planning	3	0	3	
ENGL 101	Intro. to Academic Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3	
MATH 131	Finite Mathematics	3	0	3	MATH 132	Applied Calculus	3	0	3	
PHYS 133	Principles of Physics	3	3	4	IAS 101	Practical Grammar	2	0	2	
IAS 111	Belief and its Effects	2	0	2	ICS 102	Introduction to Computing I	2	3	3	
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1	
		11	15	18				13	5	15
Second Year (Sophomore)										
CP 201	Planning Theory	3	0	3	CP 204	Land Use Planning	3	0	3	
CP 202	Planning Laws and Legislation	3	0	3	CP 205	Urban Economics	3	0	3	
CP 203	Intro. to Spatial Database Management Sys.	3	0	3	CP 206	GIS I	2	3	3	
CE 261	Surveying I	1	3	2	CP 210	Planning Workshop I	1	9	4	
STAT 211	Statistics for Business I	3	0	3	ENGL 214	Academic & Professional Comm.	3	0	3	
IAS 212	Professional Ethics	2	0	2						
		15	3	16				12	12	16
Third Year (Junior)										
CP 301	Urban Survey Methods	3	0	3	CP 306	Quant. Methods in Planning	3	0	3	
CP 302	Intro. to Environmental Planning	2	0	2	CP 307	Transportation Planning	3	0	3	
CP 308	GIS II	2	3	3	CP 303	Intro. to Cartography & Remote Sensing	2	3	3	
CP 310	Planning Workshop II	1	9	4	CP 315	Planning Workshop III	1	9	4	
ARC 353	Housing Policy and Design	2	0	2	IAS 322	Human Rights in Islam	2	0	2	
IAS 201	Objective Writing	2	0	2						
		12	12	16				11	12	15
Summer Session					CP 399	Summer Training	0	0	0	
Fourth Year (Senior)										
CP 401	Senior Planning Project Preparation	1	0	1	CP 402	Sustainable Development	2	0	2	
CP 410	Planning Workshop IV	1	9	4	CP 499	Senior Planning Project	1	9	4	
CP 4xx	CP Elective I	3	0	3	ARC 482	Socio-Cultural Factors in Design	2	0	2	
CP 4xx	CP Elective II	3	0	3	XXX xxx	Free Elective II	3	0	3	



XXX	xxx	Free Elective I	3	0	3	IAS	4xx	IAS Elective	2	0	2
IAS	301	Language Comm. Skills	2	0	2						
			13	9	16				10	9	13
Total credit hours required in Degree Program : 125											

**Requirements for the B.S. Degree in City and Regional Planning  
Option II: With Cooperative Work**

Every student majoring in City and Regional Planning (Cooperative Work Option) must complete the following curriculum:

**(a) General Education Requirements (38 credit hours) Credit Hours**

Communication Skills	ENGL 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Architectural Graphics	ARC 100	5
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 131, 132	6
Natural Sciences	PHYS 133	4
Physical Education	PE 101, 102	2
		<b>38</b>

**(b) Core Requirements (64 credit hours)**

Introduction to City Planning and Theory	CP 101, 201	6
Planning Workshops	CP 210, 310, 315	12
Analytical Methods	STAT 211, CP 301, 306	9
GIS and IT	ICS 102, CP 203, 206, 308	12
Socio-Economics	CP 205, ARC 482	5
Policies and Housing	CP 202, ARC 353	5
Land Use and Transportation	CP 204, 307	6
Environmental Plan. & Sustainable Development	CP 302, 402	4
Surveying and Remote Sensing	CE 261, CP 303	5
		<b>64</b>

**(c) Electives (14 credit hours)**

CP Electives	6 credit hours from: CP 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 490	6
Free Electives	6 credit hours of 300 or above courses from any other department	6
IAS Elective	IAS 4xx	2
		<b>14</b>

**(d) Cooperative Work (9 credit hours)**

Each student in this option must work for 28 weeks in a professional planning office and submit a formal written report.

Cooperative Work	CP 351	9
		<b>9</b>

**The total number of credit hours required is**

**125**



## City Planning Curriculum – Cooperative Work Option

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
<b>Preparatory Year</b>									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		<b>20</b>	<b>10</b>	<b>16</b>			<b>18</b>	<b>12</b>	<b>15</b>
<b>Total credit hours required in Preparatory Program: 31</b>									
<b>First Year (Freshman)</b>									
ARC 100	Architectural Graphics	0	10	5	CP 101	Intro. to City Planning	3	0	3
ENGL 101	Intro. to Academic Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3
MATH 131	Finite Mathematics	3	0	3	MATH 132	Applied Calculus	3	0	3
PHYS 133	Principles of Physics	3	3	4	IAS 101	Practical Grammar	2	0	2
IAS 111	Belief and its Effects	2	0	2	ICS 102	Introduction to Computing I	2	3	3
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1
		<b>11</b>	<b>15</b>	<b>18</b>			<b>13</b>	<b>5</b>	<b>15</b>
<b>Second Year (Sophomore)</b>									
CP 201	Planning Theory	3	0	3	CP 204	Land Use Planning	3	0	3
CP 202	Planning Laws and Legislation	3	0	3	CP 205	Urban Economics	3	0	3
CP 203	Intro. to Spatial Database Management Sys.	3	0	3	CP 206	GIS I	2	3	3
CE 261	Surveying I	1	3	2	CP 210	Planning Workshop I	1	9	4
STAT 211	Statistics for Business I	3	0	3	ENGL 214	Academic & Professional Comm.	3	0	3
IAS 212	Professional Ethics	2	0	2					
		<b>15</b>	<b>3</b>	<b>16</b>			<b>12</b>	<b>12</b>	<b>16</b>
<b>Third Year (Junior)</b>									
CP 301	Urban Survey Methods	3	0	3	CP 306	Quant. Methods in Planning	3	0	3
CP 302	Intro. to Environmental Planning	2	0	2	CP 307	Transportation Planning	3	0	3
CP 308	GIS II	2	3	3	CP 303	Intro. to Cartography & Remote Sensing	2	3	3
CP 310	Planning Workshop II	1	9	4	CP 315	Planning Workshop III	1	9	4
ARC 353	Housing Policy and Design	2	0	2	IAS 322	Human Rights in Islam	2	0	2
IAS 201	Objective Writing	2	0	2	XXX xxx	Free Elective I	3	0	3
		<b>12</b>	<b>12</b>	<b>16</b>			<b>14</b>	<b>12</b>	<b>18</b>
<b>Summer Session</b>					CP 350	Begin Cooperative Work	<b>0</b>	<b>0</b>	<b>0</b>
<b>Fourth Year (Senior)</b>									
CP 351	Cooperative Work	0	0	9	CP 402	Sustainable Development	2	0	2
					CP 4xx	CP Elective I	3	0	3
					CP 4xx	CP Elective II	3	0	3
					ARC 482	Socio-Cultural Factors in Design	2	0	2
					XXX xxx	Free Elective II	3	0	3

					IAS 301	Language Comm. Skills	2	0	2
					IAS 4xx	IAS Elective	2	0	2
		<b>0</b>	<b>0</b>	<b>9</b>			<b>17</b>	<b>0</b>	<b>17</b>
<b>Total credit hours required in Degree Program : 125</b>									

# **COLLEGE OF INDUSTRIAL MANAGEMENT**

**Dean: Dr. Mohammed F. Al-Zahrani**

## **UNDERGRADUATE DEPARTMENTS**

ACCOUNTING and MANAGEMENT INFORMATION SYSTEMS

FINANCE and ECONOMICS

MANAGEMENT and MARKETING

## **UNDERGRADUATE PROGRAMS**

B.S. in ACCOUNTING

B.S. in MANAGEMENT INFORMATION SYSTEMS

B.S. in FINANCE

B.S. in MANAGEMENT

B.S. in MARKETING

Established in 1975, the College of Industrial Management (CIM) offers undergraduate and graduate degree programs. It offers five undergraduate programs leading to the baccalaureate degrees in Accounting, Management Information Systems, Finance, Management, and Marketing. CIM programs are accredited by the AACSB International since 2002.

All programs are subjected to periodic reviews to assure currency and relevancy. The instruction language in all programs is English. All programs require students to spend 28 weeks of work in the industry to apply knowledge and gain valuable skills and competencies. All programs share common learning goals and in addition each program has learning goals specific to the discipline. CIM programs are delivered by qualified faculty members who were recruited from around the world. The College enjoys excellent facilities and learning support technologies. The College fosters mutually beneficial relations with the industry and with other universities.

### **Vision**

To be among the best in the world as a center for excellence in management education, research, and community service that actively addresses the needs of stakeholders.

### **Mission**

To be a prominent provider of management education through high quality teaching reinforced by experiential learning for students who will play significant and productive roles in the development of the Saudi economy within the global business environment.

To actively contribute to Saudi business, industry, and community through relevant high quality research, professional services, and dissemination of knowledge responsive to the evolving stakeholders' needs.

### **Learning Goals**

In addition to the learning goals specific to each major, all CIM programs have the following learning goals:

1. Communication Abilities: Ability to communicate business ideas effectively both orally and in writing
2. Team Work Skills: Ability to function effectively as a member or leader of a team in performing group tasks in business and professional organizations
3. Reflective Thinking Skills: Ability to apply logic and exercise sound judgment in making decisions
4. Analytic/Quantitative Skills: Ability to understand, analyze and use quantitative data to make business decisions and/or solve business problems
5. Ethical Understanding: Ability to recognize, understand and evaluate ethical issues in business situations
6. Use of Information Technology: Ability to use information technology as a business enabler
7. Leadership: Ability to take initiative, show confidence and exercise leadership in business and professional organizations

8. Multicultural and diversity understanding: Awareness and understanding of cultural issues that impact business operations in a global society
9. General Business Knowledge: Ability to apply concepts and theories from business functional areas appropriately

### **Graduation Requirements**

To graduate with a B.S. degree in the College of Industrial Management, the candidate must have

- completed a minimum of 127 credit hours,
- met the University requirement for cumulative and major GPA's, and
- met other University requirements stated in this bulletin and in the regulations.

## Department of Accounting and Management Information Systems

**Chairman: Dr. Ahmed S. Alojairi**

### **Faculty**

Abdel Halim  
Ahmed, F  
Ahmed, N  
Al-Ahmadi  
Al-Bashrawi  
Al-Harbi  
Al-Hazmi  
Al-Jabri

Al-Khaldi  
Al-Mulhim  
Al-Ojairi  
Al-Wahaishi  
Ba-Hamdan  
Eid  
Fallatah  
Islam

Khan  
Kurdi  
Madani  
Musabeh  
Shawosh  
Talet  
Talha  
Qahwash



The Bachelor of Science in Accounting educates students to function effectively in a wide range of accounting careers in all types of economic organizations. The program is designed to prepare graduates for accounting careers in industry, public accounting, government, not-for-profit organizations or for an academic accounting career. The program stresses basic conceptual knowledge in all fields of business administration as an essential foundation for an effective accounting career. The program includes financial accounting, accounting information systems, cost accounting, managerial accounting, advanced accounting, auditing, accounting theory and research, as well as 28 weeks of practical training in accounting. The focus of the program is on the principles, concepts, and procedures of measuring, analyzing, and communicating economic information for decision making. The program keeps up with the most recent developments in the field of accounting. Significant emphasis is placed on computer applications in all areas of accounting. Ethical behavior is stressed throughout the program to highlight its importance to the maintenance of public trust in accounting and accounting professionals. Through a commitment to excellence, the program has remained a steady and very practical part of management education in the Kingdom of Saudi Arabia over the years.

### Program Learning Goals and Objectives

Learning goals and objectives for the B.S. in Accounting program are shown below. Consistent with AACSB guidelines, the goals and objectives are classified into three categories: general education, management-specific (i.e. business-specific), and discipline-specific (i.e. accounting-specific) goals and objectives.

Learning goal	Learning objective
<b><i>College General Education Learning Goals and Objectives</i></b>	
<b>1. Communication Abilities</b> Ability to communicate business ideas effectively both orally and in writing	1. Students will be able to write reports that (a) are grammatically correct and (b) incorporate logical, complete, and articulate thoughts
	2. Students will be able to make effective oral presentations on business topics. For example, they will (a) conduct themselves professionally, (b) speak clearly, (c) maintain eye contact with their audience, and (d) convey the main ideas.
<b>2. Team Work Skills</b> Ability to function effectively as a member or leader of a team in performing group tasks in business and professional organizations	1. Students will be able to work effectively in group settings.
	2. Students will be able to lead group work.
<b>3. Reflective Thinking Skills</b> Ability to apply logic and exercise sound judgment in making decisions	Students will be able to show good judgment in making choices and decisions
<b>4. Analytic/Quantitative Skills</b> Ability to understand, analyze and use quantitative data to make business decisions and/or solve business problems	1. Students will be able to identify quantitative characteristics of business problems.
	2. Students will be able to examine and interpret numeric business data.
	3. Students will be able to analyze numeric business data to derive conclusions.
<b>5. Ethical Understanding</b> Ability to recognize, understand and	1. Students will be able to recognize and understand ethical issues in business situations.

evaluate ethical issues in business situations	2. Students will be able to evaluate ethical issues presented to them and to make responsible choices and/or decisions.
<b>6. Use of Information Technology</b> Ability to use information technology as a business enabler	1. Students will be able to use basic IT software tools, such as spreadsheets, database management, and presentation software.
	2. Students will be able to use software tools to solve accounting, financial and quantitative problems
	3. Students will be able to use software tools to meaningfully select, manipulate and process data to make business decisions.
	4. Students will be able to use information technology (e.g. research databases and/or the Internet) to obtain information.
<b>7. Leadership</b> Ability to take initiative, show confidence and exercise leadership in business and professional organizations	Students will be able to demonstrate that they are proactive, have confidence, and have potential for leadership in their coop experience and the capstone courses.
<b>8. Multicultural and diversity understanding</b> Awareness and understanding of cultural issues that impact business operations in a global society	Students will be able to deal effectively with people from diverse social, economic, and religious backgrounds.
<b><i>College Management-Specific Learning Goals and Objectives</i></b>	
<b>9. General Business Knowledge</b> Ability to apply concepts and theories from business functional areas appropriately	1. Students will demonstrate knowledge of the functional areas of business and their inter-relationships.
	2. Students will be able to integrate basic functional area competencies to critically evaluate information and make decisions
<b><i>Accounting Specific Learning Goals and Objectives</i></b>	
<b>10. Accounting Knowledge</b> Awareness and understanding of accounting principles, concepts, and theories	1. Students will be able to demonstrate knowledge and understanding of accounting standards, principles, concepts, and theories and their relevance to business situations.  2. Students will be able to understand the role of accounting and accountants in organizations and society.  3. Students will be able to demonstrate awareness and understanding of the challenges facing accounting and accountants in organizations and society.
<b>11. Application of Accounting knowledge</b> Ability to apply accounting principles, concepts, theories and procedures to a variety of business situations	1. Students will be able to record, analyze and interpret financial and non-financial information.  2. Students will be able apply accounting principles, Standards and technologies to financial reporting and accounting practices.  3. Students will be able to apply management accounting

	<p>frameworks and techniques to planning, decision-making and financial control.</p> <p>4. Students will be able to demonstrate awareness of international accounting issues, diversity and practices including roles and responsibilities played by accountants within a global context.</p>
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## Requirements for the B.S. Degree in Accounting

Every student majoring in Accounting must complete the following curriculum:

<b>(a) General Education Requirements (43 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENG 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 101, 102, 131	11
Physical Education	PE 101, 102	2
Science or Engineering Elective	XXX xxx	3
General Studies	Two GS xxx Courses	6
		<b>43</b>

<b>(b) Core Requirements in Business Administration (42 credit hours)</b>		
Business Communications	MGT 210	3
Economics	ECON 101, 102, 206	9
Management	MGT 301, 311, 412	9
Management Information Systems	MIS 215	3
Marketing	MKT 250	3
Operations Management	OM 210, 310	6
Statistics	STAT 211, 212	6
College Business Elective	XXX xxx	3
		<b>42</b>

<b>(c) Accounting Major Requirements (36 credit hours)</b>		
Accounting	ACCT 110, 210	6
Accounting Information Systems	ACCT 300	3
Finance	FIN 250	3
Management	MGT 449	3
Intermediate Accounting I	ACCT 301	3
Intermediate Accounting II	ACCT 302	3
Auditing	ACCT 311	3
Advanced Accounting	ACCT 403	3
Zakat and Business Tax Accounting	ACCT 408	3
Cost Accounting	ACCT 410	3
Major Elective, Any course of:	ACCT 304, 305, 307, 314, 405, 406, 407, 411	3
		<b>36</b>

### **(d) Cooperative Work (6 credit hours)**

Each student majoring in Accounting must participate in a structured 28-week cooperative work program.

Cooperative Work	ACCT 351	6
		<b>6</b>

**The total number of credit hours required is**

**127**

## Accounting Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2		
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
MATH 101	Calculus I	4	0	4	ECON 102	Principles of Economics II	3	0	3	
ENGL 101	Intro. to Academic Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3	
IAS 101	Practical Grammar	2	0	2	MIS 215	Principles of MIS	3	0	3	
XXX xxx	Science or Eng. Elective	3	0	3	MATH 102	Calculus II	4	0	4	
MATH 131	Finite Mathematics	3	0	3	IAS 111	Belief and its Effects	2	0	2	
ECON 101	Principles of Economics I	3	0	3	ACCT 110	Intro. to Financial Accounting	3	0	3	
					PE 101	Health and Physical Educ. I	0	2	1	
		18	0	18				18	2	19
Second Year (Sophomore)										
GS xxx	GS Elective I	3	0	3	MGT 210	Business Comm.	3	0	3	
ACCT 210	Intro. to Managerial Accounting	3	0	3	STAT 212	Statistics for Business II	3	0	3	
IAS 201	Objective Writing	2	0	2	OM 210	Operations Management	3	0	3	
ENGL 214	Academic & Professional Comm.	3	0	3	MKT 250	Principles of Marketing	3	0	3	
ECON 206	Economy of Saudi Arabia	3	0	3	IAS 212	Professional Ethics	2	0	2	
STAT 211	Statistics for Business I	3	0	3	FIN 250	Financial Management	3	0	3	
PE 102	Health and Physical Educ. II	0	2	1						
		17	2	18				17	0	17
Third Year (Junior)										
ACCT 300	Accounting Information Systems	2	2	3	ACCT 302	Intermediate Accounting II	3	0	3	
ACCT 301	Intermediate Accounting I	3	0	3	ACCT 311	Auditing	3	0	3	
OM 310	Quant. Methods for Management	3	0	3	ACCT 410	Cost Accounting	3	0	3	
GS xxx	GS Elective II	3	0	3	IAS 322	Human Rights in Islam	2	0	2	
IAS 301	Language Comm. Skills	2	0	2	MGT 311	Legal Environment	3	0	3	
MGT 301	Principles of Management	3	0	3	XXX xxx	College Business Elective	3	0	3	
		16	2	17				17	0	17
Summer Session					ACCT 350	Begin Cooperative Work	0	0	0	
Fourth Year (Senior)										
ACCT 351	Cooperative Work	0	0	6	ACCT 403	Advanced Accounting	3	0	3	
					ACCT 408	Zakat and Business Tax Accounting	3	0	3	
					ACCT xxx	Major Elective	3	0	3	
					MGT 412	Entrepreneurship and Small Business Mgt.	3	0	3	
					MGT 449	Strategic Management	3	0	3	
		0	0	6				15	0	15
Total credit hours required in Degree Program : 127										

## **B.S. Degree in Management Information Systems (MIS)**

The MIS program is current and relevant; it has a structure that is academically sound and consists of an integrated body of knowledge, with a good balance between breadth and depth, theory and practice. The knowledge and skills will open up a broad range of career options to the graduates and will enhance the chances of securing lucrative employment within a short span of time. The program is designed to empower and equip graduates with:

- a) A most up-to-date, comprehensive, well-founded set of technical knowledge and skills. – knowledge and skills that will not only open up a broad range of career options to them, but also enhance their chances of securing lucrative employment within a short span of time and help them make a smooth transition from student to professional life;
- b) technical and managerial knowledge in business analysis, study of processes, re-engineering, simplification and re-design with the help of automation;
- c) interpersonal, communication, analytical/reasoning, and problem-solving skills; - skills that are essential for success in their chosen careers, as well as in their future ability to make efficient and effective contributions to collaborative endeavors;
- d) business application development techniques by using different methodologies, testing, implementation, project management, and post implementation review;
- e) comprehensive study of system analysis and design, database development and management support systems and their applications to business problem solving;
- f) knowledge to develop leaders who are confident of in themselves, are able to present and defend their ideas, enjoy team spirit, who are systematic, creative, and sensitive to both economic and non-economic factors, and who are ethical, and responsible in all their endeavors; and
- g) a technical educational foundation that facilitates continuous learning and that will enable them to surmount the challenges they will encounter in managing information services later in their professional activities, and to sustain their technical strengths in their chosen careers.

### **Program Learning Goals and Objectives**

<b>Learning goals</b>	<b>Learning objectives</b>
<b><i>College General Education Learning Goals and Objectives</i></b>	
<b>1. Communication Abilities</b> Ability to communicate business ideas effectively both orally and in writing	1. Students will be able to write reports that (a) are grammatically correct and (b) incorporate logical, complete, and articulate thoughts.
	2. Students will be able to make effective oral presentations on business topics. For example, they will (a) conduct themselves professionally, (b) speak clearly, (c) maintain eye contact with their audience, and (d) convey the main ideas.
<b>2. Team Work Skills</b> Ability to function effectively as a member or leader of a team in performing group tasks in business and professional organizations	1. Students will be able to work effectively in group settings.
	2. Students will be able to lead group work.
<b>3. Reflective Thinking Skills</b>	Students will be able to show good judgment in making

Ability to apply logic and exercise sound judgment in making decisions	choices and decisions.
<b>4. Analytic/Quantitative Skills</b> Ability to understand, analyze and use quantitative data to make business decisions and/or solve business problems	1. Students will be able to identify quantitative characteristics of business problems.
	2. Students will be able to examine and interpret numeric business data.
	3. Students will be able to analyze numeric business data to derive conclusions.
<b>5. Ethical Understanding</b> Ability to recognize, understand and evaluate ethical issues in business situations	1. Students will be able to recognize and understand ethical issues in business situations.
	2. Students will be able to evaluate ethical issues presented to them and to make responsible choices and/or decisions.
<b>6. Use of Information Technology</b> Ability to use information technology as a business enabler	1. Students will be able to use basic IT software tools, such as spreadsheets, database management, and presentation software.
	2. Students will be able to use software tools to solve accounting, financial and quantitative problems.
	3. Students will be able to use software tools to meaningfully select, manipulate and process data to make business decisions.
	4. Students will be able to use information technology (e.g. research databases and/or the Internet) to obtain information.
<b>7. Leadership</b> Ability to take initiative, show confidence and exercise leadership in business and professional organizations	Students will be able to demonstrate that they are proactive, have confidence, and have potential for leadership in their coop experience and the capstone courses.
<b>8. Multicultural and diversity understanding</b> Awareness and understanding of cultural issues that impact business operations in a global society	Students will be able to deal effectively with people from diverse social, economic, and religious backgrounds.
<b><i>College Management-Specific Learning Goals and Objectives</i></b>	
<b>9. General Business Knowledge</b> Ability to apply concepts and theories from business functional areas appropriately	1. Students will demonstrate knowledge of the functional areas of business and their inter-relationships.
	2. Students will be able to integrate basic functional area competencies to critically evaluate information and make decisions.
<b><i>Discipline-Specific (MIS) Learning Goals and Objectives</i></b>	
<b>10. Systems analysis, design and project management concepts</b> Design and implement information technology solutions that enhance	1. Students will be able to analyze, design, implement, and maintain MIS applications. 2. Student will be able to plan, coordinate, monitor, and control MIS development projects.

organizational performance	
<b>11. Role of MIS</b> Understand the MIS strategic role in integrating, supporting, and enabling organizational capabilities	3. Student will be able to support business and MIS managers in their management activities and IT enabled decision making process. 4. Student will be able to evaluate strategic impact of MIS and emerging technologies and manage MIS resources. 5. Student will be able to apply MIS Ethical and societal issues.



## Requirements for the B.S. Degree in Management Information Systems

Every student majoring in MIS must complete the following curriculum:

<b>(a) General Education Requirements (43 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENG 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 101, 102, 131	11
Physical Education	PE 101, 102	2
Science or Engineering Elective	XXX xxx	3
General Studies	Two GS xxx Courses	6
		<b>43</b>

<b>(b) Core Requirements in Business Administration (54 credit hours)</b>		
Accounting	ACCT 110, 210	6
Business Communications	MGT 210	3
Economics	ECON 101, 102, 206	9
Finance	FIN 250	3
Management	MGT 301, 311, 412, 449	12
Management Information Systems	MIS 215	3
Marketing	MKT 250	3
Operations Management	OM 210, 310	6
Statistics	STAT 211, 212	6
College Business Elective	XXX xxx	3
		<b>54</b>

<b>(c) MIS Major Requirements (24 credit hours)</b>		
Introduction to Computing I	ICS 102	3
Business Systems Analysis & Design	MIS 301	3
Business Data Management	MIS 311	3
Fundamentals of Computer Comm.	COE 353	3
IS Project Management	MIS 405	3
Management Support Systems	MIS 410	3
Information Resources Management	MIS 490	3
Major Elective, Any course of:	COE 307, 385, 441, 442, 445, 446, ICS 481, 483, 484, 485, MIS 300, 302, 315, 320, 325, 345, 355, 365, 375, 411, 415, 499, SE 429, 443, 449, 464, SWE 422, 423, 444	3
		<b>24</b>

### **(d) Cooperative Work (6 credit hours)**

Each student majoring in MIS must participate in a structured 28-week cooperative work program.

Cooperative Work	MIS 351	6
		<b>6</b>

**The total number of credit hours required is**

**127**

## Management Information Systems Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
Preparatory Year									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		20	10	16			18	12	15
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
IAS 101	Practical Grammar	2	0	2	IAS 111	Belief and its Effects	2	0	2
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1
MATH 101	Calculus I	4	0	4	MATH 102	Calculus II	4	0	4
ECON 101	Principles of Economics I	3	0	3	MATH 131	Finite Mathematics	3	0	3
ACCT 110	Intro. to Financial Accounting	3	0	3	ECON 102	Principles of Economics II	3	0	3
ENGL 101	Intro. to Academic Discourse	3	0	3	ACCT 210	Intro. to Managerial Accounting	3	0	3
ICS 102	Intro. to Computing I	2	3	3	ENGL 102	Intro. to Report Writing	3	0	3
		17	5	19			18	2	19
Second Year (Sophomore)									
IAS 201	Objective Writing	2	0	2	IAS 212	Professional Ethics	2	0	2
XXX xxx	Science or Eng. Elective	3	0	3	OM 210	Operations Management	3	0	3
STAT 211	Statistics for Business I	3	0	3	STAT 212	Statistics for Business II	3	0	3
FIN 250	Financial Management	3	0	3	ECON 206	Economy of Saudi Arabia	3	0	3
ENGL 214	Academic & Professional Comm.	3	0	3	MKT 250	Principles of Marketing	3	0	3
MIS 215	Principles of MIS	3	0	3	MGT 210	Business Comm.	3	0	3
		17	0	17			17	0	17
Third Year (Junior)									
IAS 301	Language Comm. Skills	2	0	2	IAS 322	Human Rights in Islam	2	0	2
XXX xxx	College Business Elective	3	0	3	OM 310	Quant. Methods for Management	3	0	3
GS xxx	GS Elective I	3	0	3	MGT 311	Business Legal Environment	3	0	3
MGT 301	Principles of Management	3	0	3	GS xxx	GS Elective II	3	0	3
COE 353	Fundamentals of Computer Comm.	3	0	3	MIS 311	Business Data Management	2	2	3
MIS 301	Business Systems Analysis & Design	2	2	3	MIS 405	IS Project Management	3	0	3
		16	2	17			16	2	17
Summer Session					MIS 350	Begin Cooperative Work	0	0	0
Fourth Year (Senior)									
MIS 351	Cooperative Work	0	0	6	MGT 449	Strategic Management	3	0	3
					XXX xxx	Major Elective	3	0	3
					MGT 412	Entrepreneurship and Small Business Mgt.	3	0	3
					MIS 410	Management Support Systems	2	2	3
					MIS 490	Information Resources Management	3	0	3
		0	0	6			14	2	15
Total credit hours required in Degree Program : 127									

## Department of Finance and Economics

**Chairman: Dr. Hesham Merdad**

### Faculty

Aghdam	Al-Naeem	Merdad
Al-Abandi	Al-Sahlawi, A	Miah
Albinaly	Al-Sahlawi, M	Ramady
Al-Elg	Al-Sakran	Ulussever
Al-Gahtani	Al-Subaie	Uthman
Al-Hejji	Al-Yousef	
Almansur	Al-Zahrani	

The field of finance deals with the acquisition and efficient allocation of financial resources by business firms, governments, and individuals. The Bachelor of Science in Finance is designed to develop an understanding of financial markets and institutions, and to provide students with both the theoretical background in finance and the analytical tools required to make intelligent financial decisions. The finance curriculum prepares students for careers in corporate financial management, commercial and investment banking, investments, capital markets, and financial services.

## Program Learning Goals and Objectives

Learning goals and objectives for the B.S. in finance program are shown below. Consistent with AACSB guidelines, the goals and objectives are classified into three categories: general education, management-specific (i.e. business-specific), and discipline-specific (i.e. finance-specific) goals and objectives.

Learning goal	Learning objective
<b>College General Education Learning Goals/Objectives</b>	
<b>1. Communication Abilities</b> Ability to communicate business ideas effectively both orally and in writing	1. Students will be able to write reports that (a) are grammatically correct and (b) incorporate logical, complete, and articulate thoughts.
	2. Students will be able to make effective oral presentations on business topics. For example, they will (a) conduct themselves professionally, (b) speak clearly, (c) maintain eye contact with their audience, and (d) convey the main ideas.
<b>2. Team Work Skills</b> Ability to function effectively as a member or leader of a team in performing group tasks in business and professional organizations	1. Students will be able to work effectively in group settings.
	2. Students will be able to lead group work.
<b>3. Reflective Thinking Skills</b> Ability to apply logic and exercise sound judgment in making decisions	Students will be able to show good judgment in making choices and decisions.
<b>4. Analytic/Quantitative Skills</b> Ability to understand, analyze and use quantitative data to make business decisions and/or solve business problems	1. Students will be able to identify quantitative characteristics of business problems.
	2. Students will be able to examine and interpret numeric business data.
	3. Students will be able to analyze numeric business data to derive conclusions.
<b>5. Ethical Understanding</b> Ability to recognize, understand and evaluate ethical issues in business situations	1. Students will be able to recognize and understand ethical issues in business situations.
	2. Students will be able to evaluate ethical issues presented to them and to make responsible choices and/or decisions.
<b>6. Use of Information Technology</b> Ability to use information technology as a business enabler	1. Students will be able to use basic IT software tools, such as spreadsheets, database management, and presentation software.
	2. Students will be able to use software tools to solve accounting, financial and quantitative problems.

	3. Students will be able to use software tools to meaningfully select, manipulate and process data to make business decisions.
	4. Students will be able to use information technology (e.g. research databases and/or the Internet) to obtain information.
<b>7. Leadership</b> Ability to take initiative, show confidence and exercise leadership in business and professional organizations	Students will be able to demonstrate that they are proactive, have confidence, and have potential for leadership in their coop experience and the capstone courses.
<b>8. Multicultural and diversity understanding</b> Awareness and understanding of cultural issues that impact business operations in a global society	Students will be able to deal effectively with people from diverse social, economic, and religious backgrounds.
<b>9. Management-Specific Knowledge</b> Ability to apply functional area concepts and theories appropriately	1. Students will demonstrate knowledge of the functional areas of business and their inter-relationships.
	2. Students will be able to integrate basic functional area competencies to critically evaluate information and make decisions.
<b><i>Finance Major Learning Goals/Objectives</i></b>	
<b>10. Discipline-Specific Knowledge</b> Awareness and understanding of finance and economic concepts, principles and theories. Learning objectives are numbered OB1 to OB4.	1. Understanding of fundamental economic concepts and familiarity with the role and working of financial markets and institutions, including exposure to the Saudi economy and its institutional arrangements, 2. Become familiar with the major analytical tools of corporate financial performance evaluation, capital budgeting, and estimation of cost of capital. 3. Understanding of risk-return concepts within the context of modern portfolio theory. Gain familiarity with investment practices with a global perspective. 4. Ability to integrate financial and economic concepts and techniques to diagnose business problems and propose solutions, and to show an appreciation for ethical values in making decisions.

## Requirements for the B.S. Degree in Finance

Every student majoring in Finance must complete the following curriculum:

<b>(a) General Education Requirements (43 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENG 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 101, 102, 131	11
Physical Education	PE 101, 102	2
Science or Engineering Elective	XXX xxx	3
General Studies	Two GS xxx Courses	6
		<b>43</b>

<b>(b) Core Requirements in Business Administration (39 credit hours)</b>		
Business Communications	MGT 210	3
Economics	ECON 206	3
Management	MGT 301, 311, 412, 449	12
Management Information Systems	MIS 215	3
Marketing	MKT 250	3
Operations Management	OM 210, 310	6
Statistics	STAT 211, 212	6
College Business Elective	XXX xxx	3
		<b>39</b>

<b>(c) Finance Major Requirements (39 credit hours)</b>		
Accounting	ACCT 110, 210	6
Economics	ECON 101, 102	6
Finance	FIN 250	3
Intermediate Financial Management	FIN 310	3
Investments	FIN 320	3
Financial Modeling	FIN 425	3
Financial Policy	FIN 450	3
Any three courses of:	ACCT 301, FIN 410, 415, 421, 430, 435, 440, 460, 470, 480	9
Major Elective, Any course of:	ECON 301, 302, 305, 330, 401, 410, 415, 420, 425, 525	3
		<b>39</b>

### **(d) Cooperative Work (6 credit hours)**

Each student majoring in Finance must participate in a structured 28-week cooperative work program.

Cooperative Work	FIN 351	6
		<b>6</b>

**The total number of credit hours required is**

**127**

## Finance Curriculum

Finance Curriculum									
LT	LB	CR	COURSE	TITLE	LT	LB	CR		
15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4		
		4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4		
3	1	4	MATH 002	Prep. Math II	3	1	4		
2	0	2	PYP 002	Prep. Computer Science	0	2	1		
0	2	1	PYP 004	Prep. Eng. Technology	0	2	1		
0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1		
20	10	16				18	12	15	
hours required in Preparatory Program: 31									
3	0	3	ECON 102	Principles of Economics II	3	0	3		
3	0	3	ENGL 102	Intro. to Report Writing	3	0	3		
2	0	2	MIS 215	Principles of MIS	3	0	3		
3	0	3	MATH 102	Calculus II	4	0	4		
4	0	4	IAS 101	Practical Grammar	2	0	2		
3	0	3	ACCT 210	Intro. to Managerial Accounting	3	0	3		
18	0	18				18	0	18	
2	0	2	MGT 301	Principles of Management	3	0	3		
3	0	3	MGT 210	Business Comm.	3	0	3		
3	0	3	FIN 250	Financial Management	3	0	3		
2	0	2	STAT 212	Statistics for Business II	3	0	3		
3	0	3	OM 210	Operations Management	3	0	3		
0	2	1	MKT 250	Principles of Marketing	3	0	3		
3	0	3							
16	2	17				18	0	18	
3	0	3	MGT 311	Legal Environment	3	0	3		
3	0	3	FIN xxx	FIN Elective I	3	0	3		
0	2	1	FIN 425	Financial Modeling	3	0	3		
3	0	3	FIN 320	Investments	3	0	3		
3	0	3	MGT 412	Entrepreneurship and Small Business Mgt.	3	0	3		
2	0	2	IAS 301	Language Comm. Skills	2	0	2		
3	0	3							
17	2	18				17	0	17	
			FIN 350	Begin Cooperative Work	0	0	0		
0	0	6	FIN xxx	FIN Elective II	3	0	3		
			XXX xxx	ACCT/FIN Elective	3	0	3		
			FIN 450	Financial Policy	3	0	3		
			XXX xxx	College Business Elective	3	0	3		
			MGT 449	Strategic Management	3	0	3		
0	0	6				15	0	15	
hours required in Degree Program : 127									

## Department of Management and Marketing

**Chairman: Dr. Aymen A. Kayal**

### Faculty

Al-Ashban	Al-Shuridah	Mansour
Al-Faraj	Alwuhaibi	Matzin
Al-Ghamdi	Eltayeb	Mohamed
Alkahtany	Frimpong	Oukil
Al-Khars	Heineck	Qazi
Al-Meer	Joyner	Sadi
Al-Qahtani, H	Kazmi	Shareef
Al-Qahtani, N	Kayal	Sohail
Al-Shammari	Maghrabi	
Alshebil	Mahdi	



## B.S. Degree in Management

Management is a fundamental human activity, and one of the key functions of any business organization. It is the function through which businesses anticipate, create, and communicate value to and manage relationships with stakeholders. The Management program at CIM is designed for students who wish to pursue a wide variety of careers in business organizations.

The Management program prepares students to assume leadership roles in business and other types of institutions. The program is designed to develop the student's ability to think objectively and make sound decisions. This program will teach the student how to become effective as a person and as a managerial leader.

The Management program includes Management of Human Resources, Supply Chain Management, International Business, Cost Accounting, Financial Management, Management Information Systems, Organizational Behavior, Marketing Research, and courses in Quantitative Methods and Research, as well as 28 weeks of practical experience in business organizations. The program keeps up with the most recent developments in the field of management. It places sufficient emphasis on computer applications and quantitative methods. The B.S. in Management program has been offered in CIM for close to 20 years now, and has graduated many students who are now playing significant roles in the management functions of their organizations.

### Program Learning Goals and Objectives

Learning goals and objectives for the B.S. in management program are shown below. Consistent with AACSB guidelines, the goals and objectives are classified into three categories: general education, management-specific (i.e. business-specific), and discipline-specific (i.e. management-specific) goals and objectives.

Learning goal	Learning objective
<b>College General Education Learning Goals/Objectives</b>	
<b>1. Communication Abilities</b> Ability to communicate business ideas effectively both orally and in writing	1. Students will be able to write reports that (a) are grammatically correct and (b) incorporate logical, complete, and articulate thoughts.
	2. Students will be able to make effective oral presentations on business topics. For example, they will (a) conduct themselves professionally, (b) speak clearly, (c) maintain eye contact with their audience, and (d) convey the main ideas.
<b>2. Team Work Skills</b> Ability to function effectively as a member or leader of a team in performing group tasks in business and professional organizations	1. Students will be able to work effectively in group settings.
	2. Students will be able to lead group work.
<b>3. Reflective Thinking Skills</b> Ability to apply logic and exercise sound judgment in making decisions	Students will be able to show good judgment in making choices and decisions.
<b>4. Analytic/Quantitative Skills</b> Ability to understand, analyze and use quantitative data to make business	1. Students will be able to identify quantitative characteristics of business problems.
	2. Students will be able to examine and interpret numeric

decisions and/or solve business problems	business data. 3. Students will be able to analyze numeric business data to derive conclusions.
<b>5. Ethical Understanding</b> Ability to recognize, understand and evaluate ethical issues in business situations	1. Students will be able to recognize and understand ethical issues in business situations 2. Students will be able to evaluate ethical issues presented to them and to make responsible choices and/or decisions.
<b>6. Use of Information Technology</b> Ability to use information technology as a business enabler	1. Students will be able to use basic IT software tools, such as spreadsheets, database management, and presentation software. 2. Students will be able to use software tools to solve accounting, financial and quantitative problems 3. Students will be able to use software tools to meaningfully select, manipulate and process data to make business decisions. 4. Students will be able to use information technology (e.g. research databases and/or the Internet) to obtain information.
<b>7. Leadership</b> Ability to take initiative, show confidence and exercise leadership in business and professional organizations	Students will be able to demonstrate that they are proactive, have confidence, and have potential for leadership in their coop experience and the capstone courses.
<b>8. Multicultural and diversity understanding</b> Awareness and understanding of cultural issues that impact business operations in a global society	Students will be able to deal effectively with people from diverse social, economic, and religious backgrounds.
<b><i>College Management-Specific Learning Goals and Objectives</i></b>	
<b>9. Management-Specific Knowledge</b> Ability to apply functional area concepts and theories appropriately	1. Students will demonstrate knowledge of the functional areas of business and their inter-relationships. 2. Students will be able to integrate basic functional area competencies to critically evaluate information and make decisions.
<b><i>Management Major Learning Goals/Objectives</i></b>	
<b>10. Discipline-Specific Knowledge</b> Awareness and understanding of management concepts, principles and theories	1. Students will be able to demonstrate a thorough understanding of the role of management in organizations and society at large. 2. Students will be able to demonstrate a good understanding of the principles and theories underlying modern management thinking and practice. 3. Students will be able to demonstrate awareness of the responsibilities and challenges facing management in organizations and society at large
<b>11. Application of Discipline-Specific Knowledge</b>	1. Students will be able to apply the management process of planning, organizing, leading, and controlling.

<p>Ability to apply management area concepts, principles and theories appropriately</p>	<ol style="list-style-type: none"><li>2. Students will be able to draw appropriate implementation plans for the strategies.</li><li>3. Students will be able to design and conduct basic-level management-related research studies, or evaluate and use third-party business research studies for effective managerial decision making.</li></ol>
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## Requirements for the B.S. Degree in Management

Every student majoring in Management must complete the following curriculum:

<b>(a) General Education Requirements (43 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENG 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 101, 102, 131	11
Physical Education	PE 101, 102	2
Science or Engineering Elective	XXX xxx	3
General Studies	Two GS xxx Courses	6
		<b>43</b>

<b>(b) Core Requirements in Business Administration (42 credit hours)</b>		
Accounting	ACCT 110, 210	6
Business Communications	MGT 210	3
Economics	ECON 101, 102, 206	9
Finance	FIN 250	3
Management	MGT 311	3
Management Information Systems	MIS 215	3
Operations Management	OM 210, 310	6
Statistics	STAT 211, 212	6
College Business Elective	XXX xxx	3
		<b>42</b>

<b>(c) Management Major Requirements (36 credit hours)</b>		
Management	MGT 301, 310, 312, 440, 449, 450	18
Marketing	MKT 250, 345	6
Operations Management	OM 320	3
Human Resources Management	HRM 301	3
Major Electives, Any two courses of:	HRM 390, 401, 402, 403, 411, MGT 312, 413, 430	6
		<b>36</b>

### **(d) Cooperative Work (6 credit hours)**

Each student majoring in Management must participate in a structured 28-week cooperative work program.

Cooperative Work	MGT 351	6
		<b>6</b>

**The total number of credit hours required is**

**127**

## Management Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1	
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
ECON 101	Principles of Economics I	3	0	3	ACCT 110	Introduction to Financial Accounting	3	0	3	
ENGL 101	Intro. to Academic Discourse	3	0	3	ECON 102	Principles of Economics II	3	0	3	
MATH 101	Calculus I	4	0	4	ENGL 102	Intro. to Report Writing	3	0	3	
IAS 101	Practical Grammar	2	0	2	MATH 102	Calculus II	4	0	4	
IAS 111	Belief and its Effects	2	0	2	MATH 131	Finite Mathematics	3	0	3	
PE 101	Health and Physical Educ. I	0	2	1	IAS 212	Professional Ethics	2	0	2	
GS xxx	GS Elective I	3	0	3						
		17	2	18				18	0	18
Second Year (Sophomore)										
ACCT 210	Introduction to Managerial Accounting	3	0	3	MGT 301	Principles of Management	3	0	3	
MIS 215	Principles of MIS	3	0	3	MGT 210	Business Comm.	3	0	3	
ENGL 214	Academic and Professional Comm.	3	0	3	OM 210	Operations Management	3	0	3	
IAS 322	Human Rights in Islam	2	0	2	STAT 212	Statistics for Business II	3	0	3	
STAT 211	Statistics for Business I	3	0	3	MKT 250	Principles of Marketing	3	0	3	
GS xxx	GS Elective II	3	0	3	IAS 201	Objective Writing	2	0	2	
PE 102	Health and Physical Educ. II	0	2	1						
		17	2	18				17	0	17
Third Year (Junior)										
HRM 301	Human Resources Management	3	0	3	MKT 345	Marketing Research	3	0	3	
MGT 310	Organization Behavior	3	0	3	XXX xxx	Science or Eng. Elective	3	0	3	
ECON 206	Economy of Saudi Arabia	3	0	3	IAS 301	Language Comm. Skills	2	0	2	
MGT 311	Legal Environment	3	0	3	OM 320	Intro. to Supply Chain Management	3	0	3	
FIN 250	Financial Management	3	0	3	OM 310	Quant. Methods for Management	3	0	3	
					XXX xxx	College Business Elective	3	0	3	
		15	0	15				17	0	17
Summer Session					MGT 350	Begin Cooperative Work	0	0	0	
Fourth Year (Senior)										
MGT 351	Cooperative Work	0	0	6	MGT 412	Entrepreneurship and Small Business Mgt.	3	0	3	
					MGT 440	International Business	3	0	3	
					MGT 449	Strategic Management	3	0	3	
					MGT 450	Management of Innovation and Change	3	0	3	
					XXX xxx	MGT/HRM elective I	3	0	3	
					XXX xxx	MGT/HRM elective II	3	0	3	
		0	0	6				18	0	18
Total credit hours required in Degree Program : 127										

## B.S. Degree in Marketing

Marketing is a fundamental human activity. Businesses and noncommercial institutions attempt to anticipate, manage and satisfy demands for goods and services. To do this, marketers must adequately conceive, promote, price, and distribute such goods and services. Marketing is an appropriate field of study for individuals who are interested in discovering consumer needs, satisfying these needs, and communicating benefits to a target group of customers.

The broad objective of the B.S. in marketing program is to equip students with relevant knowledge and skills to enable them to function effectively in marketing-related positions in a variety of contexts. This program stresses basic conceptual knowledge in all fields of industrial management as an essential foundation for an effective Marketing career.

The Marketing program is designed for students who wish to pursue careers as marketing managers or directors, sales managers, marketing research coordinators, advertising directors, product development specialists, distribution managers, sales executives, market analysts, retail merchandising specialists, brand or product managers, or export directors.

The Marketing program includes courses in marketing research, product and brand management, integrated marketing communications, marketing channels, international marketing, strategic marketing, and a marketing elective course, as well as 28 weeks of practical experience in marketing. The program focuses on the principles, concepts, and procedures needed for measuring and analyzing marketing information for effective decision-making and for implementing and controlling marketing plans for efficient market penetration. Even though the program is designed to meet the local marketing environment requirements, it also keeps up with the most recent developments in the field of marketing.

### Program Learning Goals and Objectives

Learning goals and objectives for the B.S. in marketing program are shown below. Consistent with AACSB guidelines, the goals and objectives are classified into three categories: general education, management-specific (i.e. business-specific), and discipline-specific (i.e. marketing-specific) goals and objectives.

Learning goal	Learning objective
<b><i>College General Education Learning Goals and Objectives</i></b>	
<b>1. Communication Abilities</b> Ability to communicate business ideas effectively both orally and in writing	1. Students will be able to write reports that (a) are grammatically correct and (b) incorporate logical, complete, and articulate thoughts.
	2. Students will be able to make effective oral presentations on business topics. For example, they will (a) conduct themselves professionally, (b) speak clearly, (c) maintain eye contact with their audience, and (d) convey the main ideas.
<b>2. Team Work Skills</b> Ability to function effectively as a member or leader of a team in performing group tasks in business and professional organizations	1. Students will be able to work effectively in group settings.
	2. Students will be able to lead group work.

<b>3. Reflective Thinking Skills</b> Ability to apply logic and exercise sound judgment in making decisions	Students will be able to show good judgment in making choices and decisions.
<b>4. Analytic/Quantitative Skills</b> Ability to understand, analyze and use quantitative data to make business decisions and/or solve business problems	1. Students will be able to identify quantitative characteristics of business problems.
	2. Students will be able to examine and interpret numeric business data.
	3. Students will be able to analyze numeric business data to derive conclusions.
<b>5. Ethical Understanding</b> Ability to recognize, understand and evaluate ethical issues in business situations	1. Students will be able to recognize and understand ethical issues in business situations.
	2. Students will be able to evaluate ethical issues presented to them and to make responsible choices and/or decisions.
<b>6. Use of Information Technology</b> Ability to use information technology as a business enabler	1. Students will be able to use basic IT software tools, such as spreadsheets, database management, and presentation software.
	2. Students will be able to use software tools to solve accounting, financial and quantitative problems.
	3. Students will be able to use software tools to meaningfully select, manipulate and process data to make business decisions.
	4. Students will be able to use information technology (e.g. research databases and/or the Internet) to obtain information.
<b>7. Leadership</b> Ability to take initiative, show confidence and exercise leadership in business and professional organizations	Students will be able to demonstrate that they are proactive, have confidence, and have potential for leadership in their coop experience and the capstone courses.
<b>8. Multicultural and diversity understanding</b> Awareness and understanding of cultural issues that impact business operations in a global society	Students will be able to deal effectively with people from diverse social, economic, and religious backgrounds.
<b><i>College Management-Specific Learning Goals and Objectives</i></b>	
<b>9. General Business Knowledge</b> Ability to apply concepts and theories from business functional areas appropriately	1. Students will demonstrate knowledge of the functional areas of business and their inter-relationships.
	2. Students will be able to integrate basic functional area competencies to critically evaluate information and make decisions.
<b><i>Marketing Specific Learning Goals and Objectives</i></b>	
<b>10. Marketing Knowledge</b> Awareness and understanding of marketing concepts, principles and theories	1. Students will be able to demonstrate a thorough understanding of the role of marketing in an organization and society at large.  2. Students will be able to demonstrate a good understanding of the principles and theories of modern marketing thinking and practice.

	3. Students will be able to demonstrate awareness of responsibilities and challenges facing marketing in the organization and society at large.
<b>11. Application of Marketing Knowledge</b> Ability to apply marketing area concepts, principles and theories appropriately	1. Students will be able to design marketing strategies for organizations and draw appropriate implementation plans for the strategies. 2. Students will be able to design and conduct basic-level marketing research studies, or evaluate and use third-party market research studies for effective marketing decision making.



## Requirements for the B.S. Degree in Marketing

Every student majoring in Marketing must complete the following curriculum:

<b>(a) General Education Requirements (43 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENG 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 101, 102, 131	11
Physical Education	PE 101, 102	2
Science or Engineering Elective	XXX xxx	3
General Studies	Two GS xxx Courses	6
		<b>43</b>

<b>(b) Core Requirements in Business Administration (42 credit hours)</b>		
Accounting	ACCT 110, 210	6
Business Communications	MGT 210	3
Economics	ECON 101, 102, 206	9
Finance	FIN 250	3
Management	MGT 311	3
Management Information Systems	MIS 215	3
Operations Management	OM 210, 310	6
Statistics	STAT 211, 212	6
College Business Elective	XXX xxx	3
		<b>42</b>

<b>(c) Marketing Major Requirements (36 credit hours)</b>		
Management	MGT 301, 412, 449	9
Marketing	MKT 250	3
Consumer Behavior	MKT 410	3
Marketing Research	MKT 345	3
Product & Brand Management	MKT 360	3
Integrated Marketing Communications	MKT 370	3
Marketing Channels	MKT 380	3
International Marketing	MKT 420	3
Strategic Marketing	MKT 450	3
Major Elective, One course of:	MKT 430, 440, 460, 470, 480, 490, 495	3
		<b>36</b>

### **(d) Cooperative Work (6 credit hours)**

Each student majoring in Marketing must participate in a structured 28-week cooperative work program.

Cooperative Work	MKT 351	6
		<b>6</b>

**The total number of credit hours required is**

**127**

## Marketing Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
<b>Preparatory Year</b>									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		<b>20</b>	<b>10</b>	<b>16</b>			<b>18</b>	<b>12</b>	<b>15</b>
<b>Total credit hours required in Preparatory Program: 31</b>									
<b>First Year (Freshman)</b>									
ECON 101	Principles of Economics I	3	0	3	ACCT 110	Intro. to Financial Accounting	3	0	3
ENGL 101	Intro. to Academic Discourse	3	0	3	ECON 102	Principles of Economics II	3	0	3
MATH 101	Calculus I	4	0	4	ENGL 102	Intro. to Report Writing	3	0	3
IAS 101	Practical Grammar	2	0	2	MATH 102	Calculus II	4	0	4
XXX xxx	Science or Eng. Elective	3	0	3	MATH 131	Finite Mathematics	3	0	3
PE 101	Health and Physical Educ. I	0	2	1	IAS 111	Belief and its Effects	2	0	2
					PE 102	Health and Physical Educ. II	0	2	1
		<b>15</b>	<b>2</b>	<b>16</b>			<b>18</b>	<b>2</b>	<b>19</b>
<b>Second Year (Sophomore)</b>									
ACCT 210	Intro. to Managerial Accounting	3	0	3	MGT 210	Business Comm.	3	0	3
MIS 215	Principles of MIS	3	0	3	OM 210	Operations Management	3	0	3
ENGL 214	Academic and Professional Comm.	3	0	3	STAT 212	Statistics for Business II	3	0	3
STAT 211	Statistics for Business I	3	0	3	MKT 250	Principles of Marketing	3	0	3
IAS 201	Objective Writing	2	0	2	MGT 301	Principles of Management	3	0	3
GS xxx	GS Elective I	3	0	3	FIN 250	Financial Management	3	0	3
		<b>17</b>	<b>0</b>	<b>17</b>			<b>18</b>	<b>0</b>	<b>18</b>
<b>Third Year (Junior)</b>									
ECON 206	Economy of Saudi Arabia	3	0	3	MKT 370	Integrated Marketing Comm.	3	0	3
GS 321	GS Elective II	3	0	3	MKT 380	Marketing Channels	3	0	3
MKT 360	Product & Brand Management	3	0	3	MKT 410	Consumer Behavior	3	0	3
MKT 345	Marketing Research	3	0	3	OM 310	Quant. Methods of Management	3	0	3
MGT 311	Legal Environment	3	0	3	XXX xxx	College Business Elective	3	0	3
IAS 212	Professional Ethics	2	0	2	IAS 301	Language Comm. Skills	2	0	2
		<b>17</b>	<b>0</b>	<b>17</b>			<b>17</b>	<b>0</b>	<b>17</b>
<b>Summer Session</b>					MKT 350	Begin Cooperative Work	<b>0</b>	<b>0</b>	<b>0</b>
<b>Fourth Year (Senior)</b>									
MKT 351	Cooperative Work	0	0	6	MKT 420	International Marketing	3	0	3
					MKT 450	Strategic Marketing	3	0	3
					MGT 412	Entrepreneurship and Small Business Mgt.	3	0	3
					MGT 449	Strategic Management	3	0	3
					MKT 4xx	Major Elective	3	0	3
					IAS 322	Human Rights in Islam	2	0	2
		<b>0</b>	<b>0</b>	<b>6</b>			<b>17</b>	<b>0</b>	<b>17</b>
<b>Total credit hours required in Degree Program : 127</b>									

# **COLLEGE OF PETROLEUM ENGINEERING & GEOSCIENCES**

**Dean: Dr. Abdulaziz O. Al-Kaabi**

## **UNDERGRADUATE DEPARTMENTS**

**GEOSCIENCES**

**PETROLEUM ENGINEERING**

**CENTER FOR INTEGRATIVE PETROLEUM RESEARCH**

## **Vision of the College**

To be a global leader in the integration of undergraduate and graduate education with both basic and applied research relevant to discovery and recovery of hydrocarbon resources with minimum impact on the environment.

## **Mission**

- Assure that undergraduate and graduate programs of the College keep pace with the inexorable increase both in the basic sciences underlying our understanding of petroleum engineering and geosciences, and in technological sophistication of exploration and production of oil and gas.
- To prepare graduates of the College at all levels to contribute to humankind's knowledge of discovery and recovery, to contribute to technology-based company or government missions, and to educate and mentor those students who have the ability to solve the difficult technical, industrial, and civic problems of tomorrow.
- Help secure the economic future of Saudi Arabia and world by increasing the role of the world's largest oil-producing country as a generator of new science, new technology, and tech-based start-up companies of direct relevance to the growth and development of the oil and gas industries.

## **Philosophy**

The College of Petroleum Engineering & Geosciences (CPG) integrates three units that already exist at KFUPM: the Department of Petroleum Engineering, the Department of Earth Sciences, and the Center for Petroleum and Minerals. The three units were formally under College of Engineering Sciences, College of Sciences and KFUPM Research Institute, respectively. The driver for this initiative is to substantially leverage the educational and research capacity of KFUPM, to contribute to industry-relevant research and to develop industry-ready talent across a wide spectrum.

CPG is an integral part of KFUPM but with features that distinguish it markedly from other KFUPM Colleges:

- The Center for Integrative Petroleum Research (CIPR): This Center is the home for the College's academic research enterprise, supporting curiosity-driven research, as well as performing challenge-driven contract research for both government and industry. A substantial increase in College-based research activity will support a rapid increase in enrollment in research-oriented doctoral programs over the next decade. The CIPR will establish a strong presence in the Dhahran Techno Valley, DTV, and this will open the opportunity for additional engagement between DTV industrial partners and CPG in research and education.
- High level of industry engagement: The College will leverage, and expand on, KFUPM's long history of close engagement with industry in DTV, in the Kingdom, and worldwide. The new College, and particularly the CIPR, includes programs to

draw industry interns, visiting industry executives, and visiting industry researchers and practitioners to the College to contribute to, and learn from, the College and its research activities.

- Integrated, collaborative curriculum: A critical role of the College is to form talented undergraduate and graduate students into petroleum professionals characterized by the highest standards of technical expertise, innovation and teamwork. Over the course of the early years of the College, the classroom, laboratory, and experiential aspects of the core curricula will be revised to provide world-class interdisciplinary and integrative degree programs for students matriculating through the college.

## **College Programs**

The undergraduate programs of the College of Petroleum Engineering & Geosciences provide students with a range of educational opportunities by which they will achieve competence in major branches of petroleum engineering and geosciences. A key parameter of the curriculum at CPG is the fact that the undergraduate educational experience is an integrated one, in that all students take courses in petroleum engineering and geosciences, regardless of their ultimate major. Equipped in this way with the knowledge of mathematics, geology, geophysics, petroleum engineering, computational techniques, and statistical analysis of data, the CPG graduate can engage in creative design and construction, synthesis of systems, and in research and development. Thus, the CPG graduate are well equipped to seek jobs in a range of professions, in either industry or academia. The College of Petroleum Engineering and Geosciences continues to provide flexibility in different programs through a spectrum of electives, which allows the graduate to exercise a limited choice in tailoring his program to fit his personal goals, whether for immediate employment or for graduate work.

All programs of the College of Petroleum Engineering and Geosciences met the Accreditation Criteria of the Board for Engineering and Technology (ABET) and National Commission for Academic Accreditation & Assessment (NCAAA).

## **Programs offered in the College**

- |                          |                   |
|--------------------------|-------------------|
| 1. Petroleum Engineering | (BS, MS, and PhD) |
| 2. Geology               | (BS, MS, and PhD) |
| 3. Geophysics            | (BS, MS)          |
| 4. Environmental Science | (MS)              |

## **Graduation Requirements**

In order to qualify for graduation in Petroleum Engineering and Geosciences students must:

1. Complete all required and elective courses in the selected degree program with a cumulative GPA of 2.00 or better;
2. Achieve a major GPA of 2.00 or better;
3. After the third year, successfully complete an 8-week program working in industry.

## Department of Geosciences

**Chairman: Dr. Abdulaziz M. Al-Shaibani**

### Faculty

Abdulghani  
Abdullatif  
Abokhodair  
Al-Lehyani  
Aramadan  
Al-Shaibani

Alshuhail  
Al-Shuhail  
Dogan  
Hariri  
Hughes  
Kaka

Kaminski  
Korvin  
Makkawi  
Qurban  
Tawabini  
Wood

## **Introduction**

Geosciences, which include Geology and Geophysics, are an integral part of the basic science education in most colleges and universities worldwide. Realizing their importance in the development and advancement of Saudi Arabia, KFUPM established the Department of Geology in 1963. With the addition of a Geophysics option in 1976, the name was changed to the Department of Earth Sciences.

## **Scope**

The scope of Earth Sciences is quite broad and diverse, beginning with the ground we walk on, extending inward to the center of the earth, and outward to the other planets in the solar system. While the scope of Geology and Geophysics is closely related, there are some major differences. Geologists study the composition, structure and history of the earth's crust. Geophysicists use the principles of physics and mathematics to study not only the earth's surface but its interior as well as its magnetic, electrical, and gravitational fields. Both, however, commonly apply their skills to solve environmental problems and to search for natural resources, such as oil, natural gas, minerals, and groundwater.

## **Vision**

To continue as the leading Geosciences department in the region through a balanced approach between education and research.

## **Mission**

1. To prepare students who are competent in theory and applications of Geosciences. Our graduates will be prepared equally for industrial and post-graduate careers.
2. To provide solutions to problems resulting from natural hazards and human activities in arid regions through focused research.
3. To serve the community by providing expertise in the fields of Petroleum Geology, Groundwater, Environment, and Exploration Geophysics.

## **Goals**

The main goals of Earth Sciences Department programs are: 1) to reflect in our teaching, research, and service the breadth and importance of Earth Sciences to society, 2) to provide students with the technical expertise and skills needed to gather and interpret Earth Sciences data in a scientific manner, 3) to provide students with the necessary tools to effectively communicate the results of geological/geophysical investigations to other professionals and to the public, and 4) to maintain and enhance distinction in the areas of natural resources, including oil and gas, groundwater, mineral resources, and environment.

To achieve such goals, the department has adopted the following strategies to provide: 1) Up-to-date lecture and laboratory-based courses. 2) Laboratory and field study experiences that provide exposure to modern equipment and technologies that will enhance career opportunities of our students. 3) State-of-the art-computer technology and software for data acquisition, analysis, and modeling applications within Earth Sciences. 4) Research opportunities and support for undergraduate students (senior projects, field trips, field courses, and summer training) and graduate students (theses and dissertations).

## **The Program and Facilities**

The Department of Earth Sciences offers majors in both Geology and Geophysics, covering a broad-base program in both options. The undergraduate programs in the Department are sufficiently flexible to accommodate transfer students from other departments in the university.

Facilities currently available in the department include several well-equipped lecture, seminar, audio-visual and resource rooms. The resource room contains a wide selection of professional journals, memoirs, reference textbooks and other publications. The Earth Sciences museum has an impressive inventory of geological specimens (fossils, fossil fuels, minerals, and rocks) collected from different areas in the Kingdom and worldwide. The department owns several 4-wheel drives and a dune buggy for field trips. These vehicles are used for local course-related field trips as well as during the Summer Field camp.

Laboratory facilities and equipment available in the department include thin-section, and reflection microscopy, scanning electron microscopy (SEM), X-ray diffractometry (XRD), equipment for rock-magnetic and paleomagnetic studies, remote sensing, aerial photographs, gravimeter, ground penetrating radar (GPR), resistivity and seismic, and various analytical instruments for the field as well as laboratory hydrologic investigations. In addition, the department enjoys unrestricted access to the world-class research facilities in the Central Analytical Laboratories and remote sensing units of the University Research Institute (RI).

The PC laboratory of the department is equipped with state-of-the art computing facilities. The department has acquired several SUN workstations for training students in different geological and geophysical applications. In addition, the department is connected to the UNIX server of the university Information Technology Center (ITC), a major data processing center in the region.

## **Employment Opportunities**

Most Earth Scientists are employed by government agencies and industries related to oil and gas, mining and minerals, environmental consulting, and water resources. Depleting energy, mineral, and water resources along with increasing concerns about the environment and natural hazards have created added opportunities and challenges for Earth Scientists. In addition, demand for geologists in faculty positions both at school and university levels has been steadily increasing for the last few decades.

In Saudi Arabia, a majority of the Earth Sciences graduates find employment in Saudi ARAMCO, different service companies and government agencies including the Geological Survey of Saudi Arabia, the Ministry of Agriculture and Water, Ministry of Petroleum and Mineral Resources, Ministry of Defense, Ministry of Higher Education, King Abdulaziz City for Science and Technology (KACST), Schlumberger, Western Geophysical, Geophysical Services International, Arabian Geophysical and Surveying (ARGAS) and others. In a fast-developing country like Saudi Arabia, expanded exploration and exploitation efforts for hydrocarbons, economic minerals deposits, and groundwater resources, city and highway planning, and environmental pollution control will require the service of a growing number of Earth Scientists in the future.



## Requirements for the B.S. Degree in Geology

Every student majoring in Geology must complete the following curriculum:

<b>(a) General Education Requirements (58 credit hours)</b>		<b>Credit Hours</b>
Chemistry	CHEM 101, 102	8
Information and Computer Science	ICS 103	3
English	ENGL 101, 102, 214	9
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322, 4xx	14
Mathematics and Statistics	MATH 101, 102, 201, STAT 201	14
Physical Education	PE 101, 102	2
Physics	PHYS 101, 102	8
		<b>58</b>
<b>(b) Core Requirements (46 credit hours)</b>		
Physical Geology	GEOL 201	3
Historical Geology	GEOL 203	3
Paleontology and Biostratigraphy	GEOL 214	3
Mineralogy and Optics	GEOL 216	4
Structural Geology	GEOL 305	3
Sedimentation and Stratigraphy	GEOL 307	4
Regional Geology	GEOL 318	3
Petrology	GEOL 320	4
Geology Seminar	GEOL 409	1
Petroleum Geology	GEOL 415	3
Hydrogeology	GEOL 423	3
Field Geology	GEOL 430	6
Environmental Geology	GEOL 446	3
Introduction to Geophysics	GEOL 202	3
		<b>46</b>
<b>(c) Electives (18 credit hours)</b>		
Geology Electives, 6 credits from:	GEOL 312, 328, 341, 355, 420, 431, 434, 435, 436, 440, 441, 454, 456, 460, 461, 464, 480	6
General Studies	One Approved GS xxx Course	3
Free Electives (Three 200-level or higher courses to a total of 9 credit hours after consultation with the advisor)	Three XXX xxx Courses	9
		<b>18</b>
<b>(d) Summer Training (2 credit hours)</b>		
Each student must work as a trainee geologist for a period of a total of eight weeks in an organization/company that conducts geological activities, after which he must submit a written report and make an oral presentation, based on his training in the organization.		
Summer Training	GEOL 399	2
		<b>2</b>

**The total number of credit hours required is**

**124**

# Geology Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
<b>Preparatory Year</b>									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		<b>20</b>	<b>10</b>	<b>16</b>			<b>18</b>	<b>12</b>	<b>15</b>
<b>Total credit hours required in Preparatory Program: 31</b>									
<b>First Year (Freshman)</b>									
CHEM 101	General Chemistry I	3	4	4	CHEM 102	General Chemistry II	3	4	4
ENGL 101	Intro. to Academic Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3
IAS 111	Belief and its Effects	2	0	2	MATH 102	Calculus II	4	0	4
MATH 101	Calculus I	4	0	4	PE 102	Health and Physical Educ. II	0	2	1
PE 101	Health and Physical Educ. I	0	2	1	PHYS 102	General Physics II	3	3	4
PHYS 101	General Physics I	3	3	4					
		<b>15</b>	<b>9</b>	<b>18</b>			<b>13</b>	<b>9</b>	<b>16</b>
<b>Second Year (Sophomore)</b>									
GEOL 201	Physical Geology	2	3	3	GEOL 214	Paleontology and Biostratigraphy	2	3	3
GEOL 203	Historical Geology	2	3	3	ENGL 214	Academic & Professional Comm.	3	0	3
IAS 101	Practical Grammar	2	0	2	GEOL 216	Mineralogy and Optics	3	3	4
ICS 103	Computer Programming in C	2	3	3	IAS 212	Professional Ethics	2	0	2
MATH 201	Calculus III	3	0	3	STAT 201	Intro. to Statistics	2	2	3
		<b>11</b>	<b>9</b>	<b>14</b>			<b>12</b>	<b>8</b>	<b>15</b>
<b>Summer Session</b>					GEOL 399	Summer Training	<b>0</b>	<b>0</b>	<b>2</b>
<b>Third Year (Junior)</b>									
GEOL 305	Structural Geology	2	3	3	GEOL 318	Regional Geology	3	0	3
GEOL 307	Sedimentation and Stratigraphy	3	3	4	GEOL 320	Petrology	3	3	4
IAS 201	Objective Writing	2	0	2	IAS 322	Human Rights in Islam	2	0	2
XXX xxx	Free Elective I	3	0	3	XXX xxx	Free Elective II	3	0	3
GEOP 202	Intro. to Geophysics	3	0	3					
		<b>13</b>	<b>6</b>	<b>15</b>			<b>11</b>	<b>3</b>	<b>12</b>
<b>Summer Session</b>					GEOL 430	Field Geology	<b>0</b>	<b>18</b>	<b>6</b>
<b>Fourth Year (Senior)</b>									
GEOL 415	Petroleum Geology	3	0	3	GEOL 423	Hydrogeology	3	0	3
GEOL 446	Environmental Geology	3	0	3	GEOL xxx	GEOL Elective II	3	0	3
GEOL xxx	GEOL Elective I	3	0	3	GEOL 409	Geology Seminar	1	0	1
XXX xxx	Free Elective III	3	0	3	IAS 4xx	IAS Elective	2	0	2
IAS 301	Language Comm. Skills	2	0	2	GS xxx	GS Elective	3	0	3
		<b>14</b>	<b>0</b>	<b>14</b>			<b>12</b>	<b>0</b>	<b>12</b>
<b>Total credit hours required in Degree Program : 124</b>									

## Requirements for the B.S. Degree in Geophysics

Every student majoring in Geophysics must complete the following curriculum:

<b>(a) General Education Requirements (62 credit hours)</b>		<b>Credit Hours</b>
Chemistry	CHEM 101, 102	8
Information and Computer Science	ICS 103	3
English	ENGL 101, 102, 214	9
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322, 4xx	14
Mathematics	MATH 101, 102, 201, 202	14
Physical Education	PE 101, 102	2
Physics	PHYS 101, 102, 201	12
		<b>62</b>
<b>(b) Core Requirements (40 credit hours)</b>		
Introduction to Geophysics	GEOP 202	3
Introduction to Seismology	GEOP 204	3
Computational Geophysics	GEOP 205	3
Seismic Exploration I	GEOP 315	3
Seismic Data Processing	GEOP 320	3
Senior Project	GEOP 402	3
Gravity and Magnetism Exploration	GEOP 404	3
Seminar	GEOP 405	1
Electrical Exploration	GEOP 450	3
Physical Geology	GEOL 201	3
Structural Geology	GEOL 305	3
Regional Geology	GEOL 318	3
Classical Mechanics I	PHYS 301	3
Electricity and Magnetism I	PHYS 305	3
		<b>40</b>
<b>(c) Electives (21 credit hours)</b>		
Geophysics Electives, 6 credits from:	GEOP 415, 430, 455, 465, 470, 472, 475, 478, 480	6
Math Elective (200-level or higher after consultation with the advisor)	MATH xxx	3
Geology Elective (200-level or higher after consultation with the advisor)	GEOL xxx	3
General Studies	GS xxx	3
Free Electives (200-level or higher courses from Engineering and/or Sciences approved by the advisor)	Two XXX xxx Courses	6
		<b>21</b>
<b>(d) Summer Training (2 credit hours)</b>		
Each student must spend eight weeks in a firm or institution that conducts geophysical activities, after which he must submit a formal written report and give an oral presentation.		
Summer Training	GEOP 399	2
		<b>2</b>

**The total number of credit hours required is**

**125**

# Geophysics Curriculum

Geophysics Curriculum										
COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2		
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
CHEM 101	General Chemistry I	3	4	4	CHEM 102	General Chemistry II	3	4	4	
ENGL 101	Intro. to Academic Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3	
IAS 111	Belief and its Effects	2	0	2	MATH 102	Calculus II	4	0	4	
MATH 101	Calculus I	4	0	4	PE 102	Health and Physical Educ. II	0	2	1	
PE 101	Health and Physical Educ. I	0	2	1	PHYS 102	General Physics II	3	3	4	
PHYS 101	General Physics I	3	3	4	ICS 103	Computer Programming in C	2	3	3	
		15	9	18				15	12	19
Second Year (Sophomore)										
GEOP 202	Intro. to Geophysics	3	0	3	GEOP 204	Intro. to Seismology	3	0	3	
GEOL 201	Physical Geology	2	3	3	ENGL 214	Academic & Professional Comm.	3	0	3	
IAS 101	Practical Grammar	2	0	2	GEOP 205	Computational Geophysics	3	0	3	
PHYS 201	General Physics III	3	3	4	IAS 212	Professional Ethics	2	0	2	
MATH 201	Calculus III	3	0	3	MATH 202	Elements of Differential Eq.	3	0	3	
		13	6	15				14	0	14
Third Year (Junior)										
GEOP 315	Seismic Exploration I	2	3	3	GEOP 320	Seismic Data Processing	2	3	3	
GEOL 305	Structural Geology	2	3	3	GEOL 318	Regional Geology	3	0	3	
IAS 201	Objective Writing	2	0	2	GEOL xxx	GEOL Elective	3	0	3	
PHYS 301	Classical Mechanics I	3	0	3	IAS 322	Human Rights in Islam	2	0	2	
MATH xxx	MATH Elective	3	0	3	XXX xxx	Free Elective I	3	0	3	
		12	6	14				13	3	14
Summer Session					GEOP 399	Summer Training	0	0	2	
Fourth Year (Senior)										
GEOP 402	Senior Project	1	6	3	GEOP 404	Gravity and Magnetic Exploration	3	0	3	
GEOP xxx	GEOP Elective I	3	0	3	GEOP 405	Seminar	1	0	1	
GEOP 450	Electrical Exploration	3	0	3	GS xxx	GS Elective	3	0	3	
PHYS 305	Electricity and Magnetism I	3	0	3	IAS 4xx	IAS Elective	2	0	2	
IAS 301	Language Comm. Skills	2	0	2	XXX xxx	Free Elective II	3	0	3	
					GEOP xxx	GEOP Elective II	3	0	3	
		12	6	14				15	0	15
Total credit hours required in Degree Program : 125										

## Department of Petroleum Engineering

**Chairman: Dr. Abdullah S. Sultan**

### Faculty

Abdulraheem	Al-Ramadan	Hossain
Abu-Khamsin	Awotunde	Mahmoud
Al-Hashim	Al-Shehri	Muhammadain
Al-Yousef	Elkatatny	Sultan
Al-Majed	Gajbhiye	

## **Introduction**

Petroleum engineering is the application of basic sciences for the development, recovery and field processing of oil and gas resources. Due to the complex nature of petroleum reservoirs, various petroleum engineering specialties have emerged. Among these are drilling engineering, formation evaluation, completion and workover, surface processing, and reservoir engineering. It should be emphasized, however, that modern petroleum production operations require a team effort in which all specialties of petroleum engineering as well as geologists, geophysicists, and computer technologists are involved.

In the Petroleum Engineering program, the student is educated in the principles, procedures and practices of drilling, formation evaluation, reservoir studies, production, environmental protection, and economic analysis. The aim of the first two years of the curriculum is to provide the necessary background of physics, chemistry, geology, mathematics, and engineering subjects such as fluid mechanics, thermodynamics, strength of materials and electric circuits. They also introduce the students to basic petroleum engineering subjects. The third and fourth years are dedicated to petroleum engineering courses which cover the core areas of drilling engineering, production engineering, formation evaluation and reservoir engineering.

The job of petroleum engineers starts after the discovery of a structure suitable for oil and gas accumulation. Exploration wells are first drilled and tested to evaluate the economic aspects of the discovery and to obtain the necessary data for the planning and development of the field. Petroleum reservoir engineers are normally responsible for determining the optimum number and locations of the wells and for establishing the production and recovery methods to achieve the maximum recovery in the most economical manner. This involves the utilization of basic and advanced sciences and computer technology.

The role of the petroleum production engineers comes next. These engineers, with the information provided by the reservoir engineers, are responsible for the design and implementation of well completions and subsurface and surface production facilities, which are needed to produce the field and treat the produced fluids to produce oil and gas with the specifications needed for transportation and refining operations. Petroleum drilling engineers are responsible for the design, planning and supervision of the well drilling activities.

## **Vision**

The vision of the Department of Petroleum Engineering at KFUPM is to be recognized worldwide as a center of excellence in education and research in the area of petroleum engineering.

## **Mission**

The mission of the Department of Petroleum Engineering at KFUPM is to have a high-quality program in petroleum engineering that stresses innovation, integration, team work, high ethical standards and awareness of industry needs in addition to advanced research capabilities.

## **Program Educational Objectives**

The educational objectives of the Petroleum Engineering program are to prepare the graduate to:

1. Be a petroleum engineer who is qualified to achieve a successful career in the petroleum industry.
2. Have a good understanding of the scientific, mathematical and technical foundation of petroleum engineering to facilitate self-learning and professional development.
3. Employ practical thinking with commitment to economic, innovative and optimum use of resources.
4. Promote professionalism, work ethics, social values and HSE issues.

## **Student Outcomes**

To achieve the program's educational outcomes, the program strives to have the student attain the following skills and abilities – the student outcomes - by the time of graduation:

- a. Ability to apply knowledge of mathematics, science and engineering.
- b. Ability to design and conduct experiments as well as to analyze and interpret data.
- c. Ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental and safety.
- d. Ability to function on multidisciplinary teams.
- e. Ability to identify/diagnose and solve petroleum engineering problems.
- f. Understanding of professional and ethical responsibilities.
- g. Ability to communicate effectively in all written and oral forms.
- h. Understanding of the impact of the petroleum industry in the global, economic, environmental and social context.
- i. Recognition of the need for and the ability to engage in life-long learning.
- j. Knowledge of contemporary issues.
- k. Ability to use techniques, skills and modern engineering tools necessary for engineering practices.

## **Program Strategy**

To achieve the program objectives, the Department of Petroleum Engineering endeavors to execute the following measures:

1. Attract and retain top quality faculty members and administrative staff, and invite experienced industry professionals to partake in teaching and research.
2. Attract high quality students, especially those with top university entrance scores, to the petroleum engineering program.
3. Continually improve and update the quality and scope of the program through periodic curriculum revisions and amendments.
4. Adopt and apply advanced educational technologies to improve the teaching and learning environment.

5. Formalize program assessment tools and procedures and make them an integral part of the educational process.
6. Upgrade and expand laboratory facilities and strive to employ qualified laboratory staff.
7. Acquire modern computer software in all areas of petroleum engineering, especially in reservoir simulation, pressure test analysis, and drilling engineering.
8. Promote ties between the department and the local petroleum industry, especially with Saudi Aramco and oil service companies, to expose faculty and students to technical developments and capture research opportunities. Strengthen the role of the department's Industrial Advisory Committee.
9. Strengthen relations between the department and professional societies, such as the Society of Petroleum Engineers (SPE) and its local section, and encourage student involvement in such societies.
10. Foster interdisciplinary cooperation with allied KFUPM units such as the Department of Earth Sciences and the Center for Petroleum and Minerals.
11. Foster collaboration with top petroleum engineering schools, such as the ones at Stanford University, Colorado School of mines, and Texas A&M University, on all aspects of undergraduate education including student and faculty exchange programs.



## Requirements for the B.S. Degree in Petroleum Engineering

Every student majoring in Petroleum Engineering must complete the following curriculum:

<b>(a) General Education Requirements (73 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	IAS 101, 201, 301, ENGL 101, 102, 214	15
Engineering	CE 202, CHE 204, EE 204, ME 203	12
Geology	GEOL 201, 318	6
Computer Programming	ICS 103	3
Islamic Studies	IAS 111, 212, 322	6
Mathematics and Statistics	MATH 101, 102, 201, 202, STAT 319	17
Physical Education	PE 101, 102	2
Sciences	CHEM 101, PHYS 101, 102	12
		<b>73</b>

<b>(b) Core Requirements (45 credit hours)</b>		
Drilling Engineering	PETE 203, 304	6
Formation Evaluation	PETE 303, 305, 306	10
Production Engineering	PETE 302, 403	6
Reservoir Engineering	PETE 204, 205, 301, 402, 410	15
Others	PETE 201, 407, 408, 411	8
		<b>45</b>

<b>(c) Electives (15 credit hours)</b>		
PETE Electives	Two PETE 4xx Courses	6
Technical Elective (From the Department's approved list or any other course subject to the approval of the academic advisor and the Department chairman)	XE xxx	3
General Studies	Two GS xxx Courses	6
		<b>15</b>

### **(d) Summer Training (0 credit hours)**

A student of junior standing spends a period of eight summer weeks working in the industry to gain exposure to and appreciation of the petroleum engineering profession. On completion of the training, the student is required to write and submit a formal report on his work.

Summer Training	PETE 399	0
		<b>0</b>

**The total number of credit hours required is**

**133**

# Petroleum Engineering Curriculum

Petroleum Engineering Curriculum										
COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2		
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
CHEM 101	General Chemistry I	3	4	4	IAS 101	Practical Grammar	2	0	2	
PHYS 101	General Physics I	3	3	4	PHYS 102	General Physics II	3	3	4	
MATH 101	Calculus I	4	0	4	MATH 102	Calculus II	4	0	4	
ENGL 101	Intro. to Academic Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3	
PETE 201	Intro. to Petroleum Eng.	1	0	1	ICS 103	Computer Programming in C	2	3	3	
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Education II	0	2	1	
		14	9	17				14	8	17
Second Year (Sophomore)										
EE 204	Fundamentals of Electrical Circuits	2	3	3	CE 202	Statistics & Strength of Materials	3	0	3	
GEOL 201	Physical Geology	2	3	3	CHE 204	Transport Phenomena I	3	0	3	
MATH 201	Calculus III	3	0	3	GS xxx	GS Elective I	3	0	3	
IAS 111	Belief and its Effects	2	0	2	MATH 202	Elements of Differential Eq.	3	0	3	
ME 203	Thermodynamics I	3	0	3	PETE 204	Reservoir Rock Properties	2	3	3	
PETE 203	Drilling Eng. I	2	3	3	PETE 205	Petroleum Fluid Properties	2	3	3	
		14	9	17				16	6	18
Third Year (Junior)										
IAS 201	Objective Writing	2	0	2	GEOL 318	Regional Geology	3	0	3	
ENGL 214	Academic & Professional Comm.	3	0	3	GS xxx	GS Elective II	3	0	3	
STAT 319	Probability and Stat. for Eng. and Scientists	2	3	3	IAS 212	Professional Ethics	2	0	2	
PETE 301	Reservoir Eng.	3	0	3	PETE 304	Drilling Eng. II	3	0	3	
PETE 302	Well Completion	3	0	3	PETE 305	Reservoir Description	3	0	3	
PETE 303	Well Logging	3	3	4	PETE 306	Well Testing	3	0	3	
		16	6	18				17	0	17
Summer Session					PETE 399	Summer Training	0	0	0	
Fourth Year (Senior)										
IAS 301	Language Comm. Skills	2	0	2	IAS 322	Human Rights in Islam	2	0	2	
PETE 402	Reservoir Simulation	2	3	3	PETE 403	Petroleum Production Eng.	3	0	3	
PETE 408	Seminar	0	2	1	PETE 407	Petroleum Economics	3	0	3	
PETE 410	Natural Gas Eng.	3	0	3	PETE 411	Senior Design Project	0	9	3	
PETE 4xx	PETE Elective I	3	0	3	PETE 4xx	PETE Elective II	3	0	3	
XE xxx	Technical Elective	3	0	3						
		13	5	15				11	9	14
Total credit hours required in Degree Program : 133										

# **COLLEGE OF SCIENCES**

**Dean: Dr. Suliman S. Al-Homidan**

## **UNDERGRADUATE DEPARTMENTS**

BIOLOGY  
CHEMISTRY  
EARTH SCIENCES  
MATHEMATICS AND STATISTICS  
PHYSICS

The College of Sciences provides programs in the Physical Sciences and Mathematics at the undergraduate and graduate levels. The College also offers science service courses for students enrolled in all of the other colleges. The College includes the Departments of Biology, Chemistry, Earth Sciences, Mathematics and Statistics, and Physics.

The programs of the College are formulated to provide the Kingdom with students that are skilled in ways of understanding the world and to make them prepared to respond thoughtfully to learning opportunities and personal challenges that come their way. Education in the College seeks to transform the students into well-informed, engaged and empowered individuals. The classes are small in size to facilitate teaching thereby engaging students in a vigorous and in-depth active learning. We offer multiple opportunities from a wide range of disciplinary programs. Learning through first-hand experience towards a substantial and meaningful education is one objective. Students are encouraged to develop an academic plan that includes study abroad, internships in fields of interest, independent research, and extra curricular experiences that complement learning in their chosen major.

The recently introduced program in actuarial science and financial mathematics is designed to prepare students for an actuarial career. This program combines mathematics, statistics, finance, and insurance into one dynamic field of study. The program is expected to provide manpower that not only understands the economic, societal, operational, and financial risks facing the country's businesses but also knows how to advise them on the best course of action to minimize and manage these risks. This also goes very well with the domestic demands of the growing Takaful industries in the country. Actuaries analyze and solve complex business and social problems by designing plans for managing risks, such as designing insurance, Takaful, and pension plans.

Recently, a new biological science department has been added. It will involve fundamental knowledge in the field of biology and other related fields, as well as involve basic research in the field of biology as a multidisciplinary field related to natural, environmental, engineering, biotechnology and biomedical sciences. The department is not offering a BS degree but will rather focus on building collaboration within the University and abroad in the area of research in biotechnology which will serve the strategic choices of the Kingdom. The Department of biological sciences will offer undergraduate biology courses required by several engineering department.

Programs offered in the Collge:

- |     |   |                   |
|-----|---|-------------------|
| 1.  | Mathematics                               | (BS, MS, and PhD) |
| 2.  | Statistics                                | (BS)              |
| 3.  | Actuarial Science & Financial Mathematics | (BS)              |
| 4.  | Physics                                   | (BS, MS, and PhD) |
| 5.  | Chemistry                                 | (BS, MS, and PhD) |
| 6.  | Industrial Chemistry                      | (BS, MS, and PhD) |
| 7.  | Geology                                   | (BS, MS, and PhD) |
| 8.  | Geophysics                                | (BS, MS, and PhD) |
| 9.  | Environmental Science                     | (MS)              |
| 10. | Medical Physics                           | (MS)              |

## Department of Chemistry

**Chairman: Dr. Abdulaziz A. Al-Saadi**

### Faculty

Abulkibash  
Al-Arfaj  
Al-Barri  
Al-Betar  
Al-Harbi  
Alhooshani  
Al-Saadi  
Al-Suwaiyan  
Al-Thagfi  
Asrof

Badawi  
Chanbasha  
El-Ali  
Fettouhi  
Forner  
Hamdan  
Imam  
Isab  
Kawde  
Khaled

Maung  
Mazumder  
Morsy  
Muallem  
Musa  
Oweimreen  
Saleh  
Siddiqui  
Ullah  
Wazeer

## **Introduction**

The Chemistry Department is one of the earliest departments established at KFUPM and one of the leading chemistry departments in the Middle East. There are over 30 faculty members with a wide range of research interests. These are reflected in the content of our advanced courses, where topics at the forefront of research are taught. The Chemistry Department offers the degree of Bachelor of Science with two options: (1) Chemistry and (2) Industrial Chemistry.

The chemist is a professional scientist who specializes in some specific area of chemistry. He can either be involved in research or in the utilization of our natural resources. As a research chemist, he studies the ways in which matter changes and how to develop new materials to improve our living conditions. The chemist may be an analytical chemist who performs a variety of tasks such as, to analyze water, air, or petroleum samples, to determine the composition of a newly discovered substance, or to identify the materials in a crime investigation. An inorganic chemist synthesizes and characterizes materials like alloys, semiconductors, superconductors, glasses, catalysts, and inorganic pharmaceuticals. An organic chemist is concerned with the syntheses of new materials such as plastics, pharmaceutical products, or other commercial chemicals from various other chemicals or from natural resources and he studies the chemical properties of various carbon compounds. A physical chemist applies physics principles to the structure of matter and the process of chemical changes. An environmental chemist can investigate the conditions of pollution, monitor pollutants and assess hazardous effects. There are many other branches of chemistry, such as petroleum chemistry, biochemistry, nanochemistry and electrochemistry.

An industrial chemist undertakes the optimization of complex processes, but unlike engineers, he examines and modifies the chemistry of the process itself. The industrial chemist is involved in all the production stages of a wide range of important chemicals and materials. These include the design and modification of the actual chemical process, the analysis of raw materials, the application of advanced computers to the simulation and control of the chemical plant, verification of the quality of the product and giving technical advice to both management and customers.

Chemistry graduates are expected to contribute to the academic, civil service and industrial development of the Kingdom by working in educational institutions, in government and in private institutions responsible for public health and safety of the environment, or in one of the many industries whose products or processes involve chemical technology. These areas include: schools and technical colleges, water authorities, desalination plants, agencies for environment protection, the standards and specifications bureau; the vast petroleum, petrochemical and mining industries scattered all over the Kingdom; as well as the many smaller industries whose products or processes involve chemical technology. Chemistry graduates are also expected to form the backbone of the various research centers that are emerging in the Kingdom whether related to government organizations such as agriculture, health, petroleum, commerce (standards and quality control) or to private organizations. Industrial research centers, in particular, are envisaged to supplement huge industrial complexes to utilize manpower trained under the above programs of studies.

## **Vision**

To be a leading department in chemical education, research and community services.

## **Mission**

The chemistry department is committed to excellence in the discovery and transmission of knowledge in the field of chemistry. It will honor this commitment by a continuous modernization of its programs to achieve international recognition and satisfy the Saudi industrial need of skilled manpower. It will support research that has impact on the Kingdom's economy and provide distinguished services to the national community. It will provide a nurturing and conducive environment for quality teaching, learning and research in basic and applied chemistry relying on teamwork and successful organizational practices.

## **Goals**

### **I. Teaching:**

- To offer quality programs in chemistry and industrial chemistry
- To integrate modern teaching/learning methods into the curriculum
- To avail, for faculty, the latest instructional technology tools
- To hire and develop distinguished faculty
- To develop new interdisciplinary programs
- To incorporate Saudi industry feedback into the curriculum

### **II. Research:**

- To respond to current technological needs of Saudi industry
- To conduct internationally recognized research
- To consolidate and add to the present areas of concentration
- To support multidisciplinary research
- To acquire and maintain state of the art instrumentation
- To attract and recruit high quality graduate students
- To promote undergraduate research
- To endorse collaborative research with national and international institutions

### **III. Services**

- To disseminate chemical awareness in the community
- To carry out analysis of environmental contaminants and fuel oils
- To offer specialized training on instrumentation and methodologies
- To update high school teachers skills through tailored programs
- To act as a consultation hub for industrial, governmental and academic institutions

To achieve these goals, the chemistry and industrial chemistry curricula are designed to provide the necessary professional background for pursuing careers in academic, governmental and industrial establishments. The courses offered are those recommended by international chemical organizations and provide a fundamental knowledge in the major areas of chemistry. Both programs include independent study and research where the student learns to apply different techniques and principles to the solution of scientific problems under the direction of a member of the faculty. The duration of this activity is one semester for an industrial chemist and two semesters for a chemist. Summer training is required from

chemistry and industrial chemistry students. For industrial chemists, the training must be done in industry.

### **Guidelines on Electives**

Chemistry electives may be chosen by students majoring in chemistry from any 300 or 400 level chemistry courses and include: environmental chemistry and environmental analysis, chemistry of petroleum processes, polymer chemistry, homogeneous catalysis in industrial processes, industrial organic chemistry, industrial inorganic chemistry, spectroscopic identification of organic compounds, synthetic organic chemistry, computer applications in chemistry, photochemistry and others.

Free Electives can be from courses at the 200 level or above in the University except those offered by the Chemistry Department or Islamic and Arabic Studies courses. Engineering electives can be from courses at the 200 level or above in the Colleges of Engineering Sciences or Applied Engineering.

### **Biology Courses**

Five biology courses are offered by the Chemistry Department. All students at KFUPM can take these courses as requirements, where appropriate, or as electives.



## Requirements for the B.S. Degree in Chemistry

Every student majoring in Chemistry must complete the following curriculum:

<b>(a) General Education Requirements (52 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENGL 214, IAS 101, 201, 301	9
Computer Programming	ICS 103	3
English	ENGL 101, 102	6
Islamic and Arabic Studies	IAS 111, 212, 322	6
Mathematics	MATH 101, 102, 201, 202	14
Physical Education	PE 101, 102	2
Physics	PHYS 101, 102, 201	12
		<b>52</b>

<b>(b) Core Requirements (50 credit hours)</b>		
Analytical Chemistry	CHEM 223, 323, 324	8
General Chemistry	CHEM 101, 102	8
Inorganic Chemistry	CHEM 331, 332	7
Organic Chemistry	CHEM 201, 202, 303	11
Physical Chemistry	CHEM 212, 311, 312	11
Professional Skills	CHEM 471, 472, 479	5
		<b>50</b>

<b>(c) Electives (20 credit hours)</b>		
Chemistry Electives	Two CHEM xxx Courses	6
Islamic and Arabic Studies	IAS 4xx	2
Free Electives (not from CHEM or IAS)	Four XXX xxx Courses	12
		<b>20</b>

### **(d) Summer Training (2 credit hours)**

Each student must spend two months in a chemical laboratory (analytical laboratory, hospital, clinic, etc.) or in a chemical industry firm, after which he must submit a report and present a seminar before receiving a grade for this course.

Summer Training	CHEM 399	2
		<b>2</b>

**The total number of credit hours required is**

**124**

# Chemistry Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2		
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
CHEM 101	General Chemistry I	3	4	4	CHEM 102	General Chemistry II	3	4	4	
IAS 111	Belief and its Effects	2	0	2	ENGL 102	Intro. to Report Writing	3	0	3	
ENGL 101	Intro. to Academic Discourse	3	0	3	ICS 103	Computer Programming in C	2	3	3	
MATH 101	Calculus I	4	0	4	MATH 102	Calculus II	4	0	4	
PE 101	Health and Physical Educ. I	0	2	1	PHYS 102	Health and General Physics II	3	3	4	
PHYS 101	General Physics I	3	3	4						
		15	9	18				15	10	18
Second Year (Sophomore)										
CHEM 201	Organic Chemistry I	3	4	4	CHEM 202	Organic Chemistry II	3	4	4	
ENGL 214	Academic & Professional Comm.	3	0	3	CHEM 212	Physical Chemistry I	3	4	4	
IAS 212	Professional Ethics	2	0	2	CHEM 323	Instrumental Chemical Analysis	2	4	3	
MATH 201	Calculus III	3	0	3	IAS 101	Practical Grammar	2	0	2	
CHEM 223	Quant. Methods of Chemical Analysis	1	4	2	MATH 202	Elements of Differential Eq.	3	0	3	
PE 102	Physical Educ. II	0	2	1						
		12	10	15				13	12	16
Third Year (Junior)										
CHEM 331	Inorganic Chemistry	3	4	4	CHEM 303	Spectroscopic and Qual. Organic Chemistry	2	4	3	
CHEM 311	Physical Chemistry II	3	4	4	CHEM 332	Advanced Inorganic Chemistry	3	0	3	
IAS 322	Human Rights in Islam	2	0	2	CHEM 324	Advanced Instrumental Chemical Analysis	2	4	3	
PHYS 201	General Physics III	3	3	4	CHEM 312	Physical Chemistry III	3	0	3	
					IAS 201	Objective Writing	2	0	2	
		11	11	14				12	8	14
Summer Session					CHEM 399	Summer Training	0	0	2	
Fourth Year (Senior)										
CHEM 471	Chemistry Senior Project I	0	8	2	CHEM 472	Chemistry Senior Project II	0	8	2	
CHEM 479	Chemistry Seminar	1	0	1	XXX xxx	Free Elective II	3	0	3	
CHEM xxx	CHEM Elective I	3	0	3	XXX xxx	Free Elective III	3	0	3	
CHEM xxx	CHEM Elective II	3	0	3	IAS 4xx	IAS Elective	2	0	2	
IAS 301	Language Comm. Skills	2	0	2	XXX xxx	Free Elective IV	3	0	3	
XXX xxx	Free Elective I	3	0	3						
		12	8	14				11	8	13
Total credit hours required in Degree Program : 124										

## Requirements for the B.S. Degree in Industrial Chemistry

Every student majoring in Industrial Chemistry must complete the following curriculum:

<b>(a) General Education Requirement (55 credit hours)</b>		<b>Credit Hours</b>
Communication Skills	ENGL 214, IAS 101, 201, 301	9
Computer Programming	ICS 103	3
English	ENGL 101, 102	6
Islamic and Arabic Studies	IAS 111, 212, 322	6
Mathematics	MATH 101, 102, 201, 202	14
Physical Education	PE 101, 102	2
Physics	PHYS 101, 102, 201	12
Management	MGT 301	3
		<b>55</b>

### **(b) Core Requirements (59 credit hours)**

<b>Industrial Chemistry (19 credit hours)</b>		
Introduction to Chemical Engineering	CHE 201	3
Industrial Catalysis	CHEM 355	3
Polymer Chemistry	CHEM 450	4
Chemistry of Petroleum Processing	CHEM 453	3
Industrial Inorganic Chemistry	CHEM 455	3
Industrial Organic Chemistry	CHEM 456	3
		<b>19</b>
<b>Pure Chemistry (40 credit hours)</b>		
Analytical Chemistry	CHEM 323, 324	6
General Chemistry	CHEM 101, 102	8
Inorganic Chemistry	CHEM 331	4
Organic Chemistry	CHEM 201, 202, 303	11
Physical Chemistry	CHEM 212, 311	8
Professional Skills	CHEM 471, 479	3
		<b>40</b>

### **(c) Electives (8 credit hours)**

Islamic and Arabic Studies	IAS 4xx	2
Free Elective (not from CHEM or IAS)	XXX xxx	3
Engineering Elective	XXX xxx	3
		<b>8</b>

### **(d) Summer Training (2 credit hours)**

Each student must spend two months in a chemical laboratory (analytical laboratory, hospital, clinic, etc.) or in a chemical industry firm, after which he must submit a report and present a seminar before receiving a grade for this course.

Summer Training	CHEM 399	2
		<b>2</b>

**The total number of credit hours required is**

**124**

# Industrial Chemistry Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
<b>Preparatory Year</b>									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		<b>20</b>	<b>10</b>	<b>16</b>			<b>18</b>	<b>12</b>	<b>15</b>
<b>Total credit hours required in Preparatory Program: 31</b>									
<b>First Year (Freshman)</b>									
CHEM 101	General Chemistry I	3	4	4	CHEM 102	General Chemistry II	3	4	4
IAS 111	Belief and its Effects	2	0	2	ENGL 102	Intro. to Report Writing	3	0	3
ENGL 101	Intro. to Academic Discourse	3	0	3	ICS 103	Computer Programming in C	2	3	3
MATH 101	Calculus I	4	0	4	MATH 102	Calculus II	4	0	4
PE 101	Health and Physical Educ. I	0	2	1	PHYS 102	General Physics II	3	3	4
PHYS 101	General Physics I	3	3	4					
		<b>15</b>	<b>9</b>	<b>18</b>			<b>15</b>	<b>10</b>	<b>18</b>
<b>Second Year (Sophomore)</b>									
CHEM 201	Organic Chemistry I	3	4	4	CHEM 202	Organic Chemistry II	3	4	4
ENGL 214	Academic & Professional Comm.	3	0	3	CHEM 212	Physical Chemistry I	3	4	4
IAS 212	Professional Ethics	2	0	2	CHEM 323	Instrumental Chemical Analysis	2	4	3
MATH 201	Calculus III	3	0	3	IAS 101	Practical Grammar	2	0	2
PE 102	Health and Physical Educ. II	0	2	1	MATH 202	Elements of Differential Eq.	3	0	3
		<b>11</b>	<b>6</b>	<b>13</b>			<b>13</b>	<b>12</b>	<b>16</b>
<b>Third Year (Junior)</b>									
CHEM 331	Inorganic Chemistry	3	4	4	CHEM 303	Spectroscopic and Qual. Organic Chemistry	2	4	3
CHEM 311	Physical Chemistry II	3	4	4	CHEM 355	Industrial Catalysis	3	0	3
IAS 322	Human Rights in Islam	2	0	2	IAS 201	Objective Writing	2	0	2
PHYS 201	General Physics III	3	3	4	CHEM 324	Advanced Instrumental Chemical Analysis	2	4	3
CHE 201	Principles of Chem. Eng. I	3	2	3	CHEM 456	Industrial Organic Chemistry	3	0	3
		<b>14</b>	<b>13</b>	<b>17</b>			<b>12</b>	<b>8</b>	<b>14</b>
<b>Summer Session</b>					CHEM 399	Summer Training	<b>0</b>	<b>0</b>	<b>2</b>
<b>Fourth Year (Senior)</b>									
CHEM 453	Chemistry of Petroleum Processing	2	4	3	CHEM 479	Chemistry Seminar	1	0	1
CHEM 455	Industrial Inorganic Chemistry	3	0	3	CHEM 450	Polymer Chemistry	3	4	4
IAS 301	Language Comm. Skills	2	0	2	CHEM 471	Chemistry Senior Project I	0	8	2
MGT 301	Principles of Management	3	0	3	IAS 4xx	IAS Elective	2	0	2
XXX xxx	Free Elective	3	0	3	XXX xxx	Eng. Elective	3	0	3
		<b>13</b>	<b>4</b>	<b>14</b>			<b>9</b>	<b>12</b>	<b>12</b>
<b>Total credit hours required in Degree Program : 124</b>									

## Department of Mathematics and Statistics

**Chairman: Dr. Husain Salem Al-Attas**

### Faculty

Abbas	Anabosi	Laradji
Abbasi	Azad	Lo
Abuihlail	Belhaiza	Malik, N
AbuShoshah	Binns	Malik, M
Abu-Sbeih	Bokhari, A	Mellouli
Ahmad	Bokhari, M	Messaoudi
Alassaf	Bonfoh	Mimouni
Alassar	Boucherif	Mustafa
Al-Attas	Chanane	Mustapha
Al-Dweik	Echi	Omar
Alfuraidan	El-Gebeily	Riaz
Al-Garni	Fairag	Saleh, K
Al-Homidan	Fukhar-ud-din	Saleh, M
Alhumidi	Furati	Sarhan
Al-Mutawa	Ibrahim	Shehadeh
Al-Rasasi	Kabbaj	Smii
Al-Sabah	Kafini	Tatar, A
Al-Sawi	Khalid	Tatar, N
Alshahrani	Khalfallah	Tawfiq
Al-Shammari	Khan, A	Yousuf
Al-Smail	Khan, S	Zaman

## **Introduction**

The Department of Mathematics and Statistics offers six major programs: a four-year BS program in Mathematics, a four-year BS program in Statistics, a four-year BS program in Actuarial Sciences, a graduate program leading to an MS degree in Mathematics, MS degree in Statistics, and a Ph.D. program in Mathematics.

The Department is also responsible for teaching mathematics courses at both the undergraduate and graduate levels in the Colleges of Sciences, Computer Science and Engineering, Engineering, Environmental Design, and Industrial Management.

## **Vision**

To be recognized internationally for excellence in research and teaching, and nationally for high-quality service.

## **Mission**

The Department of Mathematics and Statistics is committed to:

- provide effective and innovative graduate and undergraduate education to both math and non-math major students in order to prepare them to succeed in their further studies and careers;
- contribute high-quality basic and applied research, and utilize mathematical talent for the understanding and modeling of real-life problems;
- deepen community appreciation of mathematical sciences and their role.

## **Goals**

The objective of the BS programs in mathematics and statistics is to prepare the students for career opportunities in educational institutions, industry, government organizations and other areas involving the application of mathematics. The program also prepares the students for graduate studies in mathematics and other research organizations using mathematical tools.

The programs are broad-based and cover main-stream mathematics, namely: pure mathematics, applied mathematics, numerical analysis, and statistics. The curricula are designed to strengthen both conceptual and computational talent of the students and as such the graduates will have a solid background to pursue higher educational programs as well as take up assignments in industry and other related practical fields.

## Requirements for the B.S. Degree in Mathematics

Every student majoring in Mathematics must complete the following curriculum:

<b>(a) General Education Requirements (58 credit hours)</b>		<b>Credit Hours</b>
English	ENGL 101, 102	6
Communication Skills	ENGL 214, IAS 101, 201, 301	9
Computing	ICS 101	3
Mathematics	MATH 101, 102, 201, 202	14
Natural Sciences	CHEM 101, 102, PHYS 101, 102	16
Islamic & Arabic Studies	IAS 111, 212, 322, 4xx	8
Physical Education	PE 101, 102	2
		<b>58</b>
<b>(b) Mathematics Core Requirements (28 credit hours)</b>		
Introduction to Sets and Structures	MATH 232	3
Introduction to Linear Algebra	MATH 280	3
Methods of Applied Mathematics	MATH 301	3
Advanced Calculus I	MATH 311	3
Introduction to Numerical Computing	MATH 321	3
Modern Algebra I	MATH 345	3
Advanced Calculus II	MATH 411	3
Introduction to Complex Variables	MATH 430	3
Seminar in Mathematics	MATH 490	1
Introduction to Statistics	STAT 201	3
		<b>28</b>
<b>(c) Electives (33 credit hours)</b>		
Mathematics Electives: 15 credit-hours in consultation with the advisor; at least 9 credits from one of the groups:	<i>Pure Math:</i> MATH 330, 355, 412, 421, 425, 431, 440, 450, 452, 455, 460, 465, 470 <i>Applied Math and Numerical Analysis:</i> MATH 401, 431, 442, 460, 465, 470, 471, 472, 480, 485, 495 <i>Statistics:</i> STAT 301, 302, 310, 325, 365, 415, 430, 435, 440	15
Free Electives (at least two courses numbered 300 or above; at least 9 credit hours of non-math courses)	Five XXX xxx Courses	15
General Studies	GS xxx	3
		<b>33</b>
<b>(d) Summer Training (2 credit hours)</b>		
Summer Training	MATH 399	2
		<b>2</b>

The total number of credit hours required is

**121**

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
Preparatory Year									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		20	10	16			18	12	15
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
CHEM 101	General Chemistry I	3	4	4	CHEM 102	General Chemistry II	3	4	4
ENGL 101	Intro. to Academic Discourse	3	0	3	PHYS 102	General Physics II	3	3	4
ICS 101	Computer Programming	2	3	3	MATH 102	Calculus II	4	0	4
MATH 101	Calculus I	4	0	4	ENGL 102	Intro. to Report Writing	3	0	3
PE 101	Health and Physical Educ. I	0	2	1	IAS 111	Belief and its Effects	2	0	2
PHYS 101	General Physics I	3	3	4	PE 102	Health and Physical Educ. II	0	2	1
		15	12	19			15	9	18
Second Year (Sophomore)									
ENGL 214	Academic & Professional Comm.	3	0	3	GS xxx	GS Elective	3	0	3
IAS 212	Professional Ethics	2	0	2	IAS 101	Practical Grammar	2	0	2
MATH 201	Calculus III	3	0	3	MATH 202	Elements of Differential Eq.	3	0	3
MATH 232	Intro. to Sets and Structures	3	0	3	MATH 280	Intro. to Linear Algebra	3	0	3
STAT 201	Intro. to Statistics	2	2	3	MATH 345	Modern Algebra I	3	0	3
		13	2	14			14	0	14
Third Year (Junior)									
IAS 322	Human Rights in Islam	2	0	2	IAS 201	Objective Writing	2	0	2
MATH 301	Methods of Applied Math	3	0	3	MATH 411	Advanced Calculus II	3	0	3
MATH 311	Advanced Calculus I	3	0	3	MATH xxx	MATH Elective I	3	0	3
MATH 321	Intro. to Numerical Computing	3	0	3	MATH xxx	MATH Elective II	3	0	3
XXX xxx	Free Elective I	3	0	3	XXX xxx	Free Elective II	3	0	3
		14	0	14			14	0	14
Summer Session					MATH 399	Summer Training	0	0	2
Fourth Year (Senior)									
IAS 301	Language Comm. Skills	2	0	2	IAS 4xx	IAS Elective	2	0	2
MATH xxx	MATH Elective III	3	0	3	MATH 430	Intro. to Complex Variables	3	0	3
MATH xxx	MATH Elective IV	3	0	3	MATH 490	Seminar in Math	1	0	1
XXX xxx	Free Elective III	3	0	3	MATH xxx	MATH Elective V	3	0	3
XXX xxx	Free Elective IV	3	0	3	XXX xxx	Free Elective V	3	0	3
		14	0	14			12	0	12
Total credit hours required in Degree Program : 121									



## **B.S. Degree in Statistics**

### **Objectives of the Program**

Statistics is the science that deals with collecting data, analyzing it and making decisions from it. A statistician is a value asset in every industry from the design stage, through the data collection stage to the analysis. The input of the statistician is essential for the success of every endeavor.

The objective of the BS program in Statistics is to prepare students for career opportunities in industry and government, as well as the private sector in such fields as business, banking, insurance, health, and for further graduate studies. The program has a good balance of theory, applications and data analysis, as well as carefully selected sequences of courses from computer science, management information systems, accounting and finance, and management and marketing. This interdisciplinary approach is meant to make the program flexible, and give the students a broad base of education, improving their chances of employment. Graduates of the program are well-qualified statisticians with good knowledge in computing, information systems, management and marketing.

## Requirements for the B.S. Degree in Statistics

Every student majoring in Statistics must complete the following curriculum:

<b>(a) General Education Requirements (64 credit hours)</b>		<b>Credit Hours</b>
English	ENGL 101, 102	6
Communication Skills	ENGL 214, IAS 101, 201, 301	9
Computer Programming	ICS 103	3
Islamic & Arabic Studies	IAS 111, 212, 322, 4xx	8
Mathematics	MATH 101, 102, 201, 202	14
Natural Sciences	CHEM 101, 102, PHYS 101, 102	16
Physical Education	PE 101, 102	2
Economy and MIS	ECON 101, MIS 105	6
		<b>64</b>
<b>(b) Core Requirement ( 26 credit hours)</b>		
Introduction to Linear Algebra	MATH 280	3
Introduction to Numerical Computing	MATH 321	3
Introduction to Statistics	STAT 201	3
Introduction to Probability Theory	STAT 301	3
Statistical Inference	STAT 302	3
Regression Analysis	STAT 310	3
Data Collection and Sampling Methods	STAT 365	3
Experimental Design	STAT 430	3
Senior project in Statistics	STAT 470	2
		<b>26</b>
<b>(c) Electives (30 credit hours)</b>		
Four courses of:	STAT 320, 325, 355, 361, 375, 415, 435, 440, 460, 461, 475, 499	12
Four courses from one of the groups:	<i>Group I:</i> ICS 201, 202, 252, 334, MIS 301, 340, 401, 410, 425  <i>Group II:</i> ACCT 201, 202, ECON 202, FIN 301, 302, MGT 210, 301, MKT 301, 345  <i>Group III:</i> From any department with the approval of the advisor	12
One Extra Technical Elective	XXX xxx	3
General Studies	GS xxx	3
		<b>30</b>
<b>(d) Summer Training (2 credit hours)</b>		
Students are required to spend eight weeks working in industry prior to the term in which they expect to graduate.		
Summer Training	STAT 399	2
		<b>2</b>

**The total number of credit hours required is**

**122**

## Statistics Curriculum

COURSE		TITLE			LT	LB	CR	COURSE		TITLE			LT	LB	CR
<b>Preparatory Year</b>															
ENGL 01-xx	Prep. English I (First Quarter)				15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)				15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)						4	ENGL 04-xx	Prep. English IV (Fourth Quarter)						4
MATH 001	Prep. Math I				3	1	4	MATH 002	Prep. Math II				3	1	4
PYP 001	Prep. Physical Science				2	0	2	PYP 002	Prep. Computer Science				0	2	1
PYP 003	University Study Skills				0	2	1	PYP 004	Prep. Eng. Technology				0	2	1
PE 001	Prep. Health and Physical Educ. I				0	2	1	PE 002	Prep. Health and Physical Educ. II				0	2	1
					<b>20</b>	<b>10</b>	<b>16</b>						<b>18</b>	<b>12</b>	<b>15</b>
<b>Total credit hours required in Preparatory Program: 31</b>															
<b>First Year (Freshman)</b>															
CHEM 101	General Chemistry I				3	4	4	CHEM 102	General Chemistry II				3	4	4
PHYS 101	General Physics				3	3	4	PHYS 102	General Physics II				3	3	4
MATH 101	Calculus I				4	0	4	MATH 102	Calculus II				4	0	4
ENGL 101	Intro. to Academic Discourse				3	0	3	ENGL 102	Intro. to Report Writing				3	0	3
IAS 111	Belief and its Effects				2	0	2	ICS 103	Computer Programming in C				2	3	3
PE 101	Health and Physical Educ. I				0	2	1	PE 102	Health and Physical Educ. II				0	2	1
					<b>15</b>	<b>9</b>	<b>18</b>						<b>15</b>	<b>12</b>	<b>19</b>
<b>Second Year (Sophomore)</b>															
ENGL 214	Academic & Professional Comm.				3	0	3	MIS 105	Intro. to Computer Applications				2	2	3
IAS 212	Professional Ethics				2	0	2	IAS 101	Practical Grammar				2	0	2
MATH 201	Calculus III				3	0	3	MATH 202	Elements of Differential Eq.				3	0	3
ECON 101	Principles of Economics				3	0	3	MATH 280	Intro. to Linear Algebra				3	0	3
STAT 201	Intro. to Statistics				2	2	3	XXX xxx	Technical Elective I				3	0	3
					<b>13</b>	<b>2</b>	<b>14</b>						<b>13</b>	<b>2</b>	<b>14</b>
<b>Third Year (Junior)</b>															
IAS 322	Human Rights in Islam				2	0	2	IAS 201	Objective Writing				2	0	2
GS xxx	GS Elective				3	0	3	STAT 302	Statistical Inference				3	0	3
STAT 301	Intro. to Probability Theory				3	0	3	STAT 365	Data Collection and Sampling Methods				3	0	3
MATH 321	Intro. to Numerical Computing				3	0	3	STAT xxx	STAT Elective I				3	0	3
STAT 310	Regression Analysis				3	0	3	XXX xxx	Technical Elective II				3	0	3
					<b>14</b>	<b>0</b>	<b>14</b>						<b>14</b>	<b>0</b>	<b>14</b>
<b>Summer Session</b>								STAT 399	Summer Training				<b>0</b>	<b>0</b>	<b>2</b>
<b>Fourth Year (Senior)</b>															
IAS 301	Language Comm. Skills				2	0	2	IAS 4xx	IAS Elective				2	0	2
STAT 430	Experimental Design				3	0	3	STAT 470	Senior Project in Statistics				1	3	2
STAT xxx	STAT Elective II				3	0	3	STAT xxx	STAT Elective IV				3	0	3
STAT xxx	STAT Elective III				3	0	3	XXX xxx	Technical Elective IV				3	0	3
XXX xxx	Technical Elective III				3	0	3	XXX xxx	Technical Elective V				3	0	3
					<b>14</b>	<b>0</b>	<b>14</b>						<b>12</b>	<b>3</b>	<b>13</b>
<b>Total credit hours required in Degree Program : 122</b>															

## **B.S. Degree in Actuarial Sciences**

### **Objectives of the Program**

Actuarial Science and Financial Mathematics is an area of study that manages risk in the financial and government sector and industries. Specifically, it involves analyzing risk data and making informed decisions from it. It is a multidisciplinary study that combines four major areas (Mathematics, Statistics, Finance, and Insurance) into one. A graduate of the program is able to contribute to all areas of Saudi Arabian and international financial sectors as well as the government sector where the objective of minimization of risk is the main daily focus.

An actuary is a professional who analyzes the financial consequences of risk. Actuaries use mathematics, statistics, financial theory and insurance to study uncertain future adverse events, and decrease the impact of those future loss events. Actuaries are an integral part of the management team of companies that employ them. Their work requires a combination of strong analytical skills, business knowledge and understanding of human behavior to design and manage programs that control risk. A graduate typically finds employment in private and government sectors and industry that deal with activities such as investment, insurance, pension funding, financial consulting, or healthcare funding. The actuarial profession has been rated the best career for several years in the USA (e.g. rated the best career in 2010 by the Wall Street Journal). Graduates of such programs typically find no issues in finding a good first job. With some professional exams, graduates may face a different but welcome job dilemma of choosing which company in which to enlist.

The **objective** of the BS program in Actuarial Science and Financial Mathematics is to prepare students for a career as an actuary or financial risk manager. In addition, the program also prepares the students for international professional society examinations. The program has a good balance of theory, applications and data analysis, as well as carefully selected sequences of courses from computer science, economics, accounting, mathematics, statistics, finance, and risk management. This interdisciplinary approach is meant to make the program flexible and give the students a broad based education. The program also prepares students for further graduate study in any area of Applied Mathematics, Statistics, Actuarial Science, Finance, or Business.

## Requirements for the B.S. Degree in Actuarial Sciences

Every student majoring in Actuarial Sciences must complete the following curriculum:

<b>(a) General Education Requirements (55 credit hours)</b>		<b>Credit Hours</b>
English	ENGL 101, 102	6
Communication Skills	ENGL 214, IAS 101, 201	7
Computing	ICS 101 or ICS 103	3
Mathematics	MATH 101, 102, 201, 202, 280	17
Economy	ECON 101, 102	6
Islamic & Arabic Studies	IAS 111, 212, 322, 418	8
Accounting	ACCT 110, 210	6
Physical Education	PE 101, 102	2
		<b>55</b>
<b>(b) Actuarial Sciences Core Requirements (47 credit hours)</b>		
Statistical Methods for Actuaries	STAT 213	3
Financial Management	FIN 250	3
Quantitative Methods for Actuaries	MATH 322	3
Introduction to Probability Theory	STAT 301	3
Statistical Inference	STAT 302	3
Regression Analysis	STAT 310	3
Time Series	STAT 460	3
Financial Mathematics	AS 201	3
Actuarial Science Problem Lab I	AS 288	1
Actuarial Contingencies I	AS 381	3
Actuarial Science Problem Lab II	AS 388	1
Actuarial Contingencies II	AS 482	3
Stochastic Processes for Actuaries	STAT 416	3
Investments	FIN 320	3
Financial Engineering	FIN 470	3
Risk Management, Conventional and Islamic Insurance	FIN 430	3
Actuarial Risk Theory and Credibility	AS 483	3
		<b>47</b>
<b>(c) Electives (15 credit hours)</b>		
Three courses from:	AS 498, 475, ECON 206, 305, 420, FIN 310, 410, 421, 440,	9
<i>Recommended:</i>	MATH 301, 311,	
Takaful Insurance Option: AS 475, 498	471, 472, 480, MGT	
Financial Math Option: FIN 410, 421	301, 311, MKT 250,	
Risk Management Option: STAT 361, MGT 301	STAT 325, 355, 361,	
<i>The third course is selected from the list with consultation with the advisor</i>	365, 435, 430, 440	
General Studies	Two GS xxx Courses	6
		<b>15</b>
<b>(d) Cooperative Work (9 credit hours)</b>		
Cooperative Work	AS 351	9
		<b>9</b>

The total number of credit hours required is

**126**

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
Preparatory Year									
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2	1
		20	10	16			18	12	15
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
ENGL 101	Intro. to Academic Discourse	3	0	3	IAS 111	Belief and its Effects	2	0	2
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1
MATH 101	Calculus I	4	0	4	ENGL 102	Intro. to Report Writing	3	0	3
ECON 101	Principles of Economics I	3	0	3	MATH 102	Calculus II	4	0	4
IAS 101	Practical Grammar	2	0	2	ACCT 110	Intro. to Financial Accounting	2	2	3
ICS 103	Computer Programming in C	2	3	3	ECON 102	Principles of Economics II	3	0	3
					GS xxx	GS Elective I	3	0	3
		14	5	16			17	4	19
Second Year (Sophomore)									
IAS 201	Objective Writing	2	0	2	IAS 212	Professional Ethics	2	0	2
AS 201	Financial Math	3	0	3	MATH 202	Elements of Differential Eq.	3	0	3
MATH 201	Calculus III	3	0	3	FIN 250	Financial Management	3	0	3
ACCT 210	Intro. to Managerial Accounting	2	2	3	MATH 280	Intro. to Linear Algebra	3	0	3
STAT 213	Statistical Methods for Actuaries	2	2	3	AS 288	Actuarial Science Problem Lab I	0	1	1
ENGL 214	Academic & Professional Comm.	3	0	3	STAT 301	Intro. to Probability Theory	3	0	3
		15	4	17			14	1	15
Third Year (Junior)									
IAS 322	Human Rights in Islamic	2	0	2	MATH 322	Quant. Methods for Actuaries	3	0	3
STAT 302	Statistical Inference	3	0	3	FIN 430	Risk Management, Conv. and Islamic Insurance	3	0	3
STAT 310	Regression Analysis	3	0	3	STAT 460	Time Series	3	0	3
FIN 320	Investments	3	0	3	FIN 470	Financial Eng.	3	0	3
AS 381	Actuarial Contingencies I	3	0	3	AS 482	Actuarial Contingencies II	3	0	3
AS 388	Actuarial Science Problem Lab II	0	1	1	AS 483	Actuarial Risk Theory and Credibility	3	0	3
STAT 416	Stochastic Processes for Actuaries	3	0	3					
		17	1	18			18	0	18
Summer Session					AS 350	Begin Cooperative Work	0	0	0
Fourth Year (Senior)									
AS 351	Cooperative Work	0	0	9	XXX xxx	Free Elective I	3	0	3
					AS xxx	AS Elective I	3	0	3
					AS xxx	AS Elective II	3	0	3
					GS xxx	GS Elective II	3	0	3
					IAS 418	Contemporary Financial Transactions in Islam	2	0	2
		0	0	9			14	0	14
Total credit hours required in Degree Program : 126									

## Department of Physics

**Chairman: Dr. Abdullah Al-Sunaidi**

### Faculty

Al-Adel	Ayub	Khiari
Al-Aithan	Azadul Islam	Kunwar
Al-Amoudi	Bahlouli	Maalej
Al-Basheer	Dastageer	Mekki, A
Al-Jalal	Dwaikat	Mekki, M
Al-Karmi	El-Said	Nagadi
Al-Kuhaili	Faiz	Naqvi
Al-Marzoug	Gasmi	Nasser
Al-Matouq	Ghannam	Raashid
Al-Ohali	Gondal	Rao
Al-Sadah	Haider	Salem
Al-Shukri	Harrabi	Fazal Urrehman
Al-Sunaidi	Hrahsheh	Yamani
Al-Zahrani	Khattak	Ziq

## **Introduction**

Physics deals with the study of natural phenomena originating from matter, motion, and energy. It represents, therefore, the foundation of all scientific, technological and engineering disciplines. The main purpose of physics is to understand and describe the apparent complexities of nature with as few unifying concepts as possible.

The teaching efforts of the Physics Department at the undergraduate level have two main objectives:

- to provide science and engineering students with the basic knowledge of physics principles necessary for their respective studies; and
- to provide advanced and specialized training for students who seek a deeper understanding of the physical world.

The first objective is met by the Department's offering of a series of introductory physics courses, and the second is met by providing an advanced program leading to a bachelor's degree.

A student enrolled in the bachelor's degree program will not only become familiar with basic physics principles and applications, but will also study the underlying fundamental concepts of the structure of matter and the nature of the universe. In addition, a Physics graduate is well prepared for a career in any one of the Kingdom's rapidly expanding technological sectors and for possible advanced study either at home or abroad.

## **Vision**

The physics department aspires to be one of the leading departments in teaching, research, and community services.

## **Mission**

The Physics Department is committed to provide the best education possible in basic and applied physics. It strives to insure high quality teaching and research, valuable services to the community, and effective contribution to the development of the country.

## **Goals**

- Provide solid general physics course instruction
- Provide high quality education and training to undergraduate and graduate physics majors to prepare them for their future careers
- Conduct basic and applied physics research
- Provide consulting, short courses, training, outreach activities and community services

## **Strategy**

- Excel in teaching by maintaining rigorous course curricula, using sound teaching methods, continuously assessing the program and making necessary improvements



- Prepare physics students for successful careers by instilling in them the required physics knowledge, skills and work ethics through close interaction with the faculty and involvement in physics projects
- Provide resources and opportunities for faculty to enhance their skills, teaching and research abilities to maintain a high level of performance
- Support and promote collaboration between faculty members, with other departments, and with industry in interdisciplinary research
- Identify and provide relevant services to the community

## Requirements for the B.S. Degree in Physics

Each student majoring in Physics must complete the following curriculum:

<b>(a) General Education Requirements (61 credit hours)</b>		<b>Credit Hours</b>
Chemistry	CHEM 101, 102	8
Computer Programming	ICS 101	3
English	ENGL 101, 102, 214	9
Islamic & Arabic Studies	IAS 101, 111, 201, 212, 301, 322, 4xx	14
Mathematics	MATH 101, 102, 201, 202	14
Physics	PHYS 101, 102	8
Physical Education	PE 101, 102	2
General Studies	GS xxx	3
		<b>61</b>

<b>(b) Core Courses (34 credit hours)</b>		
Optics & Modern Physics	PHYS 211, 212	7
Classical Mechanics I	PHYS 301	3
Experimental Physics	PHYS 303, 304, 403	7
Electricity & Magnetism	PHYS 305, 306	6
Quantum Mechanics	PHYS 401, 402	6
Physics Seminar	PHYS 409	1
Thermal & Statistical Physics	PHYS 430	4
		<b>34</b>

<b>(c) Electives (27 credit hours)</b>		
Physics Electives, 12 credits from:	PHYS 302, 307, 315, 323, 353, 365, 371, 373, 404, 411, 412, 416, 422, 432, 434, 435, 441, 442, 461, 493, 495	12
Math Electives	Two MATH xxx Courses	6
Free Electives (at least 6 credit hours should be from outside the program)	Three XXX xxx Courses	9
		<b>27</b>

### **(d) Summer Training (2 credit hours)**

Students are required to spend one summer working in industry prior to the term in which they expect to graduate. They will be required to write a report and present it in a seminar at the Department.

Summer Training	PHYS 399	2
		<b>2</b>

**The total number of credit hours required is**

**124**

# Physics Curriculum

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR	
Preparatory Year										
ENGL 01-xx	Prep. English I (First Quarter)	15	5	4	ENGL 03-xx	Prep. English III (Third Quarter)	15	5	4	
ENGL 02-xx	Prep. English II (Second Quarter)			4	ENGL 04-xx	Prep. English IV (Fourth Quarter)			4	
MATH 001	Prep. Math I	3	1	4	MATH 002	Prep. Math II	3	1	4	
PYP 001	Prep. Physical Science	2	0	2	PYP 002	Prep. Computer Science	0	2	1	
PYP 003	University Study Skills	0	2	1	PYP 004	Prep. Eng. Technology	0	2	1	
PE 001	Prep. Health and Physical Educ. I	0	2	1	PE 002	Prep. Health and Physical Educ. II	0	2		
		20	10	16				18	12	15
Total credit hours required in Preparatory Program: 31										
First Year (Freshman)										
CHEM 101	General Chemistry I	3	4	4	CHEM 102	General Chemistry II	3	4	4	
ENGL 101	Intro. to Acad. Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3	
IAS 111	Belief and its Effects	2	0	2	MATH 102	Calculus II	4	0	4	
MATH 101	Calculus I	4	0	4	PE 102	Health and Physical Educ. II	0	2	1	
PE 101	Health and Physical Educ. I	0	2	1	PHYS 102	General Physics II	3	3	4	
PHYS 101	General Physics I	3	3	4						
		15	9	18				13	9	16
Second Year (Sophomore)										
ENGL 214	Academic & Professional Comm.	3	0	3	IAS 212	Professional Ethics	2	0	2	
IAS 101	Practical Grammar	2	0	2	MATH 202	Elements of Differential Eq.	3	0	3	
MATH 201	Calculus III	3	0	3	MATH xxx	MATH Elective I	3	0	3	
PHYS 211	Optics	2	3	3	PHYS 212	Modern Physics	3	3	4	
ICS 101	Computer Programming	2	3	3	XXX xxx	Free Elective I	3	0	3	
		12	6	14				14	3	15
Third Year (Junior)										
IAS 201	Objective Writing	2	0	2	IAS 322	Human Rights in Islam	2	0	2	
GS xxx	GS Elective	3	0	3	PHYS 304	Experimental Physics II	1	3	2	
PHYS 301	Classical Mechanics I	3	0	3	PHYS 306	Electricity and Magnetism II	3	0	3	
PHYS 303	Experimental Physics I	2	3	3	XXX xxx	Free Elective II	3	0	3	
MATH xxx	MATH Elective II	3	0	3	PHYS 401	Quantum Mechanics and Applications I	3	0	3	
PHYS 305	Electricity and Magnetism I	3	0	3						
		16	3	17				12	3	13
Summer Session					PHYS 399	Summer Training	0	0	2	
Fourth Year (Senior)										
IAS 301	Language Comm. Skills	2	0	2	IAS 4xx	IAS Elective	2	0	2	
PHYS 402	Quantum Mechanics and Applications II	3	0	3	PHYS xxx	PHYS Elective II	3	0	3	
PHYS 403	Senior Physics Laboratory	0	6	2	PHYS 4xx	PHYS Elective III	3	0	3	
PHYS xxx	PHYS Elective I	3	0	3	PHYS 4xx	PHYS Elective IV	3	0	3	
PHYS 409	Physics Seminar	1	0	1	XXX xxx	Free Elective III	3	0	3	
PHYS 430	Thermal and Statistical Physics	4	0	4						
		13	6	15				14	0	14
Total credit hours required in the Degree Program: 124										

## **ACADEMIC COURSES**

## KFUPM COURSE ABBREVIATIONS

ACCT	Accounting	GS	General Studies
AE	Aerospace Engineering	HRM	Human Resources Management
ARC	Architecture	IAS	Islamic and Arabic Studies
ARE	Architectural Engineering	ICS	Information and Computer Science
AS	Actuarial Sciences	ISE	Industrial and Systems Engineering
BIOL	Biology	MATH	Mathematics
CE	Civil and Environmental Engineering	ME	Mechanical Engineering
CHE	Chemical Engineering	MGT	Management
CHEM	Chemistry	MIS	Management Information Systems
CISE	Control and Instrumentation Systems Engineering	MKT	Marketing
COE	Computer Engineering	OM	Operations Management
CP	City Planning	PE	Physical Education
ECON	Economy	PETE	Petroleum Engineering
EE	Electrical Engineering	PHYS	Physics
ENGL	English	PYP	Preparatory Year Program
FIN	Finance	STAT	Statistics
GEOL	Geology	SWE	Software Engineering
GEOP	Geophysics		

### NOTES

- The parenthesized numerals, such as ( 3-3-4) in the following course descriptions indicate the weekly lecture hours, the weekly laboratory hours, and the credit hours for each course, respectively.
- Prerequisites/Co-requisites are separated by commas. The following examples show how lists of prerequisites/co-requisites should be interpreted.

Example 1: The prerequisites of CE 230 written as “CE 201, MATH 102” should be interpreted as: A student may take CE 230 if he has already taken both CE 201 and Math 102.

Example 2: The prerequisites of MATH 301 written as “MATH 202 or MATH 260” should be interpreted as: A student may take MATH 301 if he has already taken either Math 202 or Math 260.

Example 3: The prerequisites of ME 322 “CE 101 or ME 210, ME 216, ME 217” should be interpreted as: A student may take ME 322 if he has already taken all the courses in any of the following two combinations:

- CE 101 and ME 216 and ME 217
- ME 210 and ME 216 and ME 217

Example 4: The prerequisites of ME 410 “(ME 216 and ME 217) or ME 205” should be interpreted as: A student may take ME 410 if he has already taken all the courses in any of the following two combinations:

- ME 216 and ME 217
- ME 205

- Additional notes/restrictions, if any, are indicated at the end of course description.

# ACCOUNTING

## **ACCT 110            Introduction to Financial Accounting            (3-0-3)**

Uses, strengths, and weaknesses of financial reporting. Preparation and analysis of financial statements of a business enterprise. Overview of generally accepted accounting principles as they relate to the recognition of revenues and expenses, and the valuation of assets and liabilities. Ethics in accounting in the preparation and presentation of financial statements.

## **ACCT 210            Introduction to Managerial Accounting            (3-0-3)**

Uses of accounting information for managerial decision making to aid planning and control activities of managers in business enterprises. Methods for determining the costs of products and services, cost behavior analysis, assessing product and project profitability, cost-volume-profit analysis, budgeting, cost control using standard costing and variance analysis.

**Prerequisite:** ACCT 110

## **ACCT 300            Accounting Information Systems            (2-2-3)**

The principles and concepts of providing information support for managerial activities in the functional areas of logistics, manufacturing, marketing, human resources, and finance. Concepts related to internal control in manual and computerized accounting systems. Analysis, design, and implementation of accounting systems with emphasis on decision support systems, expert systems, and networked systems. Utilization of basic accounting software packages, and exposure to ERP systems.

**Prerequisite:** ACCT 210

## **ACCT 301            Intermediate Accounting I            (3-0-3)**

Objectives of financial statements and their preparation. In-depth study of generally accepted accounting principles with concentration on the valuation techniques and procedures underlying the financial statements. Conceptual and theoretical issues that face the accounting profession. Accounting for current assets and current liabilities. Accounting for acquisition and disposition of plant assets including depreciation and depletion. Accounting for intangible assets. Study of ethics in accounting.

**Prerequisite:** ACCT 210

## **ACCT 302            Intermediate Accounting II            (3-0-3)**

Stockholders' equity including issuance and reacquisition of capital stock, dividends and retained earnings. Accounting for short-term and long-term investments in securities. Revenue recognition and long-term contracts. Cash flows, capital leases, and interpretation and analysis of financial statements. Computer applications in financial accounting. Use of cases and study of ethics in accounting.

**Prerequisite:** ACCT 301

## **ACCT 304            International Accounting            (3-0-3)**

Objectives of international accounting. International accounting standards and organizations. Transnational financial reporting and disclosure problems. Accounting information systems and control for multinational operations. Financial planning for multinational operations. Accounting for foreign currency translation and inflation. Multinational taxation and transfer pricing. Consolidated financial statements for

multinational operations. Accounting and Economic Development. Accounting for multinational corporate responsibility.

**Prerequisite:** ACCT 301

**ACCT 305     Accounting for Governmental and Non-Profit Entities     (3-0-3)**

Accounting concepts and techniques for governmental operations including fund accounting. Financial reporting and disclosure problems of governmental and non-profit organizations. Budgetary control procedures for governmental and non-profit entities such as universities, hospitals, and charities.

**Prerequisite:** ACCT 210

**ACCT 307     Islamic Financial Jurisprudence     (3-0-3)**

Fundamentals of commercial law, the Islamic principles of property rights, contracts, capital, types of ownership, sale contracts, commercial papers and bankruptcy. Secured transactions, and concepts of agency, estate, and trust under Islamic Sharia Law.

**ACCT 311     Auditing     (3-0-3)**

Generally accepted auditing standards and procedures used by the external auditor. Professional ethics, professional responsibility, and legal liability of the external auditor. Audit concepts such as auditor's independence, fair presentation, and due professional care. Internal control evaluation and design of audit programs; collection of audit evidence including statistical sampling and analytical review; evaluation of audit evidence; arriving at audit opinions. Development of working papers and audit reports. Assurance services. Uses of the computer as an audit tool. Utilization of generalized audit software packages. Information Technology and the audit process.

**Prerequisite:** ACCT 300

**ACCT 314     Computer Control and Audit     (3-0-3)**

Auditing of computer-based information systems. Audit environment and information systems controls. Theory of internal control and the application of audit procedures in a computerized environment. Techniques for evaluating applications, data integrity, general operations, security, systems software and maintenance.

**Prerequisite:** ACCT 300

**ACCT 350     Begin Cooperative Work     (0-0-0)**

See contents in ACCT 351.

**Prerequisite:** Same as in ACCT 351

**ACCT 351     Cooperative Work     (0-0-6)**

Comprehensive period for accounting practical training in a selected economic organization. The Department of Accounting and Management Information Systems approves the training program and monitors the student's progress during his co-op period. Under the supervision of an accounting faculty member or a faculty member in a related discipline, the student writes an analytical report about his co-op experience.

**Prerequisite:** ENGL 214, at least 85 credit hours

**ACCT 352     End Cooperative Work     (0-0-0)**

See contents in ACCT 351.

**Prerequisite:** Same as in ACCT 351

**ACCT 403      Advanced Accounting (3-0-3)**

Accounting principles and procedures related to business combinations. Methods and techniques for preparing consolidated financial statements. Receiverships and statement of affairs. Accounting for formation, operation, and liquidation of partnerships. Accounting for branches, consignments, and joint-ventures. Ethics in accounting.

**Prerequisite:** ACCT 302

**ACCT 405      Accounting Theory & Research (3-0-3)**

The development and structure of accounting theory, principles, and practices applicable to business organizations. Objectives of financial reporting and disclosure. Models of income determination and balance sheet valuations including historical cost, replacement cost, exit values, and discounted cash flows. Controversial accounting treatments and their effect of the usefulness and reliability of financial statements. The pronouncements of professional accounting bodies. Study of contemporary issues in financial accounting.

**Prerequisite:** ACCT 301

**ACCT 406      Internal Auditing (3-0-3)**

Development and evolution of the internal auditing profession; scope and objectives of internal auditing; standards of professional practice; control concepts; techniques of internal auditing; internal auditing and internal control; the internal audit process; reporting and communication of internal audit findings; administration of internal audit departments and quality assurance; internal auditor's independence; relationships between internal and external auditors and audit committees; ethics in internal auditing; financial audits; operational, efficiency, and management audits; compliance audits and computer applications in internal auditing.

**Prerequisite:** ACCT 210

**ACCT 407      Financial Statement Analysis (3-0-3)**

Structured analysis of financial statements; forecasting of income and cash flows; pro-forma financial statements; firm valuation using discounted cash flows and discounted residual income methods; comparative valuation analysis; credit analysis. A study of the potential effects of Generally Accepted Accounting Principles on financial statement analysis and valuation techniques and outcomes. Concepts of earnings quality and management of earnings.

**Prerequisite:** ACCT 210

**ACCT 408      Zakat and Business Tax Accounting (3-0-3)**

The fundamentals, rules, and objectives of taxation under Saudi Arabian tax and zakat regulations. Skills necessary to compute and assess income tax and zakat base for business entities. Business income tax and zakat rates. The Department of Zakat and Income Tax functions.

**Prerequisite:** ACCT 210

**ACCT 410      Cost Accounting (3-0-3)**

Contemporary topics in strategic cost management through and understanding of the underlying concepts and fundamental techniques involved in cost accounting for manufacturing and service companies. How cost management systems, with their performance evaluation and reward systems, encourage efforts to achieve an organization's strategic goals. Activity-based costing; decision making; pricing; joint



and common cost allocation; cost of quality and continuous improvement; responsibility accounting, performance measurement and reward systems; transfer pricing and capital investment decisions.

**Prerequisite:** ACCT 210

**ACCT 411 Cost Management & Cost Control (3-0-3)**

Advanced and contemporary issues in cost management and management control with emphasis on industrial and business practices. Behavioral and organizational foundations of managerial accounting. Cost and management accounting practices. Gap between management accounting theories and practices. The role of management accounting in inter-organizational relationships such as supply chain and outsourcing. Case studies in managerial accounting.

**Prerequisite:** ACCT 410

**ACCT 420 Petroleum Accounting (3-0-3)**

Accounting practices in the petroleum industry. Overview of the industry with a detailed focus on certain aspects of the Successful Efforts the Full Cost Methods of accounting. Oil and gas reserves, the standardized measure, supplemental disclosures, and depreciation, depletion, and amortization of exploration and development costs. Financial statement presentation issues will be analyzed to gain an appreciation for the unique impact of generally accepted accounting principles in the petroleum industry.

**Prerequisite:** ACCT 302

**ACCT 499 Special Topics in Accounting (3-0-3)**

Contemporary developments in financial and managerial accounting, such as corporate financial reporting, strategic management accounting, management control systems and regulation of financial reporting.

**Prerequisite:** ACCT 210

# **AEROSPACE ENGINEERING**

## **AE 220 Introduction to Aerospace Engineering (3-0-3)**

Introduction to overview of aerospace engineering, airplane, and the atmosphere. Basic aerodynamics and gas dynamics of incompressible flows, airfoils and wings, lift, drag, moments, circulation, boundary layers, and skin friction. Performance of aircraft, level flight, climb, range, endurance, and take-off and landing. Introduction to stability and control; structures and materials; propulsion of flight vehicles; and space flight (astronautics).

**Prerequisite:** PHYS 102

## **AE 240 AE Design (2-0-2)**

This course is a sophomore level design course that introduces the basic elements of engineering design with emphasis on teamwork and communication skills. The theme of the course includes design, build and test components associated with a specific aerospace related design project. The students are taught the theory and design techniques related to the project. The students are required to accomplish the design project in teams and communicate their preliminary results in verbal (presentation) and written form (report) by mid semester. The remaining half of the semester is devoted to building, testing and evaluating the design. The course culminates with a final design presentation and a final design report.

**Prerequisite:** MATH 201, PHYS 102

## **AE 313 AE Systems and Control (2-3-3)**

Introduction to automatic flight control systems, Modeling and analysis of linear dynamic systems; Feedback control system design using root-locus and frequency response techniques; Introduction to modern control theory and pole placement technique; Aerospace control applications.

**Prerequisite:** ME 201, MATH 202 or equivalent

## **AE 325 Gas Dynamics I (3-0-3)**

Fundamentals of compressible fluid flow (gas dynamics) in relation to effects of area change (nozzles and diffusers), friction and heat interaction (Fanno, Rayleigh line, and isothermal flow), combustion waves (deflagration, explosion, and detonation waves), normal and oblique shock waves and their effects on flow properties (extended diffusers and supersonic airfoils). Applications to flow through pipelines, subsonic, sonic, and supersonic flights, turbo machinery and combustion.

**Prerequisite:** AE 220

## **AE 328 Flight Structures I (3-0-3)**

Statistically determinate and indeterminate structures; aerodynamics and inertia loads, load factors, stresses in beams, shear flow in thin webs, closed section box beams; deflection analysis of structural systems; introduction to buckling; application to wing and fuselage stress analysis; Rayleigh-Ritz and introduction to the finite element method; elasticity of structures stress-strain relationships; vehicle materials; fatigue; strength-weight comparisons of materials; and sandwich construction including composite materials.

**Prerequisite:** CE 203, MATH 201

## **AE 333 Aerodynamics I (3-0-3)**

General fluid flow equation, potential parallel flow theory with some applications of aerodynamics, thin airfoil theory and finite wing in incompressible inviscid flow. Introduction to viscous flow and boundary layers.

**Prerequisite:** AE 220

**AE 350      Begin Cooperative Work      (0-0-0)**

See contents in AE 351.

**Prerequisite:** Same as in AE 351

**AE 351      Cooperative Work      (0-0-9)**

A period of 28 weeks of industrial employment for Aerospace Engineering students to work in appropriate industries or firms. Students are evaluated on their performance on the job and are required to submit an extensive formal report on their experience.

**Prerequisite:** ENGL 214, AE 220, Approval of the Department

**AE 352      End Cooperative Work      (0-0-0)**

See contents in AE 351.

**Prerequisite:** Same as in AE 351

**AE 355      Experimental & Computational Methods for Aerospace Engineering      (0-3-1)**

Experimental data analysis using statistics formulae, probability, and reliability; Laboratory experiments by using the basic instruments for measuring displacement, area, pressure, flow, temperature, force, torque, and vibration; Usage of data acquisition and processing devices in the experiments; Solution of systems of algebraic equations; Numerical solution of ordinary differential equations; Computer aided aerospace design and analysis; Introduction to finite difference methods and computational fluid dynamics.

**Prerequisite:** AE 220, CISE 301

**AE 399      Summer Training      (0-0-0)**

A continuous period of 8 weeks of summer training spent in the industry working in any of the fields of Aerospace Engineering. The training should be carried out in an organization with an interest in one or more of these fields. On completion of the program, the student is required to submit a formal written report of his work.

**Prerequisite:** ENGL 214, Approval of the Department

**AE 401      Aerospace System Maintenance      (2-3-3)**

Aviation maintenance regulation, records, and documents; servicing procedures and ground operation, aviation material. Hydraulic, electrical avionic, ignition, environmental, and fuel systems, engine overhaul. Installation and repair; heat exchangers; inspection testing; weight and balance computation. Aerospace maintenance and its management with economical considerations; including visits to the field.

**Prerequisite:** AE 220

**AE 402      Aerospace Avionics      (2-3-3)**

Theory of operation and utilization of various types of avionic equipment. Radio wave propagation, VHF communication, and VOR navigation system; instrument landing systems; automatic direction finder; distance measuring equipment; transponders. Weather radar and area navigation systems. Avionic system integration and flight control. Avionics equipment troubleshooting and repair; including visits to the field.

**Prerequisite:** EE 204 or equivalent

**AE 403 Aerospace Materials (3-0-3)**

Structure of materials; Mechanical properties of materials; Diffusion and heat treatment; Solidification and strengthening; Aluminum alloys, titanium alloys, nickel alloys, super alloys and their applications in aircraft structure and engine; Composite and ceramic material; Environmental effects and corrosion; Material behavior and selection processes for aerospace engineering systems applications. Visit to the field.

**Prerequisite:** Senior Standing

**AE 410 Astronautics (3-0-3)**

Solar system; rocket propulsion and staging of power trajectories; dynamics and control of spacecraft; satellite altitude control; astrodynamics; lunar and interplanetary trajectories; re-entry and heating consideration; aerospace plane.

**Prerequisite:** PHYS 102

**AE 411 Senior Design Project I (1-0-1)**

A course that integrates various components of the curriculum in comprehensive engineering experience so that the basic sciences, mathematics, and engineering sciences which the student has learned in his freshman-to-senior years of study can be applied. It considers design of a complete project or system including establishment of objectives and criteria, formulation of the problem statements, preparation of specifications, consideration of alternative solutions, feasibility considerations, and detailed engineering designs. The design should take into consideration appropriate constraints such as economic factors, safety, reliability, ethics and environmental and social impact. Submission of a written report is an essential requirement for completion of the course. Team design projects, where appropriate, are highly encouraged.

**Prerequisite:** Senior Standing, Approval of the Department.

**AE 412 Senior Design Project II (2-0-2)**

Continuation and completion of project started in AE 411. Public oral presentation and submission of final written report of the design project are essential requirements for the completion of the course.

**Prerequisite:** AE 411

**AE 414 Flight and Air Traffic Control (3-0-3)**

Introduction to air traffic control system; Navigation, communication and surveillance systems; Air traffic control procedures and organizations; Air traffic control at airport operation area; Non-radar and radar separation techniques; Human factors in air traffic control operations; Air traffic safety and management; Field project.

**Prerequisite:** Senior Standing

**AE 415 Flight and Aviation Safety (3-0-3)**

Regulatory organizations and their responsibilities; Basics of safety; Review of aviation safety statistics; Human factor in flight and ground safety; Aircraft safety systems; Principles of accident investigation; Safety management system; Accident prevention; Risk management; Aviation and airport securities.

**Prerequisite:** Senior Standing

**AE 416 Flight and Aviation Management (3-0-3)**

Air transportation regulations; Economic characteristics of airlines; Airline organization and management. Functional departments of airlines; Flight scheduling and fleet planning. Airline pricing strategies and airline marketing; Freight and cargo operations; Airline financing; Airport design and operations; Airport planning and administration; Field project.

**Prerequisite:** Senior Standing

**AE 417 Flight and Aviation Law (3-0-3)**

Legal environment of aviation; Federal Aviation Regulations; Basic principles of liability; Aircraft accident investigation law; Airline liability; Aircraft transactions; Airport and airspace law; Aviation security laws; International laws and treaties affecting aviation; Case studies.

**Prerequisite:** Senior Standing

**AE 418 Flight and Aviation Economics (3-0-3)**

The aviation industry; International regulatory framework; Airline cost structures; Demand of the airline service; Airline pricing and revenue; Air cargo; Airport economics; Airport operations; Economics of charter operation; Financial challenges facing the air transport industry; Case studies.

**Prerequisite:** Senior Standing

**AE 420 Aerospace Engineering Lab I (0-3-1)**

Laboratory experiments related to aerospace fields including wind tunnel and other equipment testing to demonstrate various phenomena, such as pressure distribution, lift, and drag measurement on different bodies. The course will include three parts, i.e., Fluid Dynamics, Aerodynamics and Gas Dynamics, and Propulsion. The course will utilize statistics, probability, and reliability basics with the fundamental principles of instrumentation.

**Prerequisite:** AE 220

**AE 421 Aerospace Engineering Lab II (0-3-1)**

Laboratory experiments related to two parts of aerospace flight: flight structures and materials; and flight dynamics and control, including demonstration and familiarization with basic components of the airframe construction (e.g., landing gear mechanism, aircraft wing, part of fuselage), and flight simulator model performance stability (e.g., lift and drag measurement and neutral point location and trim curves). The course includes films and visits to the industries in aerospace fields. The course utilizes statistical and reliability techniques for instrument data analysis.

**Prerequisite:** Senior Standing, AE 220

**AE 422 Flight Propulsion I (3-0-3)**

Introduction to Joule-Brayton cycle. Aerodynamics of aerospace vehicle engines, combustion, thrust and efficiency. Gas turbine engines: Turbojet, turbofan, turboprop; ramjet and scramjet, typical engine performance. Aerothermodynamics of inlets, combustors and nozzles. Introduction to propellers, turbo-compressors and turbines. Introduction to rockets and performance of rocket vehicle engines. Chemical and electrical drive rocket engines.

**Prerequisite:** ME 203, ME 311

**AE 426 Flight Dynamics I (3-0-3)**

Flight performance. Statics and dynamic flight stability and control of flight vehicle. Rocket trajectories and satellite orbits.

**Prerequisite:** AE 220

**AE 427 Aerospace System Design (3-0-3)**

This is an integrated aerospace design course which include theory, background, and methods of aerospace system (e.g. I aircraft, rockets, and spacecraft) design; including requirements and specifications of design, integration of aerodynamics, structure, propulsion, and flight dynamics and control; performance analysis and prediction; and complete project of aerospace system.

**Prerequisite:** Senior Standing, AE 220

**AE 428 Flight Structures II (3-0-3)**

Theory and analysis of structures of flight vehicles, plate theory, thermal stresses, buckling and failure, introduction to structural dynamics; analysis of aeroelastic phenomena and flutter; composite materials; crack-growth calculation and wear out models.

**Prerequisite:** AE 328 or equivalent

**AE 429 Gas Dynamics II (3-0-3)**

Linearized flow; method of characteristics, conical flow. Experimental methods in gas dynamics.

**Prerequisite:** AE 325 or equivalent

**AE 433 Aerodynamics II (3-0-3)**

Viscous flow and Navier-stokes equations; laminar and turbulent boundary layer; transition flow; unsteady flow; flow instabilities. High speed aerodynamics and aerodynamic heating. Introduction to hypersonic flow. Experimental methods in aerodynamics.

**Prerequisite:** AE 333 or equivalent

**AE 442 Flight Propulsion II (3-0-3)**

Rocket and power plants performance, dynamics, and control of turbo-engines. RAM/SCRAM jets engines. Blades element theory for propellers; turbo-compressors, turbines; chemical, nuclear, and electrical propulsion rockets. Introduction to space propulsion system.

**Prerequisite:** AE 422 or equivalent

**AE 446 Flight Dynamics II (3-0-3)**

Fundamentals of atmospheric flight; stability and control analysis; matrix approach to the general motion and transfer function; elastic flight vehicle; automatic flight control. Introduction to space flight dynamics; application to missile, spacecraft, and satellite attitude controls.

**Prerequisite:** AE 426 or equivalent

**AE 448 Fundamentals of Helicopter (3-0-3)**

Introduction to helicopters; Its various configurations and rotor types; Hovering theory; Vertical and forward flight performance analysis; Dynamics and control of rotor; Helicopter stability in hovering and forward flight; Helicopter vibration analysis during flight; Design of basic helicopter components.

**Prerequisite:** ME 201, MATH 202 or equivalent

**AE 499 Special Topics in Aerospace Engineering****(3-0-3)**

Topics are selected from the broad area of Aerospace Engineering to provide students with the knowledge of recent advancements in the analysis and design in Aerospace Engineering and in aviation including optimization of Aerospace System Design, Aerodynamics, Gas Dynamics, Aerospace Structures and Materials, Flight Dynamics and Control, Propulsion, Helicopter Flight, Avionics, Navigation and Guidance, Aircraft Maintenance, Flight and Aviation Safety, Air Traffic Control, Aviation Law, Astronautics, and other related fields such as Marine Engineering.

**Prerequisite:** To be set by the Department.

# ARCHITECTURE

## **ARC 100                    Architectural Graphics                    (0-10-5)**

This is a foundation course introducing the processes and techniques of graphic thinking. The course develops basic skills, ideas and the presentation methods of simple architectural exercises through a sequence of project types emphasizing 2D and 3D thinking. The importance of sketching in architecture is emphasized. The course bridges the gap between having no graphic communication skills and having the first level of skills required for the succeeding design studio.

## **ARC 101                    Design Studio I: Design Principles                    (0-10-5)**

The objectives of this course are those of improving graphic communication and initiation into design. Elementary projects are carried out which explore spatial thinking in basic structural forms and shapes. This course introduces the architectural design process, including issues of concept making, and design development.

**Prerequisite:** ARC 100

## **ARC 110                    History of Architecture I                    (2-0-2)**

This course is an introduction to the chronological development of architecture from pre-history, to Egyptian, Greek, and Byzantine, highlighting the development of structural systems, materials, construction and other building systems. Emphasis is on the Middle and Near East. The ancient Architectures of the Indian, Chinese and Japanese civilizations are also covered. The focus of this course are those of developing an understanding for material use, and of creating an appreciation as to the factors that contribute to the development of the unique architecture of the various cultures.

## **ARC 112                    History of Architecture II                    (2-0-2)**

The first part of this course covers a chronological development of architecture from the Early Christian period through the Gothic, to the Renaissance and Baroque periods. The second part studies architectural development from the Baroque period through the Industrial Revolution to the Modern movements.

**Prerequisite:** ARC 110

## **ARC 124                    Computer Aided Architectural Design                    (2-3-3)**

Introduction to the techniques and applications of computer aided design in the context of architectural design. Emphasis in the use of computer to seek, produce, manage, and exchange graphical information in the design process. Topics include introduction to personal computing in an office environment, two-dimensional editing and modifying techniques, standard layering system, associative dimensioning, blocks and external referencing system, layout management, CAD and the Internet. Introduction to computer programming using AutoLisp to automate drafting functions.

**Note:** Not to be taken for credit with ARE 221

## **ARC 132                    Man and Built Environment                    (2-0-2)**

This course constitutes an investigation into the design factors necessary for human living. It looks at the design of the built environment with emphasis on human needs and how the social sciences can contribute to architectural design and practice. The influence of other factors such as climate, materials, technology, and physical context are considered, and design principles are formulated from cross-cultural examples of world architecture.



**ARC 202                      Design Studio II: Space & Order                      (0-10-5)**

This course continues the study of the development of design principles from Design Studio 1 (ARC 101). Space definition is supplemented with human, cultural and localized contextual needs. Small and minimally complex projects explore functional, aesthetic and structural issues.

**Prerequisite:** ARC 101

**ARC 203                      Design Studio III: Site, Context & Form                      (0-10-5)**

Intermediate design scale is explored in this course, utilizing analytical approaches to problem solving, sketching and 3-D modeling. Emphasis is on site design, programming, materials and technology.

**Prerequisite:** ARC 202

**ARC 210                      History of Architecture III                      (2-0-2)**

The course covers the chronological development of Islamic civilization and architecture from Umayyad in Syria and Iraq, through the classical and late classical periods in Spain, North Africa, the Middle East, including Mesopotamia, the Ottoman empire, Persia and the Mughal Empire. The influences of Islamic architecture on other architectural styles of the same periods and vice versa are studied. The course covers the importance of Islamic art, geometry, calligraphy and variations in cultural attitudes in architectural styles. The development and evaluation of contemporary Islamic architecture is introduced.

**Prerequisite:** ARC 110

**ARC 221                      Structures in Architecture I                      (3-0-3)**

This course studies the history of shelters and the development and philosophy of structural systems. It is an introduction to different structural systems and their advantages; including load transfer mechanisms; their equilibrium and their application. The quantitative analysis of simple determinate systems, such as trusses, frames and beams; and the computation of axial and bending stress in simple members are covered.

**Prerequisite:** PHYS 101 or PHYS 133, Instructor Approval for Non-ARC Students

**ARC 222                      Structures in Architecture II                      (3-0-3)**

This course provides a continuation in the study of structural systems. Emphasis is on analysis and design. Analysis and design of in-determinate structural systems in wood and steel, along with an introduction to concrete and masonry structural systems are covered. Computers are introduced as a tool in structural analysis and design at this level.

**Prerequisite:** ARC 221

**ARC 225                      Virtual Reality in Architecture                      (2-3-3)**

Computer visualization process that includes: three dimensional modeling, analytical rendering, and animation, focusing on the description of architectural design. Digital video; capturing editing video audio clips. Virtual Reality in architecture; terminology, characteristics, environment, and applications. Virtual Reality Modeling Language. Students will apply the above tools to a design studio project. This course includes exposure to a broad spectrum of modeling, and presentation software such as; AutoCAD, 3D max Viz, Ulead Media Studio.

**Prerequisite:** ARC 124 or Instructor Approval

**ARC 251                      Introduction to Urban Design Concepts                      (2-0-2)**

This course is an introduction to the history and theories of urban spatial design. Approaches to the development of urban spaces throughout history are discussed, including Greek, Roman, Renaissance, Islamic, Baroque, Utopian, and Modern post-industrial concepts. Influential urban design theories and trends in modern times, their implications and feasibility, are studied. Urban social behavior and the psychological effects of urban space on its users are also studied.

**ARC 281                      Architecture of Saudi Arabia                      (2-0-2)**

Emphasis in this course is on developing a good understanding of the traditional architecture of all the regions of Saudi Arabia. Focus is on the need to learn important aspects about the fast-vanishing traditional architecture of the region. Historic preservation is discussed.

**ARC 300                      Workshop/Summer Internship                      (2-0-2)**

This workshop provides experience in the practical application of core subjects in a new or on-going research project. It provides 'in house' training with instruction in the students' intended professional major. Opportunities are offered for experimentation with innovative materials, construction and structural elements.

**Note:** The workshop is an acceptable substitute for the summer internship

**Prerequisite:** Junior Standing

**ARC 304                      Design Studio IV: Analysis & Synthesis                      (0-12-6)**

This studio focuses on building types that exhibit complexity and challenge. Project designs must show clear understanding of structural, mechanical and construction systems, along with space planning. Architectural programming is introduced.

**Prerequisite:** ARC 203

**ARC 305                      Design Studio V: Virtual Design Studio                      (0-12-6)**

The building types explored in this studio have greater complexity of function. In addition, emphasis is placed on building envelope in terms of form, massing, articulation and fenestration. Use of computer-aided design is a part of the design exploration.

**Prerequisite:** ARC 304, ARC 225

**ARC 313                      Theory of Architecture I                      (2-0-2)**

This course explores the path of the principal architectural thoughts and events which led to the development of major architectural and town planning theories; starting with Vitruvius' "ten Books of Architecture", to the European Art Nouveau movement (1890-1910) and the early influence of reinforced concrete. Concepts of architectural space, form and vocabulary, as well as major town planning concepts and theories from these periods are discussed and critically analyzed.

**Prerequisite:** ARC 210

**ARC 314                      Theory of Architecture II                      (2-0-2)**

The course outlines the theoretical foundations of 20th Century trends in architecture, in the light of worldwide historical developments and their social and technological influences. The focus of the course is on the Modern Movement and recent developments leading to the Post-Modern aspects of architectural aesthetics.

**Prerequisite:** ARC 313

**ARC 315                      Perception, Geometry and Color in Architecture                      (2-0-2)**

This course offers an understanding of perception and its application in transforming ideas into design and 3-D form. It is an introduction to the evolution of geometry in architecture and to primary elements such as line, plane, form, size direction and other ordering principles. The theories of color, and the interaction of color with its physical, visual and psychological aspects are included.

**Prerequisite:** Instructors Approval for Non-ARC Students

**ARC 323                      Structures in Architecture III                      (3-0-3)**

This course is an introduction to the characteristics of reinforced concrete and to its analysis and design using codes, tables and charts. Aspects of material deterioration and design for durability are covered in the course. Emphasis is placed on the use of computer applications in both analysis and design.

**Prerequisite:** ARC 222

**ARC 341                      Freehand Drawings                      (1-3-2)**

In this course students are taught how to see and how to quickly draw what they see thus improving their abilities to draw in three dimensions. The techniques of drawing are taught using various mediums, such as pencil, ink, and charcoal. The subject matter includes still-life and landscape drawing in the field, as well as “gesture drawing” drawing.

**ARC 342                      Computer Presentation Techniques                      (2-0-2)**

Expanding the use of mixed media into the translation of ideas, this course brings practical presentation principles, layout and comprehensive media techniques to the field of graphic design. Computer software, using industry standard illustration, paint, and page layout, new technologies and traditional composition are addressed.

**Prerequisite:** ARC 124

**ARC 343                      Creative Design Workshop                      (1-3-2)**

This is an advanced-level workshop covering creative thinking in design, using various media and methods of expression. The students are encouraged to develop innovative ideas and topics.

**ARC 344                      Architectural Photography                      (1-3-2)**

This course covers fundamental information about the use of photographic materials in the environmental design professions. Subjects discussed include photographic films and papers, camera types, lighting and darkroom techniques. Included in the course program are architectural documentation, presentation and promotional use of photography. Reproduction techniques using Diazo material, offset printing, model photography and line printing are also discussed.

**ARC 351                      Specific Urban Design Workshop                      (1-3-2)**

Application of traditional and modern urban design theories and methods constitutes the backbone of the course. Focus is on the solution of urban spatial problems and urban rehabilitation. Examination of case studies is undertaken at the scale of a district within the city. Action area projects are chosen from adjacent urban areas to allow easy accessibility for data collection and actual site analysis.

**Prerequisite:** ARC 251

**ARC 353                      Housing Policy and Design                      (2-0-2)**

This course provides an introduction to housing theory, socio-economic aspects related to housing, alternative approaches to housing policy and housing problems in developing countries, with particular attention to traditional housing settlements in Saudi Arabia. Exploration of current issues in the formulation and implementation of housing programs is carried out. This covers an analysis of Housing Design, classification of housing types, data gathering on housing, neighborhood theory as a housing concept, design procedure of a housing community, structure of housing areas as a criteria for the design of housing, construction technologies, materials, costs, climatic conditions and code issues.

**ARC 361                      Introduction to Landscape Plants                      (1-3-2)**

This course introduces basic principles of landscape architecture. Both landscape design processes and design methods are taught. This includes field study, and site analysis for the use of plants. Identification is made of native plants, factors of aridity, soil and types of irrigation systems suitable for Saudi Arabia. Emphasis is placed on the use of local plant materials.

**ARC 362                      Introduction to Landscape Design                      (1-3-2)**

This course is an introduction to basic principles of landscape architectural design and techniques. Projects at the scale of site design, such as open spaces and building surrounds, are dealt with. This reinforces understanding of the optimum and correct use of land development, local plant materials and irrigation systems.

**ARC 363                      Introduction to Ecological Analysis                      (1-3-2)**

This course covers the analysis of environmental factors, ecosystem functions, and ecosystem dynamics as they relate to decision-making for planning design. Environmental phenomena of Saudi Arabia, need controls, and counter measures are discussed.

**ARC 364                      Specific Open Spaces Design Workshop                      (1-3-2)**

This workshop provides a focus on how landscape design and green spaces add vitality to community and city life. The workshop introduces students to the creative design of urban open spaces. Such open spaces are analyzed, where their potentials are explored with the intent of creating parks, out door recreation, toddler lots, picnic areas, ponds, walks and natural trails.

**ARC 371                      Introduction to Interior Architecture                      (2-0-2)**

This course is an introduction to concepts of interior space, color and material selection, contract interiors and space planning methods. Course content covers discussion of marketing interior design services and methods. Sociological and psychological aspects of interior architecture are also presented.

**ARC 372                      Furnishing Design                      (1-3-2)**

This is a survey course concerning materials, methods and manufacturing processes that are applied to interior furniture and fixture design. The course covers the analysis of custom and mass production costs and considers the benefits of durability, safety and human comfort. These factors are discussed with respect to various interior furnishings.

**ARC 373                      Commercial Interiors                      (1-3-2)**

This course addresses commercial and institutional interiors. Space planning methodologies, life cycle costing, modular office systems and, materials selection are discussed. Office comfort, artificial illumination and day lighting are also considered.

**ARC 374                      History of Interior Architecture                      (2-0-2)**

This course presents a survey of interior architecture throughout history. Emphasis is placed on the way historical periods are reflected through the use of interior colors, materials and finishes.

**ARC 399                      Summer Training                      (0-0-1)**

This is a continuous period of 8 weeks of summer work in building design and construction industry, for gaining exposure and appreciation of the architectural profession. The writing of a field experience report is required. The report should emphasize duties assigned and completed during the period.

**Prerequisite:** Junior Standing, ENGL 214

**ARC 400                      Senior Project Preparation and Programming                      (2-0-2)**

In addition to teaching the basic techniques of architectural programming, this course is designed to help the senior student to prepare his proposal for the final project in ARC 408. Topics include: Client objectives, Functional relationships, Facility space requirement development, Site development requirements, Site analysis, Prioritizing functions, Spatial restrictions and budget constraints. The student carries out research on his chosen building type and location, acquires the necessary approval based on the need for where it is planned for his project, visit the site and government offices to obtain the necessary maps, contour information, street locations and photographs. The student then writes a program for his project.

**Corequisite:** ARC 406

**ARC 406                      Design Studio VI: Comprehensive Design Project                      (0-12-6)**

This studio emphasizes the comprehensive nature of architectural design. Assigned project programs relate to an urban context and a visit-able site. Experimenting with different solutions using knowledge of architectural theories and contemporary concepts of design, formulate concepts to a high level of practicality. This course is available to students of senior standing only.

**Prerequisite:** ARC 305

**ARC 407                      Construction Documents                      (0-6-3)**

This course is setup to introduce concepts and methods of preparing construction documents for buildings. It provides a hands-on experience in preparing such documents. The course will emphasize the use of computer integrated database management systems, Intranet and Intranet methods for accessing, distributing and coordinating construction documents. Topics to be covered include; the graphic component: a coordinated set of drawings, plans, sections, elevations, graphic symbols, and details, required to graphically describe the project. The alphanumeric component: dimensions and annotations, tables, and schedules (doors, windows, and room finishes). Specifications, mostly text but sometimes supplemented with graphics, including bills of quantity or materials.

**Prerequisite:** ARC 124, ARE 212

**ARC 408                      Senior Project                      (0-14-7)**

This studio begins with a presentation of the ARC-400 program document with clear indication of the intent and direction of emphasis. Having been reviewed and approved by a senior project committee, This project design is undertaken to its completion. The project

must exhibit a comprehensive mastery of architectural design, reflecting the knowledge and skills acquired during four years of study in architecture.

**Prerequisite:** ARC 400, ARC 406, Senior Standing

**ARC 416                      Specific Topics on Islamic Architecture                      (2-0-2)**

In this course, the major developments in Islamic architecture are studied. The course concentrates either on a given period, a specific case study, or both in the rich and diversified traditions of Islamic architecture. At the discretion of the instructor, themes such as Al-Hamra Palace or Andalusian Islamic Architecture, form the focus and essence for the entire course.

**Prerequisite:** ARC 210

**ARC 426                      Professional Practice                      (3-0-3)**

The course introduces knowledge required for a success career in architectural practice or employment. The course is divided into three parts. The first part discusses the training and role in society of architects. This covers academic and professional training; career choices, lives as professionals and professional ethics. The second part discusses the organization and management of architectural firms and covers firm formation and organization, marketing of services, management and dynamics. The last part deals with Project administration. It covers project conception and acquisition; project management; design services, parameters and documentation; and contract administration. The course highlights practices in Saudi Arabia and compares them with international practices.

**Prerequisite:** Junior Standing

**ARC 435                      Design Determinants for Arid Regions                      (2-0-2)**

This course offers insights into design for arid regions. It covers analysis of natural conditions, climate, topography and water. Analytical criticism of existing buildings in arid regions is used to develop an understanding of the culture, construction technology, and materials of such regions. This also develops an appreciation for cultural, site and climatic conditions that prevail and determine the building-form.

**ARC 442                      Knowledge-Based Systems in Architecture                      (2-0-2)**

This course presents an overview of the knowledge-Based Systems and their application in the field of architecture and environmental design. Fundamental concepts, as well as types of knowledge-Based systems are discussed. Case studies in the architectural application of these systems, issues of linking these systems to other information technologies such as CADD, Multimedia, Hypermedia and ontologies, are undertaken.

**Prerequisite:** ARC 124

**ARC 449                      Special Topics in Computer Aided Design                      (2-0-2)**

The objective of this course is one of exploring emerging ideas in Computer Graphics and Information Technology Applications in the fields of architecture and design. It provides a forum for faculty and IT experts to share their research findings or professional experience in computer graphics with students. It also provides an opportunity for students to explore topics in Information Technology Applications that are of special interest to them individually. The specific content and format of the course varies with the topic and research interest of the faculty teaching it.

**Prerequisite:** ARC 124

**ARC 453                      Urban Design Theory                      (2-0-2)**

This course is a critical analysis of the theories and current issues of urban spatial design. It examines city forms and patterns, and reviews utopian models. The emphasis is on the understanding of the physical, socio-cultural, economic and technological forces, and their role in shaping the urban environment.

**Prerequisite:** ARC 251

**ARC 454                      Methods of Urban Design Analysis                      (2-0-2)**

This course is concerned with 'Researching and analyzing urban form' to understand its elements and its underlying organizing principles. The purpose is to expose the students to the range of approaches available for urban form analysis and for understanding what makes a "good" city or urban area. Computer based analytical techniques and computer visualization and simulation technology will be emphasized.

**Prerequisite:** ARC 251

**ARC 459                      Special Topics in Urban Design                      (2-0-2)**

The objective of this course is one of exploring emerging ideas, concepts and policy intervention methods in urban design. The course provides a forum for faculty to share their research findings or professional experience in the field of urban design or to explore a new theory, method or techniques of urban design. Students with particular urban design interest may also explore them in this course. The specific content and format of the course varies with topic and research interest of the faculty teaching it.

**Prerequisite:** ARC 251

**ARC 482                      Socio-Cultural Factors in Design                      (2-0-2)**

This course is a study of behavioral concepts and socio-cultural aspects affecting the way man shapes his environment, and in turn is shaped by it. The course builds an understanding of human culture, attitudes, psychology, and the behavior of both individuals and groups. Selected social planning and design issues, technology and related research techniques are studied.

**ARC 483                      Architectural Conservation and Preservation                      (2-0-2)**

This course is an introduction to construction principles and materials employed in Saudi Architecture. Observation and examination of existing architectural examples in the form of their physical, historical, and cultural context, and their anatomy, both physical and conceptual make up the majority of the study. Development of skills in architectural design principles required for the conservation and preservation of "what is there" in architecture is also important.

**ARC 489                      Special Topics in Regional Architecture                      (2-0-2)**

The flexible content and format of the course offers opportunity to the student to explore much deeper into chosen areas and types of regional architecture. This exploration, however, should allow for the development of understanding in creating a link between the past, present and the future of regional architecture.

# **ARCHITECTURAL ENGINEERING**

## **ARE 101 Architectural Graphics (0-6-2)**

The course initially introduces the discipline of Architectural Engineering and the role of architectural Engineers in the process of building design, systems' integration, construction and operation. Graphical representation methods and techniques in architectural design and presentation are introduced. Drawing tools and materials; architectural drafting conventions; orthographic projections and views, their types and use in building presentation. Shades and shadows techniques. Freehand sketching and model-making techniques. Introduction to computer graphics using simple software tools.

## **ARE 202 Architectural Design I (0-9-3)**

This course introduces the design process in the form of phases, activities, and parties involved. Topics covered include: Description of each phase, activities and objectives; models for problem-solving process in design utilizing graphic thinking. Problem definition, developments of alternatives, evaluation, selection of solution and communication of a design project are introduced, explored and exercised through both abstract sketches and definitive designs to solve simple design problems. Design problems of complete but simple buildings are introduced. Considerations of building function, construction materials and systems, cultural, environmental constraints, and climatic influences are emphasized. Individual design thinking is encouraged throughout the studio work.

**Prerequisite:** ARE 101

## **ARE 211 Building Materials (2-3-3)**

Properties, behavior, and selection of building materials including wood, laminates, cements, aggregates, concrete, masonry mortar, steel, and finishing materials. Structural and architectural use of traditional and modern building materials. Introduction to basic methods of construction; excavation, foundations, building systems, and construction equipment and general techniques in wood, masonry, and concrete construction. New building materials. Visits to building sites and manufacturers.

## **ARE 212 Construction Systems (3-0-3)**

Construction systems including foundation, superstructure, enclosure (walls and roofs), interior finishes, partitions, and ceilings. Construction and detailing of site-built and prefabricated systems. Selection methods and criteria for appropriate design as a function of climate and energy use, labor and material availability, maintenance and replacement patterns, safety, functionality, and cultural context. Course material comprehension is ensured through submission of sketches, to-scale detail drawings and model-development of the introduced systems.

**Prerequisite:** ARE 211

## **ARE 222 Computer Applications in Building Design (1-3-2)**

Introduction to Computer-Aided Drafting and Design which includes: 2D drawings, 3D modeling, rendering, and Image processing. Major CAD drafting, and presentation software tools will be used for the production, management, and presentation of project information. Introduction to utilization of modeling and simulation software tools in Architectural Engineering.

**Corequisite:** ARE 101

## **ARE 301 Architectural Design II (0-9-3)**



This course is a continuation of a two-semester sequence of design studios. Introduction and appreciation of the design process through more complex buildings and larger project sites. The concept of building design as a multi-disciplinary approach is introduced. Integration of structural, mechanical and environmental control systems with the building function, form and spaces organization is emphasized. Basic elements of architectural form and space and how they can be manipulated, organized in the development of a design concept and their visual implications are explored.

**Prerequisite:** ARE 202

**ARE 303                      Working Drawings                      (0-9-3)**

An introduction to the production of construction documents used in the building industry. A preliminary building design is developed to include detailed materials, and construction information. A set of drawings is completed including floor plans and elevations, site, foundation, framing and roof plans and details, wall and roof sections and details, interior finish elevations and details, and door and window schedules and details. Drawing skills are developed and office management issues are discussed.

**Prerequisite:** ARE 202, ARE 212

**ARE 320                      Architectural Acoustics                      (1-3-2)**

Introduction to architectural acoustics. Room acoustics and noise sources, measurements, and control. Acoustical properties of materials and room shapes. Sound absorption and transmission. Computer applications in room acoustics simulation.

**Prerequisite:** PHYS 102 or PHYS 133

**ARE 322                      Building Mechanical Systems                      (2-3-3)**

Introduction to basic concepts, terminology and design methods for building mechanical systems. Thermal comfort, building thermal performance, and heating & cooling load calculation procedures. Fire protection systems and smoke control. Water supply and distribution systems; Waste and drainage systems. Vertical transportation systems. Computer applications.

**Prerequisite:** PHYS 102 or PHYS 133

**ARE 325                      Building Illumination                      (1-3-2)**

Concept of light, vision, and color. Luminaries and lamps. Lighting system design procedures; calculation and measurement techniques, evaluation of interior lighting quality, and daylighting. Computer applications in artificial and daylighting analysis and design.

**Prerequisite:** PHYS 102 or PHYS 133

**ARE 328                      Architectural Acoustics & Illumination                      (3-0-3)**

Introduction to basic phenomena, and concepts of architectural lighting and acoustics. Electrical light sources, lighting system, and design methods, quantity and quality of illumination. Daylighting, lighting measurements, instruments and methods. Acoustical properties of materials and constructions. Room acoustics and noise control. Measuring method and equipment. Acoustic design of auditoria. Impact of acoustical and lighting system on Architectural design. Computer applications.

**Note:** For non ARE Students

**Prerequisite:** PHYS 133

**ARE 345                      Principles of Heating, Ventilating, and Air-conditioning                      (3-0-3)**

Fundamental principles and engineering procedures for the design of heating, ventilating, and air conditioning systems; HVAC system characteristics; system and equipment selection; duct design and layout. Energy conservation techniques. Computer applications.

**Prerequisite:** ARE 322, ME 203

**ARE 350                      Begin Cooperative Work                      (0-0-0)**

See contents in ARE 351.

**Prerequisite:** Same as in ARE 351

**ARE 351                      Cooperative Work                      (0-0-9)**

A continuous period of 28 weeks is spent in the building industry to acquire practical experience in the Architectural Engineering under the supervision and guidance of the employer and the academic advisor. During this period the student gains an in-depth exposure and appreciation of the Architectural Engineering profession. The student is required to write a detailed report about his training period under the regulation of the ARE department.

**Prerequisite:** ENGL 214, Junior Standing

**ARE 352                      End Cooperative Work                      (0-0-0)**

See contents in ARE 351.

**Prerequisite:** Same as in ARE 351

**ARE 399                      Summer Training                      (0-0-0)**

A continuous period of 8 weeks of summer working in the building industry to gain exposure and appreciation of the Architectural Engineering profession. On-the-job training can be acquired in one of the areas related to architectural engineering. The student is required to write a brief report about his work experience. The report should emphasize duties assigned to, and completed by the student.

**Prerequisite:** ENGL 214, Junior Standing

**ARE 400                      Senior Design Project                      (0-9-3)**

A comprehensive course that integrates various components of the curriculum in a comprehensive engineering design experience. The project should include development of system design and analysis techniques such as integrated design of structural, mechanical, electrical and environmental systems. The design should take place with consideration to appropriate constraints such as economic, safety, reliability, ethics, environmental, social, and cultural factors. Public oral presentations and written reports of the final design are essential requirements for completion of the course. Computer applications and team work, where appropriate, are greatly encouraged.

**Prerequisite:** Senior Standing

**ARE 413                      Construction Management                      (3-0-3)**

A survey of Construction Management: Basic concepts, preparing the bid package, issues during construction phase, construction contracts, legal structure, time planning/control. Project cash flow; project funding, equipment ownership, equipment productivity, construction operations, construction labor, materials management and safety. Types of specifications, technical division, changes, bonds, liens, general conditions, special conditions and contract documents.

**Prerequisite:** Junior Standing

**ARE 431                      Building Economy                      (3-0-3)**

Basic concepts of building economics: initial cost, life-cycle cost, cost and benefit ratio analysis, and control of cost and depreciation. Cost estimating, including determination of materials, labor, equipment, overhead, profit, and other construction costs.

**Prerequisite:** Junior Standing

**ARE 440                      Solar Energy in Buildings                      (3-0-3)**

Principles of solar energy collection, conversion, storage and distribution. Solar water heating, space heating and cooling applications, components and systems. Passive solar strategies. Computer applications.

**Prerequisite:** Senior Standing or Consent of Instructor

**ARE 442                      Building Energy Analysis                      (3-0-3)**

Application of thermal sciences to the evaluation of building energy systems; energy estimating methods; computer models for estimating building energy consumption; applications of various energy analysis computer programs; design methods for reducing energy consumption in buildings.

**Prerequisite:** ARE 322 or Consent of Instructor

**ARE 443                      Computer-Aided Building Design                      (2-3-3)**

Introduction to Computer-Aided Building Design (CABD) software tools, their potentials, and limitations. Production of building systems design using computers. Use of computers in space planning, cost analysis, structural design, building services layout, mechanical systems, energy analysis, lighting analysis and design, and room acoustics evaluation. Choice of a software upon given conditions. Use and application of selected package(s) for various building applications.

**Prerequisite:** ARE 222 or Consent of Instructor

**ARE 444                      Knowledge-Based Systems in Buildings                      (2-3-3)**

Computer-based decision making problem solving, database and integrated approaches. Introduction to the theory of artificial intelligence and knowledge based systems in Architectural Engineering . Conceptual design of CAD systems involving knowledge base approach. Overview of available Expert System shells, their potentials and limitations. Applications of selected packages in building design problems.

**Prerequisite:** ICS 102, ARE 222 or Consent of Instructor

**ARE 445                      Structural Masonry                      (3-0-3)**

Masonry materials and their characteristics, non-load bearing wall construction, load bearing wall design, basics of design for vertical loading and lateral forces, stability and types of load bearing walls, structural elements and forms. Design of single-story structures, reinforced and post tension masonry. Masonry architecture, vault and dome design. Complete design project, site visits and practical applications. Computer applications.

**Prerequisite:** CE 305 or ARC 222

**ARE 446                      Planning and Design of Structural Systems                      (3-0-3)**

Fundamental concepts in the planning, design, and construction of complete structures. Design philosophies and criteria. The nature of loads and probabilistic determination of design loads. Selection of structural systems for buildings. Approximate analysis for preliminary design. Utilization of computers in structural engineering. Special problems in tall building.

**Prerequisite:** CE 305 or ARC 222

**ARE 450                      Artificial Lighting Systems                      (3-0-3)**

Introduction to different lighting systems. Lighting requirements under different working conditions. Detailed understanding of artificial lighting sources. Quantity and quality of light for various architectural spaces. Polar curves for various artificial lighting sources. Design of artificial lighting systems for avoiding glare. Artificial lighting design of outdoor spaces.

**Prerequisite:** ARE 325 or Consent of Instructor

**ARE 452                      Daylighting Analysis & Design                      (3-0-3)**

Introduction to daylighting. Sources of daylighting. Solar spectrum and its relationship to daylight availability. Weather phenomenon and daylighting. Concept of cloudiness and design sky: Performance of building materials with respect to daylighting such as reflectivity and absorption. Decomposition and decoloring of materials under daylight. Detailed study of daylight transmission through openings with shading devices. Solar geometry and design of sun-shading devices. Computer and lab methods for the study of daylight in buildings. Design of openings in desert areas with respect to glare and overheating.

**Prerequisite:** ARE 325 or Consent of Instructor

**ARE 455                      Room Acoustics                      (3-0-3)**

Acoustical phenomena in enclosed spaces. Sound-absorbing materials and constructions. Acoustical requirements for the design of enclosures for speech and music (e.g. studios, auditoria, and multipurpose halls). Techniques for evaluating room acoustics performance. Sound reinforcement systems; principal uses, basic elements, functional diagrams, and loudspeaker systems. Computer applications in sound behavior modeling and evaluation.

**Prerequisite:** ARE 320 or Consent of Instructor

**ARE 456                      Noise Control in Buildings                      (3-0-3)**

Noise sources and their effect. Transmission of noise in buildings; air-borne and structure-borne noise. Sound isolation and sound insulating construction. Mechanical systems noise and vibration. Noise control techniques. Computer applications.

**Prerequisite:** ARE 320 or Consent of Instructor

**ARE 457                      Introduction to Building Maintenance Management                      (3-0-3)**

Basic concepts of building maintenance management. Classification of maintenance types, work orders types, planning and scheduling of maintenance works, maintenance contract types. Organizing preventive maintenance activities. Maintenance contract documents.

**Prerequisite:** Junior Standing

**ARE 458                      Quantitative Methods in Construction Management                      (3-0-3)**

An introduction to the application of modeling techniques to problems in construction management. Topics include the application of linear programming, transportation and assignment techniques, materials management, queuing and simulation.

**Prerequisite:** Junior Standing

**ARE 459                      Contracts and Specifications                      (3-0-3)**

Contract documents, divisions of specifications, types of specifications, technical divisions options and alternatives, contracts, time and money, changes bonds liens, government contracts, general conditions, special conditions, proposal form, instruction to bidders, invitations to bid, checking, interpretation of specifications, and computerized specifications. Saudi standard public works contract.

**Prerequisite:** Junior Standing

**ARE 490                      Special Topics in Architectural Engineering                      (3-0-3)**

Variable contents. State-of-the-art advanced topics in the field of Architectural Engineering.

**Prerequisite:** Junior Standing

**ARE 491                      Special Topics in Fire safety Management                      (3-0-3)**

The course introduces students to fire safety design; fire protection objectives; ignition, fire development and propagation in confined spaces; factors controlling fire severity; chemical categories of fire fuel; fire detection and notification systems; fire suppression systems; means of egress and evacuation systems; factors affecting the design of escape routes; smoke production, movement, management and ventilation techniques in the fire area; hazard and risk assessment procedures; fire resisting elements separating buildings or compartments within buildings; protection of openings; fire stopping; fire proofing and fire retardant treatments; performance-based fire protection design; prescriptive-based fire protection design. The course will also present a number of case studies on evaluating fire safety in school, medical, office, library, restaurant and gas station facilities.

**Prerequisite:** Junior Standing

# ACTUARIAL SCIENCES

## **AS 201                      Financial Mathematics                      (3-0-3)**

Theory of compound interest and the mathematics of investment and credit. Measurement of interest, annuities certain (level, non-level, and continuous), amortization schedules, sinking funds, investment yield rates, and valuation of bonds and other securities. Methods of loan measurement and payments (Islamic and Conventional) are illustrated in amortization and sinking fund schedules. Islamic views on interest and investments.

**Prerequisite:** MATH 102

## **AS 288                      Actuarial Science Problem Lab I                      (0-1-1)**

This problem lab is designed to prepare Actuarial majors for the second Society of Actuaries and Casualty Actuarial Society Examinations, FM (Financial Mathematics).

**Prerequisite:** AS 201

## **AS 350                      Begin Cooperative Work                      (0-0-0)**

See contents in AS 351.

**Prerequisite:** Same as in AS 351

## **AS 351                      Cooperative Work                      (0-0-9)**

A continuous period of 28 weeks of industrial employment for Actuarial Science and Applied Financial Mathematics students to work in appropriate industries or firms. Students are evaluated on their performance on the job and are required to submit an extensive formal report on their work experience.

**Prerequisite:** ENGL 214, AS 201, STAT 301, STAT 310

## **AS 352                      End Cooperative Work                      (0-0-0)**

See contents in AS 351.

**Prerequisite:** Same as in AS 351

## **AS 381                      Actuarial Contingencies I                      (3-0-3)**

Introduction to life insurance mathematics based on a stochastic approach. Life insurance, annuities, benefit premiums, and net reserves. Parallel treatment of topics based on Takaful system.

**Prerequisite:** AS 201, STAT 301

## **AS 388                      Actuarial Science Problem Lab II                      (0-1-1)**

This problem lab is designed to prepare Actuarial majors for the first Society of Actuaries (SOA) and Casualty Actuarial Society (CSA) Examinations, Exam P (Probability). Students are assumed to have taken the appropriate prerequisite courses prior to registering for this society exam preparation lab.

**Prerequisite:** STAT 301

## **AS 475                      Survival Models for Actuaries                      (3-0-3)**

The statistical process of analyzing survival data, particularly for insurance applications. Techniques for estimating mortality rates; construction of mortality tables from the records of insured lives, employee benefit plans, and population statistics. Life tables, graph and related procedures. Graduation. Special attention to censoring and truncation. Single samples: complete or Type II censored data and Type I censored data for Exponential, Weibull, Gamma and other Distributions. Parametric regression for Exponential, Weibull and Gamma

Distributions. Distributions-free methods for proportional hazard and related regression models. This course section is an elective for Actuarial Science & Financial Mathematics major.

**Prerequisite:** STAT 302, STAT 310

**AS 482                      Actuarial Contingencies II                      (3-0-3)**

A continuation of Life Contingencies I. Development is based on a stochastic approach to life insurance models. Major topics include benefit premiums and reserves, and multi-life and multiple-decrement models. Parallel treatment of topics based on Takaful system. Application of such area in life insurance and property.

**Prerequisite:** AS 381

**AS 483                      Actuarial Risk Theory and Credibility                      (3-0-3)**

Distribution of aggregate claims associated with insurance including analysis of the risk due to variations in expected claim numbers and amounts. Frequency and severity distributions, individual and collective models, ruin theory, continuous-time compound Poisson surplus processes, reinsurance, dividend formulas, credibility models, and simulation. An introduction to empirical Bayes and statistical distributions used to model loss experience. Application of risk theory to the operation of insurance and takaful system and assessment of the credibility of data for ratemaking.

**Prerequisite:** STAT 416

**AS 498                      Topics in Actuarial Science and Financial Mathematics                      (3-0-3)**

Open for Actuarial majors interested in studying an advanced topic in Actuarial Science and Financial Mathematics. Course content is variable. Possible Topics: (1) Graduation Theory, (2) Advanced Risk Theory, (3) Stochastic Simulation Methods, (4) Loss Distribution Models or (5) Other Advanced Actuarial Science topic.

**Prerequisite:** Senior Standing, Permission of the Department Chairman upon recommendation of the instructor

# **BIOLOGY**

## **BIOL 101                    Introduction to Biology                    (3-3-4)**

Structural organization of cells and metabolic activities of some of the cellular components, basic principles of genetics, biological diversity and the major kingdoms of life.

## **BIOL 102                    Ecology and Environment                    (3-0-3)**

Population and community ecology, with emphasis on growth and distributions of populations, interaction between species, structure, dynamics, and functions of communities and ecosystems; structure and systems analysis of the earth from a biological perspective, with emphasis on biogeochemical cycles and global change. At least one field trip required.

**Prerequisite:** BIOL 101 or Consent of the Instructor

## **BIOL 201                    Microbiology                    (3-3-4)**

The course covers structures, functions, and diversity of microbes with respect to basic views related to microorganisms. It highlights different metabolic diversities, advances in molecular phylogeny, diversification and biogeochemical cycling of elements in different environments. It studies interaction among viruses, bacteria and macro organisms with objective views of beneficial vs. harmful effects of microorganisms on environment, human health and society.

**Prerequisite:** BIOL 102

## **BIOL 202                    Physiology                    (3-3-4)**

An introductory human physiology. The course will concentrate on basic mechanisms underlying human life process including cells and membranes; nervous and muscle function cardiovascular, respiratory, and renal and gastrointestinal physiology; metabolism, endocrinology and reproduction.

**Prerequisite:** BIOL 101

## **BIOL 233                    Biology for Engineers                    (2-3-3)**

Basic understanding of the fundamental principles of biology. Basic information in chemical context of life, cell structure, cell function, energy production and transfer, cell division (mitosis and meiosis) and DNA Technology and its engineering applications, basic information about microorganisms (microbiology) and viruses. Emphasis on topics of relevance to engineering applications.

## **BIOL 301                    Biochemistry                    (3-0-3)**

Studies of biomolecules such as sugars, polysaccharides, hemoglobin and amino acids and on the structural studies of proteins. Enzymes in biological tissues with emphasis on mechanism and catalytic reactions. Metabolism and transport in biological systems. Study of structure of nucleic acids as well as the DNA molecule.

**Prerequisite:** CHEM 201, BIOL 101



# CIVIL AND ENVIRONMENTAL ENGINEERING

## **CE 101                      Engineering Graphics                      (1-3-2)**

An introductory course on the “language of engineering” and the use of drafting instruments and machines. Topics include freehand sketching, graphic geometry, orthographic projection, sectional and auxiliary views, dimensioning, intersections, developments, and introduction to working drawings and an overview of computer graphics.

## **CE 201                      Statics                      (3-0-3)**

Basic concepts and principles of mechanics; vector algebra; equilibrium of particles in two and three dimensions; definition of moment and couple; reduction of systems forces; equilibrium of rigid bodies; statically determinate structures including beams, trusses, frames, and machines; internal forces; shear force and bending moment diagrams in beams; friction and its applications, centroid and center of gravity of lines, areas, and volumes; moment of inertia and radius of gyration.

**Prerequisite:** PHYS 101

## **CE 202                      Statics & Strength of Materials                      (3-0-3)**

Basic concepts and principles of mechanics; equilibrium of particles in two dimensions; definition of moment and couple; reduction of systems forces; equilibrium of rigid bodies in two dimensions; internal forces; shear and bending moment diagrams in beams; centroid and moment of inertia; concepts of stress, strain, and constitutive relations; stress and deformation of axially loaded members; thermal stresses; torsional stress and deformation; elastic bending and shear stresses in beams; compound stresses; stress transformation.

**Note:** Not to be taken for credit with CE 201 or CE 203

**Prerequisite:** PHYS 101

## **CE 203                      Structural Mechanics I                      (3-0-3)**

Concepts of stress, strain, and constitutive relations; stress and deformation of axially loaded members; thermal stresses; pressure vessels; energy concepts; torsion of circular and thin-walled sections; shear and bending moment diagrams in beams; elastic bending and shear stresses in beams; compound stresses; stress transformation; bending moment-curvature equation; deflection of beams; singularity functions methods, analysis and design applications.

**Prerequisite:** CE 201

## **CE 215                      Computer Graphics                      (2-3-3)**

The course focus on the following topics: Introduction to Computer Aided Design and Drafting, (CADD), 2D Drawings with AutoCAD includes Multiview Projection, Dimensions, Sections, Auxiliary Views, Free Hand Sketching, Mining and Civil Engineering Problems, Metallic Members and their Connections, Bearing and Slope of Lines and Planes, Contour Map Lines, Cut and Fill, Blue Print Reading, and 3D Drawings.

**Prerequisite:** ICS 103 or ICS 102 or ICS 101

## **CE 230                      Engineering Fluid Mechanics                      (3-0-3)**

Properties of fluids, hydrostatics with applications to manometers, forces on plane and curved surfaces, buoyancy, equations of continuity, energy and linear momentum with applications, dimensional analysis, dynamic similarity, open channel flow, conduit flow.

**Prerequisite:** CE 201, MATH 102

## **CE 261                      Surveying I                      (1-3-2)**

Introduction to measuring units; direct distance measurement with tapes; tape corrections; electronic distance measurement; levels and leveling; longitudinal profiles and cross sections; contouring; area and volume computations; the theodolite and angular measurements; optical distance measurements; rectangular coordinates; traverse surveys and computations; mapping; introduction to GPS and GIS.

**CE 303                      Structural Materials                      (3-3-4)**

Composition and properties of hydraulic cements; characteristics of local aggregates and water; properties of fresh concrete; production, handling and placement of cement and fresh concrete in the local environment; properties of hardened concrete; mix design; special concretes; introduction to pavement types; asphalt cement types, properties and usage; properties of aggregate for asphalt concrete mixes; asphalt concrete mix design concept; types, engineering properties, and usage of structural steel; introduction to aluminum, timber, glass, plastics and other structural materials. Laboratory sessions on tests of concrete constituents, fresh and hardened concrete, aggregate gradation and mix design, flexure behavior of reinforced concrete beams, physical properties and testing of asphalt binders, asphalt concrete mix design; hardness test, tensile and torsion tests on metals, measurement of Poisson's ratio and stress concentration, and bending tests on steel beams.

**Prerequisite:** CE 203

**CE 305                      Structural Analysis I                      (3-0-3)**

Shear force and bending moment diagrams for frames; influence lines for beams and trusses; displacement analysis for beams; Virtual Work Method for beams, frames and trusses; Castigliano's Theorem; analysis of statically indeterminate structures; the Force Method; the Slope-Deflection Method, the Moment Distribution Method, introduction to the Stiffness Method for beams and frames, the use of structural analysis software.

**Prerequisite:** CE 203

**CE 312                      Introduction to CE Design                      (1-0-1)**

A broad introduction to design in all four disciplines; design landscape and requirements related to data, information, specification and codes, methods and tools, design considerations and constraints; issues related to safety, economy and impact; professional ethics and responsibility; design drawings; a small-scale project work to complement student's understanding.

**Prerequisite:** Junior Standing

**CE 315                      Reinforced Concrete I                      (2-3-3)**

Behavior and design of reinforced rectangular and T-sections in flexure; doubly reinforced sections; behavior and design of beams for shear; bond and development length including splices and cut-off points; design of one-way solid and joist floor slabs; design of short columns; design of isolated footings; introduction to prestressing and precast construction; use of STAAD.Pro and other computer softwares in design; completion of a design project; site visits.

**Prerequisite:** CE 305

**CE 318                      Numerical & Statistical Methods in Civil Engineering                      (2-3-3)**

Introduction to numerical methods; error analysis; solution of system of linear and nonlinear equations; numerical integration; numerical solutions of ordinary differential equations; curve fitting and interpolation; statistical methods, descriptive statistics, probability distributions, analysis of variance and regression; introduction to linear programming and optimization

problems; development and application of computer programs to case studies derived from civil engineering practices.

**Prerequisite:** ICS 103 or ICS 102 or ICS 101, MATH 260

**CE 330                      Environmental Engineering Principles                      (3-0-3)**

Introduction to major environmental pollution issues; Analyses of water quality; Municipal solid waste management and disposal; Hazardous waste testing, management, and treatment; Air pollution characteristics, effects, measurements, control, meteorology, and dispersion; Noise pollution control; Introduction to wastewater testing, treatment and reuse; Environment Impact Assessment.

**Prerequisite:** CHEM 111 or CHEM 102

**CE 332                      Engineering Hydrology and Hydraulics                      (2-3-3)**

The hydrologic cycle, precipitation, evapotranspiration, infiltration, hydrograph analysis, fundamentals of groundwater flow, basic concepts of open channel flow and flow in pipes.

**Prerequisite:** CE 201, MATH 102

**CE 341                      Transportation Engineering                      (3-0-3)**

Transportation system in Saudi Arabia; transportation planning and evaluation; vehicle characteristics; human factors; geometric design of highways and intersections; basis of pavement design; introduction to capacity analysis of highways and intersections; introduction to airport planning and design; application of transportation related softwares.

**Prerequisite:** PHYS 101, Junior Standing

**CE 343                      Transportation Engineering Laboratory                      (0-3-1)**

Field studies of speed; traffic volume, and delay; capacity analysis; geometric design of highways, intersections, and parking facilities; traffic signal design; pavement material testing and design; flexible pavement design; application of transportation related softwares.

**Corequisite:** CE 341

**Prerequisite:** CE 303

**CE 350                      Begin Cooperative Work                      (0-0-0)**

See contents in CE 351.

**Prerequisite:** Same as in CE 351

**CE 351                      Cooperative Work                      (0-0-9)**

A continuous period of 28 weeks is spent in the industry to acquire practical experience in Civil Engineering under the supervision and guidance of the employer and the academic advisor. During this period the student gains an in-depth exposure and appreciation of the Civil Engineering profession. The student is required to write a detailed report about his training period under the regulation of the CE department.

**Prerequisite:** ENGL 214, CE 312, Junior Standing, Approval of the Department

**CE 352                      End Cooperative Work                      (0-0-0)**

See contents in CE 351.

**Prerequisite:** Same as in CE 351

**CE 353                      Geotechnical Engineering I                      (3-3-4)**

Soil formation and identification; index and classification properties of soils; clay minerals; soil compaction; capillarity, swelling, shrinkage and effective stresses; flow of water in soils;

compressibility and consolidation; stress in soils; shear strength of cohesive and cohesionless soils; introduction to lateral earth pressure and shallow foundation.

**Corequisite:** CE 230

**Prerequisite:** CE 203

**CE 399                      Summer Training                      (0-0-0)**

A continuous period of eight weeks of summer working in the industry to gain exposure and appreciation of the civil engineering profession. On-the-job training can be acquired in one of the four specialties of civil engineering. The student is required to write a brief report about his industrial experience. The report should emphasize duties assigned and completed by the student.

**Prerequisite:** ENGL 214, Junior Standing, Approval of the Department

**CE 401                      Concrete Technology                      (2-3-3)**

In-depth study of cement composition, hydration of cement; structure and properties of hardened cement paste; volumetric changes in concrete; properties of concrete related to durability such as water absorption, water permeability, chloride permeability, and chloride diffusion; use of mineral admixtures; advanced concretes and reinforcing bars; requirements and specifications for producing durable concretes suiting the local conditions.

**Prerequisite:** CE 303

**CE 402                      Durability, Evaluation and Repair of Concrete Structures                      (3-0-3)**

Durability problems of concrete structures such as reinforcement corrosion, sulfate attack, cement-aggregate reactions, salt weathering, efflorescence, acid attack, and environmental cracking; factors causing severe deterioration problems in the Arabian Gulf; condition survey, diagnosis and evaluation of deterioration damage in concrete structures; repair materials and methods; preventive measures such as protective coatings, cathodic protection, de-chlorination, and re-alkalinization.

**Prerequisite:** CE 303

**CE 405                      Structural Analysis II                      (3-0-3)**

Review of matrix algebra and solution of simultaneous equations; flexibility (force) method analysis; stiffness (displacement) method of analysis; 2-D trusses, beams and frames; development of computer programs using the stiffness method; use of available computer packages for applications in structural analysis; introduction to the Finite Element Method; introduction to Structural Stability.

**Prerequisite:** CE 305

**CE 406                      Structural Mechanics II                      (3-0-3)**

Bending of beams of non-symmetrical sections; shear center; energy concepts including Rayleigh-Ritz method; use of classical and energy methods in the analysis of curved beams; torsion of prismatic members; beams on elastic foundations; use of finite element methods in solid mechanics, including introduction to use of ANSYS software; stability of beam-columns; failure theories and fracture mechanics.

**Prerequisite:** CE 203

**CE 408                      Steel Design I                      (2-3-3)**

Properties of structural steel; steel sections, introduction to load resistance factor design (LFRD), design of tension members, compression members and capacity calculations; width-thickness ratios; design of beams with and without lateral supports; design of members under

**Prerequisite:** CE 305

**Prerequisite:** ENGL 214, CE 312

**Prerequisite:** CE 318, CE 410

**Corequisite:** CE 351

**Prerequisite:** CE 315

**Prerequisite:** CE 408

**CE 421      Construction Methods and Management      (3-0-3)**

**Prerequisite:** Junior Standing

Review of fundamentals of hydrology and advanced treatment for estimation of elements of the hydrologic cycle; hydrologic flood routing; probability concepts in hydrology, flood frequency analysis; hydrologic principles in engineering design; computer applications in hydrology and introduction to minor structure design.

Introduction and definitions, groundwater storage and supply, Darcy's Law and its limitation, Dupuit approximation, steady and unsteady flows in confined and unconfined aquifers, radial flow towards wells, storage coefficient and safe yield in a water-table aquifer, design of wells, flow nets, introduction to sources of groundwater contamination.

Analysis and characteristics of flow in open channels; channel design considerations including uniform flow, flow measuring devices, gradually varied flow, flood routing, rapidly varied flow; hydraulic factors for the design of reservoirs, dams, spillways and stilling basins.

Fundamental principles and design of water supply, sanitary and storm sewer systems and their components, including pipes, pumps, storage facilities, open-channels, culverts; computer applications in the design and analysis of hydraulic systems.

Techniques commonly associated with systems engineering; new techniques applicable to design and operations of civil engineering systems; linear optimization, linear programming, transportation and assignment problems, network analysis; simulation techniques; decision analysis; nonlinear optimization; critical path method.

Construction materials; asphalt cement; emulsified asphalt; foamed asphalt; Portland cement asphalts; cement; aggregates and asphalt additives; specifications; material selection and evaluation; tests of asphalts and aggregates, mix design procedures for hot and cold asphalt mixes, including Marshall and SuperPave; mix design for Portland cement concrete mixes for rigid pavements; characterization techniques; modulus of resilience; fatigue and rutting performance prediction; field quality control procedures; Computer applications in materials evaluation and design.

**Prerequisite:** CE 303

Pavement types and design factors; stresses and strains in flexible and rigid pavements; traffic analysis and design considerations; material characterization; performance evaluation; reliability aspects in design and construction; structural thickness design of highway and airport pavements using different methodologies; pavement evaluation; Computer application in pavement design.

Selection and processing of construction materials; asphalt concrete mix design; asphalt plants operation; material placement and compaction methods; quality control; earthwork, highway drainage and roadside requirements; construction standards; pavement performance and evaluation; pavement distress identification; surface treatments; techniques; application and design; overlay design; pavement recycling techniques; computer applications.

Vehicle, roadway and driver characteristics; traffic engineering and safety studies; highway capacity analysis; traffic control methods and devices; intersection signalization and signal timing; fundamentals of intersection design; parking facilities; introduction to attenuation devices; Intelligent transportation system; computer applications.

Fundamental relations of elasticity and plasticity in soil masses; unsaturated soils behavior; deformation properties of cohesionless and cohesive soils; advanced strength concepts in soils and stress path; slope stability analysis; introduction to soil dynamics.

General survey of soil types and their behavior and the available techniques for improvement; shallow and deep mechanical modifications; modifications by admixtures and grouting; modifications by inclusions; the use of geosynthetic material in filtration, seepage control, separation, reinforcement and water retention; hydraulic modifications; and treatment of marginal soils.

Site investigation, including determination of soil properties for design; bearing capacity theory of shallow foundation; settlement of building foundations; design and analysis of retaining walls, sheet piles and braced excavations; design of pile and pier foundations.

Route survey; horizontal curves; vertical curves; spirals; construction surveys; applications of Total Stations; topographic surveying and mapping; introduction to Global Positioning System.

**CE 471      Water and Wastewater: Treatment and Reuse      (2-3-3)**

Water treatment including pre-design issues, desalination, lime softening, sedimentation, filtration, membrane systems, ion exchange, adsorption, and disinfection technologies; Wastewater treatment including fundamentals of reactor design, activated sludge system, membrane bioreactor, trickling filter, and secondary clarifier; Natural wastewater treatment technologies for smaller and remote communities; Wastewater reuse including water scarcity issues, legal issues, health issues, technical issues & methodologies, areas of application, and case studies.

**Prerequisite:** CE 330

**CE 473 Design and Operation of Water and Wastewater Treatment Plants (3-0-3)**

Theory and practice in sanitary engineering including the concepts of processing, design, economic evaluation and computer analysis; class projects incorporating practical considerations in the design and operation of treatment units and the combining of unit processing in water and wastewater treatment plants; field trips will be organized to visit various types of treatment plants in operation.

**Prerequisite:** CE 330

**CE 474 Municipal Solid Waste Management (3-0-3)**

Problems, regulations, collection, handling, recycling and disposal issues related to municipal solid wastes; Characterization of municipal solid wastes including physical, chemical, and biological characteristics; Integrated municipal solid waste management practices including resource recovery, composting, incineration, and landfill design.

**Prerequisite:** CE 330

**CE 476 Industrial Hazardous Waste Management & Treatment (3-0-3)**

Theory and design of several industrial hazardous waste management and treatment aspects including regulations, environmental audits, pollution prevention, risk assessment, chemical & biological process fundamentals, and industrial hazardous waste separation, handling, treatment, & disposal techniques.

**Prerequisite:** CE 330

**CE 490 Civil Engineering Seminar (1-0-1)**

Weekly presentation of lectures by the instructor and the invited speakers on topical issues in civil engineering, including contemporary issues, professional responsibilities, ethical issues and advances and challenges in civil engineering profession; each student will be required to make a presentation on a selected topic and participate in classroom discussion.

**Prerequisite:** CE 312, Senior Standing



# CHEMICAL ENGINEERING

## **CHE 201 Principles of Chem. Engg. I (3-2-3)**

The basic principles and techniques used for calculations of material balances in chemical engineering processes are introduced. Material balance for reactive and nonreactive processes is discussed. Simple chemical engineering processes and complex systems including recycle are covered. Study of behavior of ideal and real gases. Computer simulation will be used for material balance problems.

**Prerequisite:** CHEM 102, PHYS 102

## **CHE 202 Principles of Chem. Engg. II (2-2-2)**

The first law of thermodynamics is studied in detail. Material covered includes concepts of energy, enthalpy, heat effects, conservation of energy, mechanical work, chemical energy liberation and equations of state, behavior of gases and liquids and standard heats of reaction, formation and combustion and heat effects of industrial reactions. Thermodynamics properties of materials and methods of their estimation are presented. Study of combined mass and energy balances and applications to problems through use of enthalpy concentration charts and humidity charts. Computer simulation will be used for combined material and energy balance problems.

**Prerequisite:** CHE 201, MATH 201, ICS 103 or ICS 102 or ICS 101

## **CHE 204 Transport Phenomena I (3-0-3)**

The course introduces principles governing fluid flow for Newtonian and non-Newtonian fluids in laminar and turbulent flows. Mass, energy, momentum balances, dimensional analysis and simulation are used as tools to analyze flows: in pipes, in packed beds, around particles and surfaces, fluidized beds and flow meters. The course also covers: hydrostatics, exact solution of Navier-Stokes equations, constitutive equations for stresses, viscous effects and boundary layer flows. Computer simulation will be used for piping and pumping problems.

**Corequisite:** MATH 202

**Prerequisite:** CHE 201 or PETE 201, ICS 103 or ICS 102 or ICS 101

## **CHE 300 Transport Phenomena II (3-0-3)**

Modes of heat transfer. Differential equations of energy transport. Steady and transient heat conduction. Free and forced convection in laminar and turbulent flows. Momentum and heat transfer analogies. Boiling and condensation. Radiation heat transfer. Application to the design of process heat transfer equipment.

**Prerequisite:** CHE 202, CHE 204

## **CHE 303 Chemical Engineering Thermodynamics (3-0-3)**

This course presents the theory and applications of chemical engineering thermodynamics. Topics covered include: review 1st and 2nd laws of thermodynamics, equations of state, thermodynamics of flow processes, steam power plants, thermodynamic relations, thermodynamics properties of pure fluids, vapor-liquid equilibria, phase diagrams, solution thermodynamics, thermodynamics properties of fluid mixtures, and chemical-reaction equilibria. Computer simulation to thermodynamic systems is applied in this course.

**Prerequisite:** CHE 202

## **CHE 304 Transport Phenomena III (3-0-3)**

**Prerequisite:** CHE 204

**Prerequisite:** CHE 303, CHE 304

**Prerequisite:** CHE 300, ENGL 214

**Prerequisite:** Same as in CHE 351

**Prerequisite:** ENGL 214, CHE 309

**Prerequisite:** Same as in CHE 351

**Prerequisite:** ENGL 214, CHE 304

The intent of this course is to present the fundamental principles in modeling and control of chemical processes. The topics covered in this course include: modeling of chemical processes, Laplace transfer and state-space models, approximation of complicated models, dynamics and simulation of different systems, feedback controllers, PID tuning, design and

**Prerequisite:** CHE 304, CISE 301

Introduction to kinetics of reactions. Techniques for experimentally determining rate laws for simple and complex chemical reactions. Design and operation of isothermal batch and flow reactors. Nonisothermal reactor design and operation. Introduction to catalysis and catalytic reactors. Computer simulation of reaction systems will be implemented.

A laboratory to complement the theoretical derivations in stagewise operations, process dynamics and control, and kinetics and reactor design. A safety session is given at the commencement of the course. Safe practices are strictly adhered to throughout the course. Two environmental engineering reaction experiments are included. Students carry out selected experiments, analyze data collected referring to applicable theories and present their findings in formal reports.

Study on several methods for the estimation of physical, thermodynamic and transport properties of fluids commonly used in industry. Study of literature sources where property information is available. Application of these properties to process design is emphasized to give the students a complete picture of the use and importance of good property estimation.

Introducing the Process flow diagrams and plant layout, conceptual design and synthesis of process flow diagrams, understanding the process conditions, technical analysis of chemical processes and use of heuristics in design and analysis, and use of simulation in equipment design and process synthesis. Engineering economic analysis of chemical processes with particular emphasis on estimation of capital cost, estimation of cost of manufacturing, time value of money, depreciation, cash flow, profitability and financial analysis, methods for decision making among alternatives.

The intent of this course is to present advances separation techniques practiced in chemical and petrochemical industry. Dynamics of the distillation column involving the column internals and column diameter calculations will be covered. Emphasis will be on the unit operations of multi-component gas absorption, humidification, evaporation, adsorption and ion exchange, reverse osmosis, permeation, dialysis, electrodialysis, and pervaporation.

Membrane fundamentals and practical applications of membrane processes; membrane classifications, materials, properties and characterization, and preparation; transport through

membranes, concentration polarization and membrane fouling, membrane permeability with special emphasis on membrane modules and process design; gas separation, pervaporation, ultrafiltration, reverse osmosis, and membrane reactors.

**Prerequisite:** CHE 306

**CHE 432 Principles of Heat Exchanger Design (3-0-3)**

Description and applications of different heat exchangers in process industries. Design of double pipe heat exchanger (including extended surfaces). Detailed design procedures for shell and tube heat exchanger for single phase flow. Detailed design procedures for air coolers. Selection criteria for heat exchangers. Descriptive discussion of condensers, evaporators and reboilers, novel heat exchangers and other types of heat exchangers.

**Prerequisite:** CHE 300

**CHE 440 Catalysis & Catalytic Processes (3-0-3)**

Basic definitions and classification of catalysts, nature and mechanism of catalytic reactions, adsorption processes, catalyst preparation and catalyst characterization. Mass and heat transport effects in catalysis. Catalyst deactivation. Design principles of heterogeneous catalytic reactors such as fixed- and fluidized-bed reactors. Industrial catalytic processes with emphasis on existing processes in Saudi Arabia.

**Corequisite:** CHE 402

**CHE 449 Biochemical Engineering (3-0-3)**

Descriptive treatment of key concepts on biochemistry. The kinetics of enzyme-catalyzed reactions and its applications. Kinetics of substrate utilization, transport phenomena in microbial systems. Design and analysis of biological reactors. Analysis of multiple interacting microbial populations in applications.

**Corequisite:** CHE 402

**Prerequisite:** CHE 304

**CHE 453 Mathematical Methods in Chemical Engineering (3-0-3)**

This course introduces the selection, construction, solution, and interpretation of mathematical models applicable to the study of chemical engineering problems. Topics covered include: introduction to mathematical modeling, analytical solution of ordinary differential equations, special functions, analytical solution of partial differential equations, numerical solution of nonlinear algebraic systems, and numerical solution of systems of first order ODE's.

**Prerequisite:** MATH 202, CHE 304

**CHE 455 Chemical Process Simulation (3-0-3)**

The intent of this course is to emphasize the application of computer simulation and flowsheeting, optimization, and process synthesis techniques to the design and operation of chemical processes and equipment. Students will learn how to simulate various process units and processes, and what is in the black box of a simulator program. The topics covered in this course include: concepts of structure and information flow and tasks in the design and analysis of chemical processes, basic solution strategies in flowsheeting computations, computation sequence in solving set of equations, concept of flowsheet partitioning and tearing, steady-state unit operation models in simulator packages such as Aspen Plus, HYSYS and UniSim Design, selection of thermodynamics and physical property models, and heuristics for process synthesis. Each student will be assigned an individual process to simulate under steady-state conditions using available process simulators.

**Prerequisite:** CHE 306

**CHE 456                                      Industrial Process Control                                      (3-0-3)**

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

**Prerequisite:** CHE 401

**CHE 461                                      Petroleum Refining                                      (3-0-3)**

General review of refining processes of crude oil. Shortcut methods for practical design calculations. Design of atmospheric, vacuum, and pressure columns for petroleum fractionation, including auxiliary furnaces and condensers. Recent developments in heavy oil processing.

**Prerequisite:** CHE 306

**CHE 462                                      Petrochemical Industries                                      (3-0-3)**

Process technologies used in petrochemical industries, such as thermal and catalytic cracking will be introduced. Basic, intermediate and final petrochemicals are studied. These include synthesis gas and derivatives, ethylene, propylene, butene, BTX, and their derivatives. Competing technologies will be assessed from the chemical engineering point of view.

**Prerequisite:** CHE 306

**CHE 463                                      Polymer Technology                                      (3-0-3)**

Structure and physical properties of polymers. Homogeneous and heterogeneous polymerization processes. The chemical, mechanical, and engineering properties of polymers as well as polymer processing and rheology are emphasized in this course.

**Prerequisite:** CHEM 311

**CHE 464                      Refining and Petrochemicals Technology and Economics                      (3-0-3)**

The characteristics of the industry in terms of feed stocks and products interaction, processes and technologies, and Economics are introduced. Petroleum fractionation and general review of refining processes of crude oil are introduced. Important petrochemical products are introduced with emphasis on those produced in Saudi Arabia. The basic unit processes such as hydrotreating, cracking, reforming, dehydrogenation, oxidation etc., are introduced along with their applications in the industry. The economics and cost of production is discussed whenever relevant. The course will emphasize the basic concepts and principles of the industry and will avoid unnecessary and descriptive process details. Integration of the Petrochemical and Petroleum Refining industries will be highlighted whenever applicable.

**Prerequisite:** CHE 306

**CHE 465                      Process Integration and Optimization                      (3-0-3)**

This course presents recent advances in chemical process integration and synthesis. The course presents systematic and state-of-the-art techniques for understanding the global insights of mass and energy flows within a process and how these integrated insights can be used to optimize process performance. A variety of mathematical and visualization tools are presented. In particular, emphasis is given to fundamental integration and synthesis methodologies along with their applications to the process industries.

**Prerequisite:** CHE 306

**CHE 470                      Process Air Pollution Control                      (3-0-3)**

Sources and effects of air pollution; air quality, atmospheric reactions and scavenging processes. Meteorological setting for dispersion of air pollutants. Theory of atmospheric dispersion modeling. Air pollution control concepts, selection, evaluation and application of control devices for emission and control from chemical and petrochemical industries.

**Prerequisite:** CHE 304

**CHE 471                      Process Water Pollution Control                      (3-0-3)**

Water quality and pollution, industrial wastewater characterization, classification of wastewater processes. Modeling and design of biological waste treatment processes. Analyses of chemical and physical processes for wastewater treatment in process industries.

**Prerequisite:** CHE 304

**CHE 472                      Corrosion                      (3-0-3)**

Study of corrosion mechanisms and techniques used in prevention and control. Electrochemistry and its application to corrosion. Material selection for different environments.

**Prerequisite:** CHEM 311

**CHE 473                      Desalination                      (3-0-3)**

Description of methods of water analysis and treatment. Study of properties of water and aqueous solutions. Detailed discussion and analysis of design, maintenance, energy requirements and economics of the major processes of desalination such as distillation, reverse osmosis, and electrodialysis.

**Prerequisite:** CHE 304, CHE 303

**CHE 480                      Energy Technology                      (3-0-3)**

Statistics on global energy use, supply and demand of energy, energy generation from fossil and non-fossil fuels. Energy transportation and storage, energy from low-calorific value fuels, energy conservation and economics, and energy management.

**Prerequisite:** CHE 304, CHE 303

**CHE 491                      Materials Evaluation and Selection                      (3-0-3)**

This course is designed to acquaint students with the theoretical reasoning and experimental methods used in evaluating both crystalline and non-crystalline materials covering metallic, polymeric and ceramic materials. The principles involved in their selection based on mechanical properties, resistance to degradation, and wear, and special properties are illustrated in the practical examples from process industries.

**Prerequisite:** ME 205

**CHE 495                      Integrated Design Course                      (1-6-3)**

Development of general engineering skills and judgment needed in the solution of open-ended problems from a technical-economic viewpoint are the major goals of this course. The design of a project from conception to implementation including preliminary feasibility study, preparation of process, flow diagram, process design, pre-construction cost estimate, equipment sizing (design), selection of materials of construction, and analysis of project.

Applications will be in areas such as petroleum, petrochemicals, emerging chemical industries and water desalination. Design topics will be assigned to teams of students.

**Corequisite:** CHE 402, CHE 425

**CHE 498                      Special Topics in Chemical Engineering I                      (3-0-3)**

Selected topics from the broad area of chemical engineering. The specific contents of the course is published one semester in advance.

**Prerequisite:** Departmental Approval

**CHE 499      Special Topics in Chemical Engineering II      (3-0-3)**

Selected topics from the broad area of chemical engineering. The specific contents of the course is published one semester in advance.

**Prerequisite:** Departmental Approval

# CHEMISTRY

## **CHEM 101                                      General Chemistry I                                      (3-4-4)**

Matter, atomic structure and the periodic table, chemical bonding, stoichiometry of pure substances, reaction in aqueous solutions, states of matter (gases, liquids, and solids), mixtures (with emphasis on some physical aspects of solutions), thermochemistry.

**Laboratory:** Qualitative and quantitative aspects of general chemistry.

## **CHEM 102                                      General Chemistry II                                      (3-4-4)**

Chemical equilibria (gases, acids and bases, and solubility equilibria), chemical kinetics, spontaneity of reactions, coordination chemistry, nuclear chemistry, electrochemistry, chemistry of selected representative elements, organic structure and reactions, chemistry of materials.

**Laboratory:** Qualitative and quantitative aspects of general chemistry

**Prerequisite:** CHEM 101

## **CHEM 111                                      Basics of Environmental Chemistry                                      (2-0-2)**

Elements, compounds, chemical equations, and gas laws, spontaneity of reactions, chemical kinetics, chemical equilibria (gases, acids and bases, redox and complexation reactions), organic structures and reactions, carbohydrates, proteins and fats, pesticides and organic pollutants, colloids.

**Prerequisite:** CHEM 101 (Not open for Chemistry and Industrial Chemistry Majors)

## **CHEM 201                                      Organic Chemistry I                                      (3-4-4)**

Structure, stereochemistry and the properties of organic compounds, synthesis and reactions of alkanes, alkenes, alkynes, dienes, alicyclic, alcohols, ethers, mechanism of radical substitution, radical, electrophilic addition and electrophilic aromatic substitution.

**Laboratory:** Laboratory techniques of organic chemicals and laboratory synthesis of organic chemicals.

**Prerequisite:** CHEM 102

## **CHEM 202                                      Organic Chemistry II                                      (3-4-4)**

Identification of organic compounds by spectroscopic methods. Synthesis and properties of carboxylic acids and derivatives, aldehydes, ketones, amines, polycyclic and heterocyclic aromatics, carbohydrates, amino acids and nucleic acids.

**Laboratory:** Basic spectroscopic techniques, laboratory synthesis of organic chemicals and multistep synthesis.

**Prerequisite:** CHEM 201

## **CHEM 212                                      Physical Chemistry I                                      (3-4-4)**

Basic gas laws, laws of thermodynamics, chemical equilibria, phases, solutions, and phase equilibria.

**Laboratory:** Techniques of physical measurements, error analysis and statistics with experiments on gas laws, calorimetry, equilibria and phase diagrams.

**Prerequisite:** CHEM 102, MATH 102, PHYS 102

## **CHEM 223                                      Quantitative Methods of Chemical Analysis                                      (1-4-2)**

Sampling and sample preparation. Gravimetric methods of analysis (formation, washing, filtration and drying). Acid-base equilibria (theories of acids and bases). Monoprotic and diprotic acids. Buffers. Precipitation titrations. Complex formation titration (EDTA titrations). Oxidation-reduction equilibria, (redox reactions and electrochemical cells).



**Laboratory:** Experiments on basic analytical methods, including gravimetric, and titrimetric techniques.

**Prerequisite:** CHEM 102

**CHEM 303          Spectroscopic and Qualitative Organic Chemistry          (2-4-3)**

A course in which spectroscopy and classical methods are combined to identify unknown organic compounds. Separation of mixtures of unknowns is carried out using chromatographic methods and other classical chemical methods. Spectroscopic and NMR methods for the identification of compounds are emphasized.

**Laboratory:** Spectroscopic and wet chemical techniques are used to determine structures of unknown organic compounds.

**Prerequisite:** CHEM 202

**CHEM 311          Physical Chemistry II          (3-4-4)**

The application of thermodynamics to electrochemical cells, chemical kinetics; the kinetics of reactions in the gaseous and liquid states, transport properties, surface chemistry and colloids and surface dynamics.

**Laboratory:** Experiments involving conductivity, electrochemistry, chemical kinetics, and transport properties of gases and liquids.

**(Prerequisite:** CHEM 212 or ME 203) or **(Corequisite:** CHE 303)

**CHEM 312          Physical Chemistry III          (3-0-3)**

Fundamentals of Quantum theory with Applications to Chemical Bonding, Molecular Structure and Spectroscopy, Basics of Fundamental Mechanics.

**Prerequisite:** CHEM 311

**CHEM 314          Computer Applications in Chemistry          (3-0-3)**

Application of available PC-software to solve chemical and numerical problems in the various areas of chemistry and to treat laboratory data. Molecular modeling and its application to interpret spectroscopic results. Emphasis will be placed on literature review and implementation of ready-to-use PC-programs in chemistry.

**Prerequisite:** ICS 101 or ICS 102 or ICS 103, CHEM 212

**CHEM 323          Instrumental Chemical Analysis          (2-4-3)**

Instrumental analysis techniques such as molecular and atomic spectrophotometry: absorption and emission spectroscopy, electroanalytical techniques of analysis with emphasis on potentiometry and voltammetry, chromatography, and thermal analysis.

**Laboratory:** Experiments related to qualitative and quantitative analysis using various instrumental techniques.

**Prerequisite:** CHEM 102

**CHEM 324          Advanced Instrumental Chemical Analysis          (2-4-3)**

Advanced instrumentation and application of modern instrumental techniques to include: spectroscopy, mass spectrometry, electrochemical methods, chromatography and flow injection analysis.

**Laboratory:** Experiments related to qualitative and quantitative analysis using advanced instrumental techniques.

**Prerequisite:** CHEM 323

**CHEM 331          Inorganic Chemistry          (3-4-4)**

Introduction to modern inorganic chemistry, facets of atomic structure and properties of elements, periodic table and periodic properties, molecular bonding, solid state chemistry, acids and bases, oxidation and reduction, molecular shape and symmetry, coordination chemistry.

**Laboratory:** Experiments in inorganic chemistry

**Prerequisite:** CHEM 102

**CHEM 332            Advanced Inorganic Chemistry            (3-0-3)**

Transition metal chemistry, structural and bonding interpretation of magnetic and spectral properties of transition metal compounds (ligand field theory), stabilities of transition metal complexes, reaction mechanisms of complexes, polynuclear complexes, coordination compounds as industrial homogeneous catalysts, naturally occurring transition metal complexes, importance of complexes in environment, importance of complexes in biological systems, chemistry of organometallic compounds.

**Prerequisite:** CHEM 331

**CHEM 355            Industrial Catalysis            (3-0-3)**

A study of transition metal chemistry and organometallic reaction mechanism. A study of important catalytic processes including alkylation, carbonylation, Oxidation-Oxygenation, Hydrogenation, Methathesis and others. Study of the mechanisms, the catalytic cycles and the active intermediates involved in these processes. Discussion of the most important industrial catalytic processes now operating in Saudi Arabia and worldwide.

**Prerequisite:** CHEM 202

**CHEM 399            Summer Training            (0-0-2)**

A period of two months of industrial employment in appropriate industries or firms. Students are evaluated on their performance, and are required to submit a report and present a seminar about their experience before receiving a grade for this course.

**Prerequisite:** ENGL 214, Junior Standing, Approval of the Department.

**CHEM 401            Special Topics            (3-0-3)**

A discussion of the recent advances in selected fields of chemistry

**Prerequisite:** Permission of the Instructor

**CHEM 402            Structure and Mechanisms in Organic Chemistry            (3-0-3)**

Chemical bonding and structure, stereochemical principles, conformational and steric effects, methods of mechanistic study, nucleophilic substitution, polar addition and elimination, carbanions, carbonyl compounds, aromatic substitution, concerted reactions, other interesting reaction types.

**Prerequisite:** CHEM 202

**CHEM 403            Synthetic Organic Chemistry            (3-0-3)**

Organic reaction types, less common functional groups, reaction mechanisms, basic synthetic methods, retrosynthesis and selected total synthesis of natural products.

**Prerequisite:** CHEM 202

**CHEM 406            Spectroscopic Identification of Organic Compounds            (3-0-3)**

Identification and structural analysis of organic compounds by nuclear magnetic resonance, infrared and ultraviolet spectroscopy, and mass spectrometry. Introduction to instrumentation, sample handling and basic theory of each technique with emphasis on their practical applications for structure determination.

**Prerequisite:** CHEM 202

**CHEM 415      Molecular Spectroscopy      (3-0-3)**

General review of wave mechanics in relation to molecular systems, vibrational and rotational energies of molecules, absorption and emission of radiation, molecular symmetry and group theory, electronic spectra of diatomic and polyatomic molecules.

**Prerequisite:** CHEM 312

**CHEM 416      Photochemistry      (3-0-3)**

A study of the fundamental photochemical and photophysical processes which follow absorption of radiation by molecules and the techniques used to study these processes.

**Prerequisite:** CHEM 312

**CHEM 417      Introduction to Statistical Thermodynamics      (3-0-3)**

Principles of Statistical Thermodynamics, Probability, Ensembles, Partition Functions, Independent Molecules and the Ideal Gas. Einstein and Debye Models of Solids, Statistical Theory of Black Body Radiation. Debye-Hückel Theory of Electrolyte Solutions.

**Prerequisite:** CHEM 312

**CHEM 418      Quantum Chemistry      (3-0-3)**

Classical mechanics versus quantum mechanics, postulates of quantum mechanics, Schrodinger equation, particle in a box, atomic wave functions, Russell-Saunders coupling and perturbation theory, molecular wave functions.

**Prerequisite:** CHEM 312

**CHEM 424      Environmental Analysis      (3-0-3)**

Pollution, pollutant dispersion, preconcentration and final degradation, transport of pollutants in the environment. The role of analytical chemistry. How to set up an analytical monitoring scheme. Techniques for water quality measurements. Trace Pollutants. Analysis of Solids. Atmospheric Analysis. Gases and Particulates. Ultra-trace analysis.

**Prerequisite:** CHEM 324

**CHEM 425**      **Trace Analysis**      **(3-0-3)**

Sampling, the working environment, laboratory materials, storage, reagents, ordinary techniques e.g. spectrophotometry, electroanalytical, methods and separation techniques, atomic absorption and atomic emission, fluorescence and phosphorescence, inductively coupled plasma, coupled techniques such as ICP-MS, HPLC-MS and HPLC-ICP-MS.

**Prerequisite:** CHEM 324

**CHEM 431**      **Chemistry of the Environment**      **(3-0-3)**

Chemical processes important in the environment from naturally occurring to man-induced systems, thermodynamics and chemical consideration of fuels, the thermodynamics of the atmosphere, atmospheric photochemistry, chemistry of natural water systems, chemistry of pesticides, fertilizers and other important environmental contaminants, aspects of the carbon, nitrogen and sulfur cycles.

**Prerequisite:** CHEM 331 or Permission of Instructor

**CHEM 436      Chemical Applications of Group Theory      (3-0-3)**

Introduction, symmetry elements and symmetry operations, introduction to groups, symmetry point groups, class structure, representations and character tables, chemical applications of symmetry, bonding and spectral interpretation from group theory.

**Prerequisite:** CHEM 331 or Permission of Instructor

**CHEM 450      Polymer Chemistry      (3-4-4)**

Basic concepts of polymer chemistry, condensation, polymerization, addition polymerization, copolymerization, polymer structure and properties, molecular weight measurements of polymers, analysis and testing of polymers, industrially important polymers and copolymers and plastic technology.

**Laboratory:** The laboratory classes are organized to provide practical experience in the field of polymer chemistry, polymer synthesis, mechanism and kinetics of polymerization, properties and characterization of polymers.

**Prerequisite:** CHEM 202

**CHEM 453      Chemistry of Petroleum Processing      (2-4-3)**

A study of the science of petroleum beginning with its formation in the ground, the physical and chemical properties of petroleum and petroleum products, the chemistry of major refining processes, and eventually leading to analysis of the production of a wide variety of petrochemical intermediates as well as the more conventional fuel products.

**Laboratory:** The laboratory experiments provide practical experience in the field of petroleum chemistry, catalyst preparation, catalytic reaction, and hydrocarbon analysis.

**Prerequisite:** CHEM 202

**CHEM 455      Industrial Inorganic Chemistry      (3-0-3)**

A study of inorganic chemicals and products with emphasis on industrial processes. The focus is on sulfur and sulfuric acid, ammonia and its derivatives, cement, glasses, ceramics, electrolytic processes, chlor-alkali industries, phosphorous industries, fertilizer chemicals and metallurgical processes.

**Prerequisite:** CHEM 331

**CHEM 456      Industrial Organic Chemistry      (3-0-3)**

A study of the organic chemicals and products derived mainly from sources other than petroleum. Special emphasis is on oils and fats, pharmaceuticals, agrochemical, fermentation products, surface coatings, explosives, detergents, and pollution and waste management.

**Prerequisite:** CHEM 202

**CHEM 457      Homogeneous Catalysis in Industrial Processes      (3-0-3)**

Introduction to homogeneous catalysis in chemical industries using inorganic compounds, comparison of homogeneous and heterogeneous catalysis, basic concepts of organometallic chemistry, metal chelates as catalysts, metallocenes as polymerization catalysts, synthesis of specialty compounds using coordination compounds as catalysts.

**Prerequisite:** Permission of Instructor

**CHEM 471      Chemistry Senior Project I      (0-8-2)**

Students are introduced to research under the direction of a member of faculty. Reasonably simple but challenging projects are chosen which give students the opportunity to use different techniques and principles of chemistry. After their research, students will submit a final project report.

**Prerequisite:** Senior Standing

**CHEM 472      Chemistry Senior Project II      (0-8-2)**

The requirements for this course are the same as CHEM 471.

**Prerequisite:** CHEM 471

**CHEM 479          Chemistry Seminar****(1-0-1)**

Students will participate with faculty members in giving and attending seminars of general chemical interest. Topics cover both reviews of current literature and discussion of research in progress. The course includes also a guide to the use of traditional and automated methods for storage and retrieval of chemical information.

**Prerequisite:** Permission of the Instructor

# **CONTROL AND INSTRUMENTATION SYSTEMS ENGINEERING**

## **CISE 201 Introduction to Control and Instrumentation (1-0-1)**

Definition and history of Automation. Social and economic dimension of Automation. Types and principles of automation systems, the hierarchy of control and instrumentation, career opportunities and scope of control and instrumentation profession. Skills, ethics, and design process. Case studies: Analysis of representative automation systems in the process industry, manufacturing, management, home and transportation.

**Prerequisite:** MATH 102

## **CISE 204 Digital Systems Design (2-3-3)**

Binary arithmetic. Boolean Algebra. Boolean functions and their simplification. Implementation of Boolean functions using logical gates, SSI, MSI, and LSI chips. Analysis and Design of Combinational circuits. Sequential Logic: Flip-Flops, Counters, and Registers. Analysis and Design of sequential circuits, Programmable Logic Devices, FPGA/PLD hardware. Analysis and Design using CAD software. Interfacing of digital electronics to control and instrumentation elements, such as relays, 24-volt signals, analog switches, and proximity switches.

**Note:** Not to be taken for credit with EE 200

**Prerequisite:** PHYS 102

## **CISE 209 Introduction to Information Technology (2-0-2)**

This course introduces the fundamentals of information technology and systems; their structure, and components. The course emphasizes the Enterprise applications of IT in improving the performance of business and industrial systems. In addition, the course introduces the current trends related to information technology, such as the Internet, E-commerce, and wireless communication. The course also gives an insight into security and ethical issues related to information exchange.

**Prerequisite:** Sophomore Standing

## **CISE 301 Numerical Methods (3-0-3)**

Roots of nonlinear equations. Solutions of systems of linear algebraic equations. Numerical differentiation and integration. Interpolation. Extrapolation and approximation. Least squares approximation and regression analysis. Numerical solution of ordinary and partial differential equations. Introduction to error analysis. Engineering case studies.

**Prerequisite:** Math 201, ICS 101 or ICS 102 or ICS 103

## **CISE 302 Linear Control Systems (3-3-4)**

Linear systems, Modeling of physical systems, Ordinary Differential equations models, Laplace Transform, transfer functions, block diagram manipulation. Open loop and closed loop systems, time domain analysis, response of systems to different test signals, Steady state analysis. Concept of stability, Routh-Hurwitz criteria, controller design. Laboratory activities include modeling, analysis and simulation of physical processes.

**Prerequisite:** MATH 260, EE 202, EE 212

## **CISE 312 Instrumentation Engineering (2-3-3)**

General measurement systems; SI units, errors in measurement systems, static and dynamic modeling of measurement systems, environmental effects, loading effects, noise in measurement

systems, calibration, design of experiment, reliability of instrumentation systems. Typical measurement systems, displacement, velocity, and acceleration measurement. Pressure/Force measurement (capacitive, elastic, strain gauges, piezoelectric, electronic, weight scales, load cells). Temperature (elastic, expansion, resistive, thermocouple, IR, electronic). Analog signal conditioning and DC/AC bridges.

**Prerequisite:** EE 203

**CISE 313 Automation Devices and Electronics (2-3-3)**

This is the first level of instrumentation and mechatronics. The course introduces the basic concepts of switching input and output devices, sensing devices, and how they are used in real life automation systems. The course is a prerequisite for the mechatronics course and for the advanced instrumentation course.

**Prerequisite:** EE 203

**CISE 315 Signals and Systems (3-0-3)**

Basic models of continuous and discrete-time signals and systems. Basic characteristics of signals (energy, power, peak amplitude). Fourier analysis of continuous and discrete-time signals and systems. Basic concepts of signal sampling and reconstruction. Basic properties of Laplace and Z-transforms and concept of transfer function. Applications of signals and systems concepts to linear control systems and digital signal processing.

**Note:** Not to be taken for credit with EE 207

**Prerequisite:** Junior Standing

**CISE 316 Control Systems Design (2-3-3)**

Transient and Steady State analysis and design specifications. Root locus, Design using Root locus. Frequency Response Techniques, Bode plot, Nyquist plot, principle of Specifications and controller Design in the Frequency domain. State-space model, analysis of the state-space model, Controllability and Observability, pole placement, and robust Control.

**Prerequisite:** CISE 302

**CISE 318 Computer Control Systems (2-3-3)**

Elements of Computer Control Systems, A/D and D/A, Sampling theorem, signal conditioning, anti-alias filters, sensors, actuators. Discrete time systems, digital control design, digital PID control. Programmable logic controllers, computer control technology including distributed computer control, fieldbus technology, and OLE for process control.

**Prerequisite:** CISE 302

**CISE 350 Begin Cooperative Work (0-0-0)**

See contents in CISE 351.

**Prerequisite:** Same as in CISE 351

**CISE 351 Cooperative Work (0-0-9)**

The Cooperative Work Program accounts for nine (9) credit hours, involves either a team-based or a single student-based project that is geared toward an integrated application of several pieces of Systems Engineering knowledge learned by the student in his undergraduate education thus far. The co-op project must address technical aspects of the practice of Systems Engineering, including analysis, experimentation and design, by utilizing the problem-solving techniques covered in the various required (core) and elective courses offered at the Systems Engineering department.

**Prerequisite:** Completion of 85 Credit Hours, Fulfillment of Departmental Requirements, ENGL 214

**CISE 352 End Cooperative Work**

**(0-0-0)**

See contents in CISE 351.

**Prerequisite:** Same as in CISE 351

**CISE 390 Seminars**

**(0-0-0)**

Improve students' ability in presenting technical work and introduce them to the knowledge of contemporary issues in their field of studies. The course features students' attendance to seminars, workshops, industrial visits, professional societal meetings, governmental agencies' conferences. Each student is required to present a written evidence for attending each of an adequate number of seminars and industrial visits at the end of the semester.

**Prerequisites:** Junior Standing

**CISE 399 Summer Training**

**(0-0-0)**

Students spend eight weeks in the industry, and submit a report and a presentation at the end of his summer training work.

**Prerequisite:** Junior Standing, ENGL 214

**CISE 412 Mechatronics**

**(2-3-3)**

Mechatronics is the synergistic integration of mechanism, electronics, and computer control to achieve a functional system. Fundamentals of interfacing of modern mixed electrical, mechanical, and computers systems. Sensors, Signal Conditioning, Electro-Mechanical Actuation, Basic System Modeling, Essentials of Dynamic Systems, Data Acquisition and Virtual Instrumentation, and PC-Based and Embedded Controllers. Physical properties, mathematical modeling for computer simulation. Applications illustrated by numerically and experimentally generated results.

**Prerequisite:** CISE 313

**CISE 414 Embedded Control Systems**

**(2-3-3)**

Basic features microcontrollers, organization & architectural Features of Microprocessor & microcontroller, Basic organization, high level and assembly language conversion to machine level instruction. Basic fetch & execute cycle of a program. Instruction Set, basic operations and addressing modes, Assembly language programming, fast prototyping using high level languages. Typical Bus structure, I/O Control & interfacing to digital systems, Interfacing to various power switching devices. Interfacing Protocols. Sensors, A/D & D/A Converters, Analog signal conditioning Circuits. Pulse Width Modulation. Applications to Industrial Automation.

**Prerequisite:** CISE 204

**CISE 418 Industrial Process Control**

**(3-0-3)**

Modeling of processes, Mass balance, and Energy balance, Models of representative processes, Dynamic response, and Linearization. Process identification using time and frequency domain techniques. Time delay, Smith predictor. Basic and advanced control strategies, e.g. PID, Feed forward, Internal model, and supervisory control. Time domain controller design, Controller tuning. Controller design in the frequency domain, Optimization Techniques and Supervisory Control. Case studies.

**Prerequisite:** CISE 302



Review of the Fundamental laws, mathematical modeling; model and simulation of typical processes. Computer simulation tools, Virtual Instruments, MMI. Systems identification, IMC, Predictive control, DMC, Neural Network modeling and control. Students will work out simulation and control projects, using DYNsIM process dynamic simulation and Simulink, of typical processes, e.g., CSTR, Gas Surge Drum, Isothermal Chemical Reactor, Vaporizer, Binary Column, Heat Exchanger, etc.

The course offers an introductory material to advanced control strategies such as fuzzy and neural network based controllers. The need for model-free control, Linguistic based control, foundations of fuzzy set theory. Main approaches of fuzzy control, design issues, fundamental of neural networks, neural networks architecture, neural networks based controller design. Application examples.

The course introduces the concept of model predictive control (MPC), their importance in process industry, implementation issues and application examples. The course covers: model based predictive control, generalized MPC, constrained MPC, some commercial MPC, issues in implementation in industrial control systems and case studies.

Dynamical systems and their mathematical models, random variables and signals, The system identification procedure. Guiding principles behind least-squares parameter estimation, statistical properties of estimates. Identification of the transfer function of linear systems in continuous time. Models for discrete-time linear systems: FIR, AR, ARX, ARMA. Various methods for recursive estimation. Experiments for data acquisition and their design.

Industrial instrumentation: measurement techniques in industrial processes. Computer data acquisition. NC and CNC machine tools. Computer process interfacing and control. Feedback control systems. Group technology. Flexible manufacturing systems. Automated assembly. Industrial robots. Computer-aided inspection and testing. Automated factories. Case studies.

Need for, advantages and basic structure of DSP systems. Basic concepts of discrete-time signals and systems. Z-Transform, discrete Fourier Transform (DFT) and frequency analysis of signals and systems. Efficient implementation of DFT: Fast Fourier Transform (FFT) algorithms. Implementation issues of discrete-time systems. Digital filter design techniques. Applications of DSP systems.

Condition-based maintenance process. Data collection and Analysis process. Decision making. Condition-based monitoring components sensors and software programs. CMMS. Hazard and

reliability functions. Models for CBM. Reliability improvement. Integration of CBM into the control design and operation. Engineering case studies.

**Prerequisite:** Junior Standing

**CISE 434 Computer Numerical Control (3-0-3)**

Review of DC motors, optical encoders, precision control of DC motors, Stepper motors, control of stepper motors, micro-step control, gearboxes, belts, motor torque and power sizing, programming motion using G-code. Basic structure and functions of milling machines and lathes. Motion simulation, CAD/CAM system. Robot arms construction, analysis, and motion programming. Case study of retrofitting conventional machines with Computer Numerical Control.

**Prerequisite:** CISE 318

**CISE 435 Distributed Computer Control Systems (3-0-3)**

Hierarchy of plant communication systems, field equipment, DCS systems, SCADA systems, Supervisory control and production control, Man-Machine Interface (MMI). Local area networks, OSI network architectures, serial communications, IEEE 802.xx standards, Local area networks for industrial applications, Field buses, Hart protocol, Foundation Field Bus, Profibus, CAN bus, etc. Smart instruments. Examples of industrial DCS systems.

**Prerequisite:** CISE 312

**CISE 438 Instrumentation for Process Control (2-3-3)**

Signal conditioning: 4-20 mA circuits, E/I transducers, bridges (AC and DC), design of bridges, operational amplifier circuits, filters (LP & HP), power supplies, reference voltages, analog multiplexer/ de-multiplexers. Data acquisition systems, SCADA Systems, interface cards, isolations, intrinsic safety, Nondestructive testing. Labview, virtual instrumentation, Visual programming, and HMI, Plant network hierarchy, DCS, Data communications, smart transmitters, Field buses, and OPC. Process and Instrumentation diagrams.

**Prerequisite:** CISE 312 or Approval of the Department

**CISE 439 Special Topics in Instrumentation (3-0-3)**

A course in an area of instrumentation reflecting current theory and practice.

**Prerequisite:** Approval of the Department

**CISE 441 Linear Optimal Control (3-0-3)**

Review of state variable models, Review of basic matrix algebra, Static optimization, Formulation of optimal control problems, Principle of optimality. The linear quadratic regulator problem, properties of the algebraic Riccati equation (ARE) The minimum principle and time optimal control problems. Output feedback design. Homework assignments include design and simulation using MATLAB or other similar software packages.

**Prerequisite:** CISE 316

**CISE 442 Stochastic Control (3-0-3)**

Probability, Random Variables and distributions, correlation, MA, AR, and ARMA systems, power spectrum, Spectral factorization, Wiener-Hopf filter. Stochastic control systems, Minimum variance control, State-variable forms, Kalman filter, LQG feedback systems. Cases studies from published work.

**Prerequisite:** CISE 316

**CISE 443 Introduction to Robust Control (3-0-3)**

This course introduces the concepts of uncertainty and Modeling Error in Control System Analysis and Design. Review the basic methods and tools of Classical Control. Robust stabilization, Loop shaping, Introduction to  $H_\infty$  Optimal Control Analysis and Synthesis. Design examples.

**Prerequisite:** CISE 316

**CISE 449 Special Topics in Control**

**(3-0-3)**

A course in an area of control reflecting current theory and practice.

**Prerequisite:** Approval of the Department

**CISE 451 Introduction to Biomedical Engineering**

**(3-0-3)**

Basics of anatomy and biological science. Fundamentals of engineering applications in biomedicine. Biomedical instrumentation and information technology, control and communication in biomedicine. eHealth and telemedicine.

**Prerequisite:** Senior Standing

**CISE 452 Theory of Stochastic Systems**

**(3-0-3)**

Review of basic Probability, Statistical Independence, Conditional Expectation and Characteristic Function. Introduction to Stochastic Processes, Stationarity and Ergodicity. Markov Chains and Poisson Processes. Linear Models of Continuous and Discrete Stochastic Processes. Engineering Applications.

**Prerequisite:** Senior Standing

**CISE 453 Methodology for Large Scale Systems**

**(3-0-3)**

An overview of large-scale problems and the framework for Systems Engineering. Graphic tools for Systems Engineering. Interaction matrices and graphs, interpretive structure modeling. Spare matrix and decomposition techniques. Model reduction techniques. Case studies.

**Prerequisite:** Senior Standing

**CISE 454 Computer-Aided Manufacturing and Robotics**

**(2-3-3)**

High volume discrete parts production systems. Fundamentals of CAD/CAM. Computers in manufacturing. Computer process monitoring. Systems for manufacturing support. Group technology and integrated manufacturing systems. Case studies for robots in industry. CAD/CAM using computer graphics laboratory.

**Prerequisite:** Senior Standing

**CISE 455 Advanced Instrumentation**

**(3-0-3)**

Micro-machined sensors, Fiber optical sensors, Gas chromatography, Gas detectors, Environment monitoring systems, NMR, Soft-sensing techniques.

**Prerequisite:** CISE 312

**CISE 456 Safety and Reliability of Control Systems**

**(3-0-3)**

DCS systems, Intrinsic safety, Emergency shutdown ESD systems, reliability of instruments and control systems, MTBF, Redundant systems, Safety standards, Classification of industrial process, Safety integrity levels (SIL), Quantitative risk assessment (QRA), Safety and control networks, Fieldbus for safety systems, Cost benefit analysis, Best practices.

**Prerequisite:** Junior Standing

**CISE 457 Industrial Communication Systems**

**(3-0-3)**

The course introduces the students to the latest trends in industrial communications systems in a practical theme. The course starts by previewing the main topics in communications systems such as modulation and coding. The course then covers the main communication network standards used in industry. The course covers mainly all data layers from the field instruments to the TCP/IP and world-wide web and even latest wireless data exchange techniques. Case studies of industrial DCS and CIM and their integration with the enterprise networks.

**Prerequisite:** CISE 318 or Approval of the Department

**CISE 459 Special Topics in Automation**

**(3-0-3)**

A course in an area of automation reflecting current theory and practice.

**Prerequisite:** Approval of the Department

**CISE 490 Senior Design Project**

**(0-9-3)**

A design course that draws upon various components of the undergraduate curriculum. The project typically contains problem definition, analysis, evaluation and selection of alternatives. Real life applications are emphasized where appropriate constraints are considered. Oral presentation and a report are essential for course completion. The work should be supervised by faculty member(s). Team projects are acceptable wherever appropriate.

**Prerequisite:** CISE 390

# COMPUTER ENGINEERING

## **COE 202                      Digital Logic Design                      (3-0-3)**

Introduction to information representation and number systems. Boolean algebra and switching theory. Manipulation and minimization of completely and incompletely specified Boolean functions. Physical properties of gates: fan-in, fan-out, propagation delay, timing diagrams and tri-state drivers. Combinational circuits design using multiplexers, decoders, comparators and adders. Sequential circuit analysis and design, basic flip-flops, clocking and timing diagrams. Registers, counters, RAMs, ROMs, PLAs, PLDs, and FPGA's.

**Note:** Not to be taken for credit with EE 200. COE 202 and COE 203 together are equivalent to EE 200

**Prerequisite:** PHYS 102

## **COE 203                      Digital Logic Design Lab                      (0-3-1)**

Introduction to information representation, Signals and bits, Logic implementation using discrete logic components (TTL, CMOS). Introduction to Field Programmable Logic Arrays (FPGAs) design flow: design capture (schematic capture, HDL design entry, design verification and test, implementation (including some of its practical aspects), and debugging. Use of CAD tools to design, simulate and implement digital logic circuits on FPGA prototyping boards.

**Note:** Not to be taken for credit with EE 200. COE 202 and COE 203 together are equivalent to EE 200

**Corequisite:** COE 202

## **COE 241                      Data and Computer Communications                      (3-0-3)**

Information representation and signals. Introduction to data communication. Frequency response, bandwidth, filtering, and noise. Fourier series and transform. Introduction to the Z-transform. Information theory concepts such as Nyquist theorem, Shannon theorem, and Sampling theorem. Analog and digital modulation techniques. Pulse Code Modulation (PCM). Communication systems circuits and devices. Data encoding. Physical Layer Protocols. Data Link Control (point to point communication; design issues; link management; error control; flow control). Multiplexing Techniques.

**Prerequisite:** MATH 102

## **COE 300                      Principles of Computer Engineering Design                      (1-3-2)**

Practical and professional skills necessary for the COE practice. Design projects successful execution steps. Team work, project management and professional communication skills. Codes of professional conduct, ethics & responsibility.

**Prerequisite:** Junior Standing

## **COE 301                      Computer Organization                      (3-3-4)**

Introduction to computer organization, machine instructions, addressing modes, assembly language programming, integer and floating-point arithmetic, CPU performance and metrics, non-pipelined and pipelined processor design, datapath and control unit, pipeline hazards, memory system and cache memory.

**Prerequisite:** COE 202, ICS 102

## **COE 306                      Introduction to Embedded Systems                      (3-3-4)**

Introduction to Embedded Systems. Microcontroller Hardware. ARM Processor. CPU Programming. Memory and I/O. Interfacing: Parallel and Serial Communication. A/D and D/A

conversion Embedded system design methodologies. Specifications. Designing robust software for embedded systems. RTOS features.

**Prerequisites:** COE 203, COE 301

**COE 344                      Computer Networks                      (3-3-4)**

TCP/IP top-down approach. Introduction to computer networks. Application layer design issues and protocols. Transport layer design issues, protocols and congestion control mechanisms. Socket programming. Analysis of the Network layer design issues, and internetworking. MAC layer design issues and protocols. Multimedia network applications are explored.

**Note:** Not to be taken for credit with ICS 342.

**Prerequisite:** COE 241, STAT 319

**COE 350                      Begin Cooperative Work                      (0-0-0)**

See contents in COE 351.

**Prerequisite:** Same as in COE 351

**COE 351                      Cooperative Work                      (0-0-9)**

A continuous period of 28 weeks spent in industry with the purpose of acquiring practical experience in different areas of Computer Engineering. During this period, a student is exposed to the profession of Computer Engineering by working in the field. Students are required to submit a final report and give a presentation about their experience and the knowledge they gained during their cooperative work.

**Prerequisite:** ENGL 214, Completion of 90 credit hours

**COE 352                      End Cooperative Work                      (0-0-0)**

See contents in COE 351.

**Prerequisite:** Same as in COE 351

**COE 353                      Fundamentals of Computer Communications                      (3-0-3)**

Digital communications fundamentals. Voice and data transmission equipment. Communications channels. Data coding and modulation. Multiplexing. Modems. Transmission media. Data transmission codes and protocols. Software packages. Data networks. Planning and design of communication networks.

**Note:** Not to be taken for credit with COE 241, Not open for COE students.

**Prerequisite:** Junior Standing

**COE 399                      Summer Training                      (0-0-0)**

The aim of the summer training is to provide students with direct on-the-job experience working with professionals in the field. This training provides an opportunity to expose students to the reality of professional practice. Students are required to submit a report and make a presentation on their summer training experience and the knowledge gained.

**Prerequisite:** ENGL 214, Junior Standing, Approval of the Department

**COE 402                      Computer System Performance Evaluation                      (3-0-3)**

Introduction to computer system performance analysis and evaluation. Review of basic probability distributions and basic concepts of statistics. Performance measures and measurement techniques. Performance analysis, performance prediction, asymptotic bounds on performance. Simulation and modeling of computer systems. Experimental and analytical approaches. Introduction to queuing network modeling. Case studies.

**Prerequisites:** STAT 319 or Consent of the Instructor

**COE 403                      Computer Architecture                      (3-0-3)**

Fundamentals of computer design, power, cost, performance, instruction set principles, instruction and arithmetic pipelines, dynamic and speculative execution, precise exception, memory hierarchy, multilevel caches, virtual memory, storage and I/O, multicores, multiprocessors, and clusters, New trends in computer architecture.

**Prerequisite:** COE 301

**COE 405                      Design and Modeling of Digital Systems                      (3-0-3)**

Review of sequential circuits design and analysis, Data path and control unit design, Design with Hardware Description languages, Design with Field-Programmable Gate Arrays (FPGAs), Block interfacing, and high-level-synthesis.

**Prerequisite:** COE 202

**COE 408                      Reconfigurable Computing                      (3-0-3)**

Review of Digital System Design, Software-Hardware partitioning, FPGA architectures, Schematic Design Entry, Design with HDL, Simulations, Design issues, Dynamic Re-configuration and applications.

**Prerequisite:** COE 405

**COE 420                      Parallel Computing                      (3-0-3)**

Introduction to parallel computing. Parallel architectures: MIMD, SIMD, communication, and mapping. Performance measures, speedup, efficiency, and limitations of parallel processing. Problem decomposition and parallel algorithm design. Basic communications. Modeling of parallel programs: granularity, scalability, and execution time. Parallel programming: message-passing and threads. Examples of parallel algorithms and applications: matrix, sorting, graph, and search. New trends in parallel computing.

**Prerequisite:** COE 301

**COE 421                      Fault Tolerant Computing                      (3-0-3)**

Introduction to fault-tolerant computing (FTC). Goals of fault tolerance (FT). Design techniques to achieve FT. Evaluation of FT systems. Reliability modeling and analysis of FT systems. Availability modeling. Logic-level fault testing and tolerance. Error detection and correction. Diagnosis and reconfiguration for system-level malfunctions. Case studies of practical fault tolerant systems.

**Prerequisite:** Senior Standing

**COE 422                      Real Time Systems                      (3-0-3)**

Introduction to real-time systems. Uniprocessor scheduling of independent tasks, hard versus soft real time, reference model, dynamic scheduling, utilization-based schedulability, demand-based scheduling, static priority systems, deadlines, and fairness. Basic operating-system functions needed for real-time computing, real-time and non-real-time operating systems. Advanced scheduling: preemptive versus non-preemptive scheduling, dynamic versus static priorities, synchronous versus asynchronous job releases. Multiprocessors and distributed systems, priority ceiling protocol and end-to-end scheduling.

**Prerequisite:** COE 306

**COE 423                      Distributed Systems                      (3-0-3)**

Theory and practice in the design and implementation of distributed computing systems are covered, including interprocess communication, remote procedure calls, distributed file systems,

synchronization, distributed transactions, replicated data, security and specifications for distributed programs. Programming assignments include using current distributed technologies (sockets). Real-world distributed systems case studies, and examples ranging from the Internet to file systems. This course is intended to prepare students to work on corporate software development teams developing enterprise applications.

**Note:** Not to be taken for credit with ICS 437.

**Prerequisite:** Senior Standing

**COE 424                      Introduction to Smart Cards & RFID Technology                      (3-0-3)**

Overview of different types of smart cards, smart card applications, architectures, standards, operating systems, security, management and fabrication. RFID concepts and fundamentals including; components of RFID systems, architectures, middleware functionality, and related standards. RFID RLTS (Real Time Location Systems) and ubiquitous computing. Privacy and security techniques, engineering design tradeoffs in designing both smart card and RFID systems.

**Prerequisite:** Senior Standing or Consent of the Instructor

**COE 425                      Data Management Systems                      (3-0-3)**

Introduction to the fundamental theories and practices of Data Acquisition, Distribution and Warehousing. Generic Structure of IT systems in Production oriented and Service oriented Organizations. Industrial and Business Automation Levels. Differences in Computer Architecture, Operating systems, Languages, Network protocols and Databases between Industrial Automation and Office Automation Domains. Most commonly used standards and Technologies. Case studies.

**Prerequisites:** Junior Standing or Consent of the Instructor

**COE 441                      Local Area Networks                      (3-0-3)**

Introduction to Local Area Networks (LANs). Classes of LANs. LAN design issues. LAN topologies. LAN transmission media. LAN protocols: Medium Access Control (MAC) and Logic Link Control (LLC). LAN standards. Network software: Network operating systems. LAN performance modeling and analysis. Internetworking: Bridges, Routers, and Gateways. Reliability, availability, survivability, and security. Case studies.

**Prerequisite:** COE 241 or Consent of the Instructor

**COE 443                      High Speed Networks                      (3-0-3)**

Introduction to high speed networking. Impact of high speed on communication protocols. Multiple traffic types integration, and quality-of-service differentiation. Design and performance issues of high speed networks. Standard high speed protocols and networks. Examples of high speed networks such as Gigabit Ethernet, Terabit networks, and Photonic networks. Case studies. Future directions.

**Prerequisite:** COE 344

**COE 444                      Internetwork Design and Management                      (3-0-3)**

Overview of computer networks. Principles of internetworking. Internetworking hardware. Bridging and switching technologies. Virtual LANs. Routing strategies. The network development life cycle. Network analysis and design methodology. Enterprise network design model. Backbone design concepts. Network security design. Structured cabling systems. Network design algorithms. Traffic flow analysis. Network reliability. Network management (SNMP). Network administration. Case studies.

**Prerequisite:** COE 344



**COE 445                      Internet Engineering and Technologies                      (3-0-3)**

Overview of current internet challenges and its next generation architecture. Overview of modern Internet protocols and supporting algorithms. Information retrieval architecture, design, and performance evaluation: search engines, proxy servers, and content distribution networks. Network programming.

**Prerequisite:** COE 344

**COE 446                      Mobile Computing                      (3-0-3)**

Introduction to different types of mobile computing; cellular networks, wireless mobile ad hoc and sensor networks, wireless LAN and so on. Discussion of different IEEE standardized protocols and their implementation and performances. New wireless technologies such as LTE and LTE advance. Quality of Service (QoS) issues. Modeling and optimization methods of wireless protocols.

**Prerequisite:** COE 344

**COE 447                      Fundamentals of Optical Networking                      (3-0-3)**

Passive and Active Optical Components. Optical Modulation and Demodulation. Transmission System Design. SONET/SDH and other Client Layers. WDM Networks. Routing and Wavelength Assignment. Control and Management. Protection and Restoration. Access Techniques. Traffic Grooming. Optical Packet/Burst Switching.

**Prerequisite:** COE 344 or Consent of the Instructor

**COE 451                      Computer & Network Security                      (3-0-3)**

Introduction to computer security (concepts, threats, attacks, assets, scope, trends). Cryptographic Protocols and standards. Integrity verification mechanisms. Wireless network security and associated protocols. Software tools to apply security in user environments. Access Control models and mechanisms. Database security, Intrusion detection systems, Firewalls. Malicious software, DoS attacks, Trusted computing and multilevel security.

**Note:** Not to be taken for credit with ICS 444.

**Prerequisite:** COE 344

**COE 461                      Principles of VLSI Design                      (3-0-3)**

State-of-the-art MOS Transistors, their operation and limitations. CMOS digital circuits, static & dynamic logic, combinational and sequential circuits. Circuit design and propagation delay. CMOS fabrication technology, layout and design rules, stick diagrams, IC Design and Verification Tools, subsystem design and case studies, and practical considerations.

**Prerequisite:** EE 203

**COE 462                      Design Automation of VLSI Circuits                      (3-0-3)**

Introduction to computer-aided design of integrated circuits. Design approaches, design steps and corresponding design automation problems and tools. Logical and physical partitioning. Solution techniques for floor planning, placement, global routing and detailed routing. Strategies for grid and channel routing. Layout generation problem and solutions. Symbolic layout, layout editors and compaction. Silicon compilation.

**Prerequisite:** COE 461 or Consent of the Instructor

**COE 464                      Testing of Digital Circuits                      (3-0-3)**

Introduction to the testing problem, fault modeling: stuck-at, bridging, transistor-open and transistor-short faults, delay faults. Fault simulation, Test generation for Combinational circuits,

Test generation for sequential circuits, Design for testability, Built-in self test, Delay fault testing. New trends in testing.

**Prerequisite:** Senior Standing

**COE 465                      VLSI System Design Methodology                      (3-0-3)**

CMOS VLSI system design options; Full-custom and semicustom designs. Design flows of ASICs; front-end and back-end design flows. Design & verification CAD tools. Chip Layout, place and route and design rules checking. Concepts and tools in floor planning, placement and routing, layout generation and design synthesis. The course stresses hands-on experience of VLSI design using CAD tools.

**Prerequisite:** COE 405

**COE 482                      Pervasive and Ubiquitous Computing                      (3-0-3)**

Introduction to ubiquitous and pervasive computing. Designing, building and evaluating ubiquitous computing technologies in order to create novel user experiences. Capturing and disseminating context information through sensors and sensor networks. Sensor network coverage, localization, synchronization, sleep scheduling, connectivity, routing, energy efficiency, data centric and transport protocols, Context-aware applications and intelligent objects and applications.

**Prerequisite:** COE 344

**COE 484                      Introduction to Robotics                      (3-0-3)**

Taxonomy of robots, Internet robotics, autonomous robots, robotic sensor networks, and applications. Motion, linear algebra, motion coordination, singularities, and multiple solutions. Vision, sensing and perception, robot vision and programming, self-localization, Kalman and Monte-Carlo approaches. Intelligence, Autonomous robotics, robot mechanisms and control, control and planning architectures, reactive, subsumptive, and deliberative control behaviors, behavior-based control programming. Humanoid robots. Introduction to multi-robot systems.

**Prerequisite:** Senior Standing

**COE 485                      Senior Design Project                      (1-6-3)**

Various design phases leading to a practical engineering solution. Feasibility study, preparation of specifications, and the methodology for the design. Detailed design and implementation, testing, debugging, and documentation.

**Prerequisite:** Senior Standing

**COE 487                      Computer Vision Processing                      (3-0-3)**

Introduction to the concepts and applications in computer vision. Cameras and projection models, low-level image processing methods such as filtering and edge detection; mid-level vision topics such as segmentation and clustering; shape reconstruction from stereo, as well as high-level vision tasks such as object recognition, scene recognition, face detection and human motion categorization.

**Note:** Not to be taken for credit with ICS 483.

**Prerequisite:** Senior Standing

**COE 488                      Data Acquisition Interfacing                      (3-0-3)**

Data acquisition systems, basic sampling concepts, data collection fundamentals. Interfaces. Special instruments. IEEE standards. RS 232C data acquisition software technique. I/O operation queuing. Hardware for data acquisition systems. Examples and designs.

**Prerequisite:** COE 301

# CITY PLANNING

## **CP 101                      Introduction to City Planning                      (3-0-3)**

Objectives of planning, forming the goals, defining the approaches and methods in the context of socio-economic activities and historical development of Cities and Regions.

## **CP 201                      Planning Theory                      (3-0-3)**

Introducing planning theories as instruments and rational decision making activity to bring physical and social changes to achieve a set of goals through recognized models: comprehensive incremental; advocate; descriptive; predictive etc.

## **CP 202                      Planning Laws and Legislation                      (3-0-3)**

An overview of planning laws and legislation and a short history of planning process. Methods, techniques and instruments for implementing plans through decrees and administrative acts, the basis for urban and regional planning and its relation to Shariah Law as well as the structure and organization of Saudi public planning administration. Discussion of zoning procedures, subdivision review practices and budget preparation and execution.

**Corequisite:** CP 101

## **CP 203                      Introduction to Spatial Database Management Systems                      (3-0-3)**

Introduction to spatial DBMS, relational databases, relational algebra, SQL, entity relationship Model. Theory of database design, physical database design, examples of DBMS.

**Corequisite:** ICS 101 or ICS 102 or ICS 103

## **CP 204                      Land Use Planning                      (3-0-3)**

Land use distribution of urban and regional functions. Location theory, infrastructure systems and municipal and Regional Models.

**Prerequisite:** CP 101

## **CP 205                      Urban Economics                      (3-0-3)**

Microeconomics principles to understand the economic nature of urban areas. Urban growth in the context of location theory. Agglomeration economies in relation to land use pattern and transportation cost. Urban economics problems within the context of the theory of public goods.

## **CP 206                      GIS I                      (2-3-3)**

GIS definition, history, and functional elements. Data input and output, data management and data analysis. Introduction to most commonly used GIS packages. Hands-on experience on selected GIS software. GIS applications in planning. GIS planning and implementation. Case studies of GIS adoption and application in Saudi Arabia and abroad are presented.

**Corequisite:** ICS 101 or ICS 102 or ICS 103

## **CP 210                      Planning Workshop I                      (1-9-4)**

Introduction of students to methodology of collecting and analyzing data about a local study area to examine the relative problem solving in situations of functional and normative requirements. Integration of analysis, programming, implementation, and presentation of phases of the planning process. The workshop includes graphical presentation of the project. Each student chooses a distinct local study area as his project.

**Prerequisite:** CP 101, ARC 100

**CP 301      Urban Survey Methods      (3-0-3)**

Design of surveys, including the preliminary planning of surveys, selection of survey methods, sampling procedures, survey instrument (questionnaire) design, pilot surveys, administration of surveys, and data processing. Computer applications in surveys, including internet-based surveys will also be covered.

**Prerequisite:** STAT 211

**CP 302      Introduction to Environmental Planning      (2-0-2)**

Effects of planning on the natural environment. Planning tools and skills to protect, preserve, sustain, and restore environmental resources. Introductory aspects of environmental assessment and sustainable development.

**CP 303      Introduction to Cartography & Remote Sensing      (2-3-3)**

Cartographic concepts and principles, map design, thematic mapping, computer-aided mapping, symbolization, and map coordinate systems and projections. Basis of remote sensing; photogrammetric systems; space borne sensors and platforms; fundamentals of analyzing remotely sensed data, data integration. Methodology for surveying and analyzing geographical phenomena. Various sensor families such as LANDSAT, Spot, IKONOS and other remote sensing satellites.

**Prerequisite:** CE 261

**CP 306      Quantitative Methods in Planning      (3-0-3)**

Application of different quantitative methods in city planning, including analysis of variance, correlation analysis, regression analysis, time series, Bayesian decision-making, extrapolation techniques, and forecasting methods.

**Prerequisite:** STAT 211

**CP 307      Transportation Planning      (3-0-3)**

Urban transportation planning process, travel demand modeling, data needs, trip generation, trip distribution, modal choice, and network assignment. Local case studies will be emphasized, and specialized software packages will be utilized.

**CP 308      GIS II      (2-3-3)**

Spatial data models, GIS Analysis Functions, System Configuration and Data Communications. Internet GIS, User Requirement Analysis (URA), Metadata Requirements, and Spatial data standards. Advanced GIS software will be used. Students will carry out a comprehensive GIS-related project by utilizing knowledge acquired in this course and previous GIS-related courses.

**Prerequisite:** CP 203

**CP 310      Planning Workshop II      (1-9-4)**

All the students participate in the project and integrate their projects in Planning Workshop I to the City scale. In this project, students should define the functions of the city and the social and economical activities of the city and their manifestation and realization in space.

**Prerequisite:** CP 210

**CP 315      Planning Workshop III      (1-9-4)**

Several options are offered each year, such as regional planning, housing, metropolitan planning, and urban design. All students participate in the project through an inter-disciplinary approach based on the experience gained in previous courses.

**Prerequisite:** CP 310

**CP 350      Begin Cooperative Work      (0-0-0)**

See contents in CP 351.

**Prerequisite:** Same as in CP 351

**CP 351      Cooperative Work      (0-0-9)**

A continuous period of 28 weeks spent in industry with the purpose of acquiring practical experience in different areas of city planning. During this period, a student is exposed to the profession of city planning by working in the field. Students are required to submit a final report and give a presentation about their experience and the knowledge gained during their cooperative work.

**Prerequisite:** Junior Standing, ENGL 214

**CP 352      End Cooperative Work      (0-0-0)**

See contents in CP 351.

**Prerequisite:** Same as in CP 351

**CP 399      Summer Training      (0-0-0)**

The aim of summer training is to provide students with direct on-the-job experience working with professional in the field. This training, which lasts for minimum of eight weeks, provides an opportunity to expose students to the reality of professional practice. Students are required to submit a report and make a presentation on their summer training experience and the gained knowledge.

**Prerequisite:** Junior Standing, ENGL 214

**CP 401      Senior Planning Project Preparation      (1-0-1)**

This course is designed to help the senior student to prepare his proposal for the final project in CP 499. In this course the student will carry out research on a selected topic in the area of city planning of his choice and approved by the course instructor. The student will write a complete proposal including statement of the problem, objectives of the project and its justification, methodology, data collection and project outline.

**Prerequisite:** CP 315

**CP 402      Sustainable Development      (2-0-2)**

Development with the most efficient utilization of natural resources. Balance between market, social, and environmental values throughout the process.

**Prerequisite:** CP 302

**CP 410      Planning Workshop IV      (1-9-4)**

This course is an exercise on applied professional planning. Utilizing a local study area the course focuses on the applications of city planning theories, concepts, and methods to the solutions of actual planning problems including data collection, analysis, preparation of development plans, policies, and recommendations; computer applications will be made when appropriate.

**Corequisite:** CP 401

**CP 421      Urban Infrastructure Systems      (3-0-3)**

Introduction to transportation systems, transportation costs, and effect on landuse planning. Other elements of the general plan: electricity, gas, and communications services systems. Storm drainage, sewage and waste disposal. Introduction to standards and control regulations.

**Prerequisite:** Senior Standing

**CP 422      Public Works Administration      (3-0-3)**

An analysis of the administrative structure and administrative practices with emphasis on finance, personnel, public safety, utilities, and public infrastructure.

**Prerequisite:** Senior Standing

**CP 423      Development Impact Assessment      (3-0-3)**

Principles of impact assessment, development impact assessment methods; cost-benefit analysis, environmental impact assessment, and balance sheet.

**Prerequisite:** Senior Standing

**CP 424      Evaluation and Appraisal      (3-0-3)**

Techniques and methods for assessment of different plans, programs, and public policies. Cost effectiveness, goal achievement, cost benefit, and cost revenue analysis. Pre and post implementation evaluation.

**Prerequisite:** Senior Standing

**CP 425      Urban Modeling      (3-0-3)**

Location theory, geographical and gravitational models, population projection, travel behavior and transportation systems, regional models and economic base models.

**Prerequisite:** Senior Standing

**CP 426      Internet GIS      (3-0-3)**

Introduction to Internet GIS; applications of Internet GIS in City and Regional Planning; use of software to create applications for the web that have interactive GIS functionality; advantages of using Internet GIS in public and private sectors.

**Prerequisite:** CP 203

**CP 427      Analysis and Modeling      (3-0-3)**

Concepts and principles of analysis and modeling of spatial data. Students will gain knowledge of different spatial data modeling techniques used in GIS through lecture, assignments and computer exercises. Student will be able to design, implement and solve a given spatial problem utilizing GIS.

**Prerequisite:** CP 203

**CP 428      GIS in Space Syntax      (3-0-3)**

Introduction to space syntax concepts; application packages; use of Axwman and Isovist analyst extensions in ArcView GIS; pedestrian and vehicular systems; modeling and analysis of urban areas and building interiors; integration of syntactic models with other GIS spatial models; techniques of reporting findings; other quantification techniques applicable to GIS concepts.

**Prerequisite:** CP 203

**CP 429      Geo-statistical Analysis      (3-0-3)**

Role of computers in geographic analysis. Data sampling and descriptive and inferential statistical techniques for analyzing geographic data. Graphic techniques, tests of hypothesis, simple regression, and the analysis of variance. Interpretation and presentation of appropriate spatial and non-spatial statistics.

**Prerequisite:** CP 203

**CP 430      GIS in Transportation      (2-3-3)**

GIS applications in various areas within transportation (GIS-T), including transportation planning, transportation engineering, mass transit, railroads, and intelligent transportation systems (ITS). Linear referencing systems and dynamic segmentation data model will be thoroughly discussed.

**Prerequisite:** CP 203

**CP 431      GIS in Utilities Management      (3-0-3)**

GIS management of utilities: electric, phone, water, and sewer networks. Automated Mapping/Facilities Management (AM/FM).

**Prerequisite:** CP 203

**CP 432      Special Topics in GIS      (3-0-3)**

Topics of this course are to be selected from special topics in GIS.

**Prerequisite:** CP 203

**CP 490      Special Topics in City Planning      (3-0-3)**

Topics of this course are to be selected from the broad areas of City planning.

**Prerequisite:** Senior Standing

**CP 499      Senior Planning Project      (1-9-4)**

The senior student will be required to work on a planning project of the topic developed during CP 401 Senior Planning Project Preparation. The objective of the course to demonstrate the student knowledge and skills acquired during his four years of city planning studies. At the end of the semester, the student is expected to submit a complete and detailed planning project of high quality utilizing planning tools, techniques and methods.

**Prerequisite:** CP 401

# ECONOMICS

## **ECON 101 Principles of Economics I (Microeconomics) (3-0-3)**

The fundamentals of microeconomics. The roles of the market price system in managing the use of society's resources and in rationing available supplies. The efficiency of resource management is examined in the light of a variety of more or less competitive market environments. Consumer behavior, consumer and market demand, concepts of elasticity, cost, production and factor pricing in perfect and imperfect competition, monopoly, monopolistic competition, oligopoly, regulation and economic policy, economic efficiency and productivity, social costs and benefits, and public goods and externalities.

## **ECON 102 Principles of Economics II (Macroeconomics) (3-0-3)**

Basic principles of macroeconomics from a market economics perspective with a focus on current macroeconomic policy issues and data. National income accounts, business cycles, unemployment and inflation, money and banking, fiscal and monetary policies, government debt and policies, economic growth and development, and international trade.

## **ECON 206 Economy of Saudi Arabia (3-0-3)**

Analysis of economic structures, policies and performance of the Saudi Arabian economy, in its evolutionary phases and current challenges. Topics covered include national income accounting; aggregate demand and its component parts. The labor market and the issue of Saudization; key sectors of the economy including crude oil, agriculture, manufacturing, and services, with particular reference to the evolving capital and financial markets. International trade, public finance, fiscal and monetary policies, the role of economic planning in Saudi development, the SME sector and privatization. The impact of globalization, WTO accession, FDI and GCC regional economic integration.

**Prerequisite:** ECON 101, ECON 102

## **ECON 301 Intermediate Microeconomic Theory (3-0-3)**

Theory of consumer behavior; demand and supply analysis; theory of cost and production; pricing theory in factor markets; different market structures such as perfect competition, monopoly, monopolistic competition, and oligopoly; general equilibrium analysis; elements of game theory; microeconomic policy; regulations; social costs and benefits.

**Prerequisite:** ECON 101, ECON 102

## **ECON 302 Intermediate Microeconomic Theory (3-0-3)**

The study of aggregate economic performance, including both long run growth and short-run fluctuations. The various measures of national output in closed and open economies. Aggregate demand and aggregate supply analysis; Keynesian general equilibrium analysis; consumption function, investment function, government expenditure, aggregate production function; economic stabilization, monetary and fiscal policy analysis; alternative macro economic paradigms – Classical, Keynesian, Monetarist, Neo-Classical, Neo-Keynesian, and Real Business Cycle; international trade, exchange rate, and balance of payments analysis; income and employment determination, unemployment and inflation, introduction to international financial and development organizations.

**Prerequisite:** ECON 101, ECON 102

## **ECON 305 Money and Banking (3-0-3)**

The history of money and its role; the role of money in macroeconomic policies; monetary policy and the role of money in the determination of output, prices, and interest rates.



Theories of supply of and demand for money; overview of the banking system; role of the central bank in the financial system and as executor of monetary policy; monetary policy tools and practices; analysis of inflation and unemployment; international monetary system. The Saudi Arabian financial and monetary system.

**Prerequisite:** ECON 101, ECON 102

### **ECON 330 Labor Economics (3-0-3)**

An introductory course which presents basic concepts, theories, and analytical techniques in labor economics. Topics covered in this course include an overview of the labor market in general and the Saudi labor market in particular; labor demand and its elasticities; Saudi supply of labor, foreign supply of labor in the Saudi labor market; compensating wage differentials; investment in human capital (education & training); worker mobility – migration & labor turnover; wage determination; inequality in earnings; types of unemployment; inflation; and policy implications.

**Prerequisite:** ECON 101, ECON 102

### **ECON 401 Managerial Economics (3-0-3)**

Application of economic theory and decision science methods to solve managerial problems. Topics include demand analysis; demand estimation; cost and production analysis; optimization methods, linear programming applied to managerial decision making problems; market structures and managerial decisions, pricing practices, business investment decisions; present value and cost-benefit methods; risk and uncertainty; capital budgeting process, and the role of government in the market economy.

**Prerequisite:** ECON 101, ECON 102

### **ECON 410 International Economics (3-0-3)**

The major focus of this course is to help enhance students' understanding of international economic issues and policies based on international trade and monetary theories. Special references will be made to the Saudi Arabian economy. The course covers the classical theories of international trade; Heckscher-Ohlin and modern theories; tests of trade models; tariffs and protection; economic integration; current international economic issues; introduction to international finance and balance of payments; theories of balance of payments and exchange rates; international monetary systems; foreign exchange market; international parity conditions; managing foreign exchange risk; optimum currency areas.

**Prerequisite:** ECON 101, ECON 102

### **ECON 415 Public Finance (3-0-3)**

Analysis of taxation and government expenditure policies. Public budgeting; different types of market imperfections and failures; role of the public sector; cost-benefit analysis; principles of public expenditure analysis and evaluation; social security and income transfer programs.

**Prerequisite:** ECON 101, ECON 102

### **ECON 420 Islamic Economics (3-0-3)**

Importance of Islamic Economics, its ideological and philosophical foundations, the approach to economic problems and solutions from the Islamic perspectives as compared to other schools of thought. Property and distribution, taxation in terms of equity and efficiency, general principles about interest, money and its nature, functions and the verdict in Islam, modern money and financial system from an Islamic viewpoint, a proposal for reform and monetary policy.

**Prerequisite:** ECON 305

**ECON 425 Economic Development (3-0-3)**

Economic development theory as applied to the unique problems facing developing economies of Asia, Africa, and Latin America. Understanding the different types of growth and developmental theories, compare and contrast between different economies, identify the role of population growth, education, health care, and other parameters in the development process. Mathematical and graphical tools in the measurement and analysis of development. Political economy, international trade, and fiscal policies for development.

**Prerequisite:** ECON 101, ECON 102

**ECON 450 Introduction to Energy Economics (3-0-3)**

Analysis of energy resources (such as petroleum, coal, gas, and electricity, renewable resources). Analysis of demand for and supply of energy sources ( oil in particular, under the assumption of the theory of cartels, such as, a dominant firm and OPEC ). Analysis of short- and long-run costs of investments in resources under uncertainty. Energy, environment and climate change issues. Energy futures and options markets for managing risks. Energy and its derivatives; economics of energy security. Case study on the energy sector of the Saudi Economy.

**Prerequisite:** ECON 101, ECON 102, ECON 206

# ELECTRICAL ENGINEERING

## **EE 200                      Digital Logic Circuit Design                      (3-3-4)**

Number systems & codes. Logic gates. Boolean algebra. Karnaugh maps. Analysis and synthesis of combinational systems. Decoders, multiplexers, adders and subtractors, PLA's. Types of flip-flops. Memory concept. Counters. Registers. Sequential circuit design. System level digital design. HDL (Verilog) use in the design and synthesis of digital systems.

**Note:** Not to be taken for credit with COE 202 and COE 203

**Prerequisite:** MATH 101

## **EE 202                      Electrical Circuits I                      (3-0-3)**

Basic laws: Ohm's, KVL, KCL. Resistive circuits. Circuit analysis techniques. Network theorems: Thevenin's Norton's, Source transformation, Superposition, Maximum power transfer. Op Amps. Energy storage elements. First and second order circuits. Phasor techniques for steady-state sinusoidal circuits.

**Prerequisite:** MATH 102, PHYS 102

## **EE 203                      Electronics I                      (3-3-4)**

Opamp Linear Applications. PN junction and zener diode. Diode basic circuit analysis and diode applications (rectifier and limiters). MOSFET and BJT (DC, small signal analysis). Amplifier configurations and characteristics. CMOS digital circuits.

**Prerequisite:** EE 202

## **EE 204                      Fundamentals of Electrical Circuits                      (2-3-3)**

Basic laws: Ohm's law, KVL, KCL. Resistive networks. Circuit analysis techniques: node-voltage and mesh-current. Network theorems. Inductance and capacitance. Sinusoidal analysis and phasor methods. Power concepts of AC circuits. Polyphase circuits.

**Note:** For non EE Students

**Prerequisite:** MATH 102, PHYS 102

## **EE 206                      Introduction to Electrical Engineering                      (2-0-2)**

Introduction to fundamentals of EE: circuits, energy, communication, control, signal processing, electromagnetics, electronics, and digital systems. Computational techniques. Instrumentation and measurement. Introduction to technology and applications.

**Prerequisite:** PHYS 102

## **EE 207                      Signals and Systems                      (3-0-3)**

Introduction to Signals and Systems. Time-Domain Analysis. Convolution. Fourier Series and Applications. Fourier Transform and Applications. Laplace Transform and Applications. Discrete-Time Signals and Systems. Sampling. Difference Equations and Z-Transform. Introduction to Discrete Time Fourier Transform and its applications.

**Note:** Not to be taken for credit with CISE 315

**Prerequisite:** EE 202, EE 206

## **EE 212                      Electrical Circuits Laboratory                      (0-3-1)**

The course consists of a set of laboratory experiments for students to gain hands-on experience in electrical circuits so that they are able to put theoretical concepts into practice. The experiments are designed to help students understand the basic principles of electric circuits as well as giving them insight on design, simulation and hardware implementation of circuits.

**Note:** For non EE Students

**Corequisite:** EE 202

**EE 213                      Electrical Circuits II                      (2-3-3)**

Important power concepts of AC circuits. Three phase circuits. s-domain analysis. Frequency selective circuits. Two-port networks. Transformers.

**Prerequisite:** EE 202

**EE 303                      Electronics II                      (3-3-4)**

Differential amplifiers. Multistage amplifiers. Amplifier frequency response (for single stage, multistage and opamp). Passive and Active filters. Feedback: Circuit topologies and analysis. Oscillators. Introduction to A/D and D/A.

**Prerequisite:** EE 203

**EE 306                      Electromechanical Devices                      (2-3-3)**

Magnetic circuits. Transformers. Concepts of electric machines. DC generators and motors operation. Three-phase Induction motors. Motor starting. Synchronous machines. Parallel operation. Fractional Horsepower Motors.

**Note:** For non EE Students

**Prerequisite:** EE 204

**EE 308                      Building Electrical Systems Design                      (2-0-2)**

Electrical symbols and Wiring Layout and Applications. Conductors, Fuses, and Circuit Breakers. Introduction to building wiring system: design elements, design procedures and calculation, and National Electrical Code requirements. Types and determination of number of branch circuits required. Basic electrical system design for residential, office and commercial buildings. Building Management Systems (BMS). The course features an electrical design project where students are required to develop and present a basic set of electrical design documents for a medium-size building.

**Note:** For ARE Students Only

**Prerequisite:** EE 204

**EE 311                      Fundamentals of EE Design                      (2-0-2)**

Introduction to engineering design. Literature survey. Formulation of practical engineering problems. Problem analysis. Engineering design process. Modeling, implementation, and evaluation using computer design tools. Report writing, presentation skills, and team work.

**Prerequisite:** EE 203, EE 207

**EE 315                      Probabilistic Methods in Electrical Engineering                      (3-0-3)**

Fundamentals of probability theory: single and two discrete and continuous random variable. Probability density function. Gaussian and other distributions. Functions of one and two random variables. Joint and conditional probabilities. Moments and statistical averages. Central limit theorem. Introduction to random process. Concept of stationarity and ergodicity. Correlation function. Power spectrum density. Response of linear systems to random signals.

**Note:** Not to be taken for credit with STAT 319

**Prerequisite:** EE 207

**EE 340                      Electromagnetics                      (3-3-4)**

Electrostatics: Coulomb's law, Gauss's law, electric potential, electric dipoles, resistance, capacitance. Magnetostatics: Biot-Savart law, Ampere's law, Magnetic forces. Magnetic

boundary conditions, inductance. Time varying fields: Faraday's Law, Maxwell's equations, Plane wave propagation. Reflection and refraction. Introduction to transmission line theory. Waveguides and Antennas.

**Prerequisite:** EE 202, Math 302

**EE 350                      Begin Cooperative Work                      (0-0-0)**

See contents in EE 351.

**Prerequisite:** Same as in EE 351

**EE 351                      Cooperative Work                      (0-0-9)**

A continuous period of 28 weeks spent in the industry working in any of the fields of electrical engineering. During this training period, the student is exposed to the profession of electrical engineering through working in many of its fields. The student is required to submit, and present, a formal written report of his work.

**Prerequisite:** Fulfilling University as well as EE Department Requirements, ENGL 214

**EE 352                      End Cooperative Work                      (0-0-0)**

See contents in EE 351.

**Prerequisite:** Same as in EE 351

**EE 360                      Electric Energy Engineering                      (3-3-4)**

Fundamentals of electric energy systems. Electric energy conversion. Components of electric energy systems. Transformers (1 and 3 phases). AC machine fundamentals. Synchronous and Induction machines. DC machine fundamentals. Overhead transmission lines and underground cables.

**Prerequisite:** EE 213

**EE 370                      Communications Engineering I                      (3-3-4)**

Review of signal and linear systems. Amplitude modulation (AM, DSB, SSB, VSB). Angle modulation (FM, PM). Sampling, Quantization, PCM, DPCM, DM. Multiplexing. Line coding and baseband transmission. Bandlimited channels and ISI. Digital carrier modulation (PSK, ASK, FSK, and M-ary). Examples of modern communication systems.

**Prerequisite:** EE 207, EE 203

**EE 380                      Control Engineering I                      (3-3-4)**

Introduction to feedback control systems. Block diagram and signal flow graph representation. Mathematical modeling of physical systems. Stability of linear control systems. Time-domain and frequency-domain analysis tools and performance assessment. Lead and lag compensatory design. Proportional, integral, and derivative control.

**Prerequisite:** EE 207

**EE 390                      Digital Systems Engineering                      (3-3-4)**

Microprocessor hardware models. Instruction sets. Assembly language programming and debugging. Memory and input/output mapping. Input and output instructions. Input/output interfacing. Introduction to interrupts.

**Prerequisite:** ICS 103, EE 200

**EE 399                      Summer Training                      (0-0-0)**

A continuous period of 8 weeks of summer training spent in the industry working in any of the fields of electrical engineering. The training should be carried out in an organization with

an interest in one or more of these fields. On completion of the program, the student is required to submit a formal written report of his work.

**Prerequisite:** ENGL 214, EE 311

**EE 400                      Telecommunication Networks                      (3-3-4)**

Network Architectures. Network Layers: OSI Model and TCP/IP Model. Physical Layer Protocols and Digital Transmission Fundamentals. Data Link Layer Protocols. Network Layer Protocols: IP Protocols. Medium Access Control systems. Packet Switching and Circuit Switching. Routing in Packet Switching Networks. Security Protocols.

**Note:** Not to be taken for credit with COE 344

**Prerequisite:** EE 315, EE 370

**EE 402                      Control Engineering II                      (3-0-3)**

Review of stability criteria and techniques. Linear feedback system design and compensation methods. Introduction to nonlinear control systems: the describing function and phase plane analysis. Stability criteria for nonlinear systems. On-off control systems and optimum switching. Introduction to optimal control theory. Simulations.

**Prerequisite:** EE 380

**EE 405                      Microwave Transmission                      (3-3-4)**

Characteristics of HF transmission lines. Lossless and lossy transmission lines. Microstrip transmission lines. Smith chart. Impedance matching techniques. Theory of waveguides (rectangular and circular). Microwave components and cavity resonators. Klystrons, Magnetrons and traveling wave tubes. Introduction to radio wave propagation. Introduction to software design tools.

**Prerequisite:** EE 340

**EE 406                      Digital Signal Processing                      (3-0-3)**

Discrete time signals and systems. Linear shift-invariant systems response, difference equations, convolution, and frequency response. Discrete Fourier transform. FFT algorithms. Discrete time Fourier transform and applications. Sampling and aliasing. Finite impulse response (FIR). Filter design techniques, Infinite impulse response (IIR) Filter Design.

**Note:** Not to be taken for credit with CISE 432

**Prerequisite:** EE 207

**EE 407                      Microwave Engineering                      (3-3-4)**

Planar transmission. Planar impedance matching techniques. S-parameters. Microwave filters, microstrip, planar microwave elements (directional coupler, circulators). Microwave amplifier design. Oscillator design. Microwave mixers, demodulators. Introduction to microwave planar antenna. Microwave systems. Introduction to software design tools.

**Prerequisite:** EE 340

**EE 410                      Digital Image Processing                      (3-0-3)**

Digital image fundamentals. Image sensing and acquisition. Image enhancement. Intensity transformation. Spatial and frequency domain filtering. Processing color images. Image compression. Basics of image segmentation. Image restoration and reconstruction. Applications of digital image processing.

**Note:** Not to be taken for credit with COE 487

**Prerequisite:** EE 207

**EE 411                      Senior Design Project                      (1-6-3)**

A course that integrates various components of the curriculum in a comprehensive engineering design experience. Design of a complete project including establishment of objectives and criteria, formulation of design problem statements, preparation of engineering designs. The design may involve experimentation, realization and/or computer project. Team design projects, where appropriate, are highly encouraged.

**Prerequisite:** EE 311, Senior Standing

**EE 417                      Communication Engineering II                      (3-0-3)**

Noise in telecommunication systems. Representation of white and narrowband noise. Performance of continuous wave modulation in the presence of additive white Gaussian noise. Noise effects and probability of error in digital communication systems. Signal detection and optimum receivers in digital communications. Bit error rate performance analysis. New trends in digital communications: Spread spectrum, OFDM, etc.

**Prerequisite:** EE 315, EE 370

**EE 418                      Introduction to Satellite Communications                      (3-0-3)**

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

**Prerequisite:** EE 340, EE 370

**EE 419                      Wireless Communication                      (3-0-3)**

Wave propagation mechanism. Antenna type. Channel models. Large and small scale fading. Performance of digital modulation over fading channels. Diversity. Link budget analysis. Multiple access techniques (TDMA, FDMA, CDMA). Cellular systems (frequency planning, capacity, handoff, sectorization). Modern wireless communication technologies and standards.

**Prerequisite:** EE 315, EE 370

**EE 420                      Optical Fiber Communications                      (3-3-4)**

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

**Prerequisite:** EE 340, EE 370

**EE 421                      Photonics and Optical Communications                      (3-0-3)**

Review of basics of optics including photon-matter interaction, interference, diffraction, coherence, polarization, etc. Introduction to geometrical optics. Light sources and transmitters. Optical detectors and receivers. Optical waveguides and optical fibers. Optical devices: amplifiers, filters, isolators, diffraction gratings, switches, polarization controllers and modulators. Operating principles of optical multiplexers and demultiplexers. Review of important concepts of digital communications including TDM, WDM and DWDM. Channel Dispersion. Overview of the design process of a point-to-point optical link.

**Prerequisite:** EE 340, EE 370

**EE 422                      Antennas                      (3-3-4)**

Introduction to antennas. Review of HF transmission lines. Fundamental parameters of antennas. Transmission formula and radar range equation. Radiation integrals. Linear wire antennas. Antenna arrays. Synthesis of far field patterns by array factors. Design of Dolph-Chebyshev arrays. Broadband antennas and matching techniques. Microstrip antennas. Introduction to smart antenna. Methods of antenna measurements. Antenna design using commercial software.

**Prerequisite:** EE 340

**EE 425                      Integrated Circuits Analysis and Design                      (3-0-3)**

Mixed mode integrated circuit devices and concepts. Advanced modeling and 2nd order effects of transistors and single stage amplifiers. Current mirrors and sources. Design of transconductance amplifier. Design of input stages, differential pairs, active loads, gain stages and level shifting. Output stages, power dissipation. Low voltage design, low power design. Fully differential operation. High performance amplifier design. Analysis and design of typical opamp circuits. Voltage and current references. Noise Analysis. Distortion analysis.

**Prerequisite:** EE 303

**EE 426                      Mixed Mode Signal Processing Circuits                      (3-0-3)**

Advanced filter design. Tuning circuits. S/H circuits. Delay elements. Clock generation circuits. Switched capacitor circuits. OTA design. Design of comparators. A/D and D/A convertors.

**Prerequisite:** EE 207, EE 303

**EE 429                      Microcomputer Organization                      (3-3-4)**

Microprocessor architectures. Design of ALU. Overview of 32- and 64-bit processors. Advanced assembly language programming. Memory mapping. Advanced input/output interfacing. Programmable timers. Analog-to-digital and digital-to-analog interfacing. BIOS and DOS interrupts. High-level language interface. Data acquisition. Design projects.

**Prerequisite:** EE 390

**EE 430                      Information Theory and Coding                      (3-0-3)**

Concept of information and its measurement. Entropy and source coding and Huffman codes, LZW codes. Channel coding theorem and channel capacity. Linear codes. Block codes: detection and correction. Cyclic codes, Hamming codes, BCH codes, encoding, and decoding algorithms. Convolutional codes. Advances in codes: LDPC, Turbo codes.

**Prerequisite:** EE 315, EE 370

**EE 432                      Digital Control Systems                      (3-3-4)**

Introduction to digital control and discrete transform (z-transform). Discrete and hybrid Signal Flow Graphs (SFG)s. Solution of discrete-time state space. Modified z-transform. Time-response and characteristic equations. Stability concepts in discrete-systems. Root locus, Nyquist method and Bode plot applied to discrete systems. Digital lead lag compensators applied to digital systems. Introduction to design.

**Prerequisite:** EE 380

**EE 433                      Applied Control Engineering                      (3-3-4)**

Introduction to process control. Feedback and feed forward control configurations. Modeling of dynamic systems: time delays, high order systems, multivariable systems. Process identification. Controller performance analysis and design. PID controller tuning. Process interaction and decoupling control.



**Prerequisite:** EE 380

**EE 434                      Industrial Instrumentation                      (2-3-3)**

Introduction to measurements systems and basic definitions. Sensors (temperature, humidity, light, piezoelectric , hall effect, pressure, flow and strain gauges) and, signal conditioning circuits (bridge , instrumentation amplifier, scaling circuits, comparators, A/D and D/A, 555 timer). Remote control. Ultrasound systems. Measurements techniques (temperature and humidity measurements, level and displacement measurement, pressure and flow measurement). Introduction to foundation field bus.

**Prerequisite:** EE 200, EE 303

**EE 441                      RF and Microwave Transceivers Design and Analysis                      (3-0-3)**

Tx and Rx architectures, RF link and RF budget, Noise analysis, Linearity analysis, System level design, Microwave measurements for transmitters characterization, CAD tools with application to system level design and analysis, Linear amplifier design (power and LNA), Design case studies.

**Prerequisite:** EE 340

**EE 445                      Industrial Electronics                      (3-3-4)**

555 timers. Power switches (power transistors, SCR, Triac, UJT, PUT). Structure and application in power control. Instrumentation amplifier. Opto electronic sensors. LCD and 7 segment interface. Ultrasonic transistors and applications. Voltage regulators (series, shunt, 3 terminals, switched mode). Power inverter and its applications. Introduction to microcontroller industrial applications.

**Prerequisite:** EE 303

**EE 446                      Programmable Logic Controllers and applications                      (2-3-3)**

Basic concepts of microcontrollers. The structure of programmable logic controllers: I/O, relays, counters and timers. Ladder diagram concepts. PLC's intermediate and advanced functions. PLC's data sets and data manipulations. PLC's industrial applications in the process control. Concepts of PLC's communications.

**Prerequisite:** Senior Standing

**EE 455                      Analog Communication Electronics                      (3-3-4)**

Functional blocks of analog communication systems. Design of mixers, converters, RF and IF amplifiers, AM detectors, and FM discriminators. Functional blocks of monochrome TV receivers. Design of video IF amplifiers, video amplifiers, sync. separators, horizontal and vertical oscillators and AFC. Functional blocks of color TV receivers. Color signal representation and processing.

**Prerequisite:** EE 303, EE 370

**EE 456                      Digital Communication Electronics                      (3-3-4)**

Functional blocks of digital communication systems: PAM, PWM, PPM and PCM. Design of S/H circuits, A/D and D/A converters, and timing (clock generator) circuits. Circuit design using PLL, VCO, and multipliers. Design of PAM, PPM, PWM and PCM transmitters and detectors. Special circuits for phase shift keying.

**Prerequisite:** EE 303, EE 370

**EE 460                      Power Electronics and Power Quality                      (3-3-4)**

Power electronic devices. DC and AC power electronics converters. Fundamental of power quality and system harmonics effects and mitigation. Power quality standards.

**Prerequisite:** EE 360

**EE 462                      Electric Machines and Drives                      (3-3-4)**

AC/DC machines dynamics. Fractional horsepower and special type machines. Integration of electric machines and control systems. AC/DC electric drives. Speed / position control. Computer simulation.

**Prerequisite:** EE 360, EE 380

**EE 463                      Power System Analysis                      (3-0-3)**

The basic concepts: representation, equivalent circuits. Per unit system. Power flow analysis. Short circuit analysis. Stability Analysis. Use of power system simulation packages.

**Prerequisite:** EE 360

**EE 464                      High Voltage Fundamentals and Applications                      (3-3-4)**

Introduction to High Voltage engineering, Generation of testing voltages. High Voltage measurements. High Voltage insulation. Electric fields and electric breakdown. High Voltage Insulators. Circuit breakers. Switchgears. Industrial applications.

**Prerequisite:** EE 360

**EE 465                      Power Transmission and Distribution                      (3-0-3)**

Fundamentals of overhead transmission lines and underground cables. Transmission line parameters and constants. Transmission Line Steady State and Transient Operations. Natural loading and reactive compensation. Fundamentals of distribution system. Load characteristics. Substation safety and Grounding. Standards.

**Prerequisite:** EE 360

**EE 466                      Power System Protection                      (3-3-4)**

Introduction to power system fault calculations. Introduction to protective relaying. Relay operating principles. Current and potential transformers. Differential protection of generators, motors, transformers, and busbars. Overcurrent, distance and pilot protection of transmission lines. Digital relays. Relay coordination.

**Prerequisite:** EE 360

**EE 467                      Power System Planning & Operation                      (3-0-3)**

Short and long term demand forecasting. Expansion of generation and transmission systems. power generation cost, economic dispatch and unit commitment. Power system state estimation. Load frequency control.

**Prerequisite:** EE 360

**EE 468                      Renewable Energy                      (3-0-3)**

Electric energy from renewable energy sources including solar, wind, and fuel cells. Characteristics of direct conversion, energy conversion and storage systems. Issues related to integration of small scale energy sources into electricity grid. Smart grids.

**Prerequisite:** EE 360

**EE 470                      Introduction to Optical Electronics                      (3-0-3)**

Optical processes in semiconductors. Spontaneous and induced transitions. Absorption and amplification of radiation. Atomic susceptibility. Semiconductor lasers. Operating principles

and practical device features. Rate equations. Gain saturation. Feedback. Coherent optical oscillation. Laser resonators. Properties of laser light. Materials and heterostructures. Fabry-Perot lasers. Mode locking. Q-switching. Modulation and bandwidth. Light emitting diodes. Optical detectors, pn and pin, schottky and avalanche diodes, Solar Cells. Photoconductive detectors.

**Prerequisite:** EE 340, EE 303

**EE 497                      Special Topics in Electrical Engineering I                      (3-0-3)**

The contents of this course will be in the areas of interest in electrical engineering. The specific contents will be given in detail at least one semester in advance of that in which it is offered.

**Prerequisite:** Senior Standing or Consent of the Instructor

**EE 498                      Special Topics in Electrical Engineering II                      (3-0-3)**

The contents of this course will be in the areas of interest in electrical engineering. The specific contents will be given in detail at least one semester in advance of that in which it is offered.

**Prerequisite:** Senior Standing or Consent of the Instructor

**EE 499                      Special Topics in Electrical Engineering III                      (3-0-3)**

The contents of this course will be in the areas of interest in electrical engineering. The specific contents will be given in detail at least one semester in advance of that in which it is offered.

**Prerequisite:** Senior Standing or Consent of the Instructor

# ENGLISH

## **ENGL 00-xx Preparatory English 0 (15-5-0)**

Introduction to basic sentence formation, speaking, listening, and reading skills. The main emphasis is on elementary speaking skills. The course helps students to develop an understanding of basic language concepts. It is designed for students who are not presently prepared to study in a preparatory year program. The aim is to ensure students enter the main four components of the Prep Year program with basic skills necessary for success. Materials used are at the A-1 level according to the Common European Framework (CEF).

## **ENGL 01-xx Preparatory English I (15-5-4)**

It is considered the academic starting-point of the Preparatory English Program. Elementary skills with an emphasis on structured reading and listening texts are employed with an emphasis on skill development. Students will study basic sentence structure and be introduced to essay formation. Materials used are at a CEF A-1 /A-2 level.

## **ENGL 02-xx Preparatory English II (15-5-4)**

Pre-Intermediate skill development in structured reading and listening texts will be emphasized. Students will also study basic essay formation. Materials used are at a CEF A-2 /B-1 level.

**Prerequisite:** ENGL 01-xx

## **ENGL 03-xx Preparatory English III (15-5-4)**

Intermediate skills with an emphasis on near native reading and listening texts are employed. Students will study academic essay writing and Introductory TOEFL preparation is stressed. Materials used are at a CEF B-1 level.

**Prerequisite:** ENGL 02-xx

## **ENGL 04-xx Preparatory English IV (15-5-4)**

This course completes the English component of the Preparatory English Program. Upper Intermediate skills with an emphasis on reading, listening, writing and TOEFL preparation are stressed. The aim is to ensure students are fully prepared to study at a university in the medium of English. Materials used are at a CEF B-2 level.

**Prerequisite:** ENGL 03-xx

## **ENGL-EP English Proficiency (6-0-2)**

This course is intended to prepare students to meet the minimum English language requirements before pursuing their undergraduate studies at KFUPM. The course is designed to reinforce the core academic English skills in ENGL 04. Topics covered include: academic lexis; prefix, root and suffix morphology; skills-based techniques for reading academic texts; skills-based techniques for listening to lectures; and spoken and written discourse production. The course duration is seven and a half weeks. When the course is registered concurrently with ENGL 04, the passing criterion is the minimum TOEFL score specified by the university.

**Corequisite:** ENGL 04

**ENGL 101 Introduction to Academic Discourse (3-0-3)**

Introduction to academic writing and reading: Writing process, draft writing, peer editing, and error recognition and correction. Writing styles covered: definition, description, exemplification, comparison, causal analysis, and argumentation. Organisational and grammatical elements. Improvement of reading skills; comprehension, skimming, scanning, meaning from context, lexis and acquisition of academic vocabulary.

**Prerequisite:** ENGL-EP

**ENGL 102 Introduction to Report Writing (3-0-3)**

Introduction to process of report writing: theme-based, and basic library research, finding, note taking, paraphrasing, summarizing text and illustrations, and referencing, MLA or APA. Critical thinking: independent research, group discussions and presentations. Mechanics of writing: functional grammar, lexis, punctuation, and organization.

**Prerequisite:** ENGL101

**ENGL 214 Academic & Professional Communication (3-0-3)**

Production of subject-specific report: discursive or positional, researched from a variety of academic or professional sources. Proposal relating to their research report. Referencing and documentation. Professional communication: work-related skills through a variety of role-play and business activities e.g. interviewing, processing CVs/resumes, group presentations.

**Prerequisite:** ENGL102

## FINANCE

<b>FIN 250</b>	<b>Financial Management</b>	<b>(3-0-3)</b>
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The theory and practice of financial management and the role of the Financial Manager. The basic concepts of finance, including the time value of money and conceptual framework of risk and return in financial markets. Overview of financial markets and institutions, financial statements, ratio analysis, cash flow analysis, capital budgeting techniques, security valuation, financial leverage, capital structure, the cost of capital, corporate financing policy, dividend policy, techniques of financial planning and analysis and working capital management.

**Prerequisite:** ACCT 210, ECON 101, ECON 102

**FIN 310      Intermediate Financial Management      (3-0-3)**

The theory and practice of capital investments and financing decisions. The theory of risk and return and modern portfolio theory and its relevance for capital investment decision making under uncertainty are discussed. Financing decisions are examined through capital structure theory, cost of capital, and dividends policy. Valuation of securities integrates the impact of both investment and financing decisions. Advances in alternate valuation techniques particularly in real options are covered. Instruments of long-term financing; leasing; mergers and acquisitions; corporate restructuring and reorganizations, risk management, corporate governance, agency theory, and international issues.

**Prerequisite:** FIN 250

**FIN 320 Investments (3-0-3)**

Security markets, choice of investment securities, sources of investment information, and factors influencing security prices. International securities and markets. Saudi market. Selection and management of financial assets; valuation techniques for stocks and bonds; fundamental and technical analysis; theory of efficient financial markets; risk-return analysis; portfolio theory; introduction to financial futures and options.

**Prerequisite:** FIN 250

**FIN 350      Begin Cooperative Work      (0-0-0)**

See contents in FIN 351.

**Prerequisite:** Same as FIN 351

**FIN 351**      **Cooperative Work**      **(0-0-6)**

Each student participates in a 28 week program of industrial experience in Finance and/or related business area and submit a formal written report.

**Prerequisite:** ENGL 214, At least 85 credit hours

**FIN 352      End Cooperative Work      (0-0-0)**

See contents in FIN 351.

**Prerequisite:** Same as FIN 351

**FIN 410      International Financial Management      (3-0-3)**

Analysis of the key financial decisions made by multinational corporations (MNCs). The course provides an international perspective to financial problems faced by multinationals. Topics include the international financial environment; international money and capital markets; analysis of foreign exchange risk exposure and risk management; capital budgeting

and working capital management for multinationals; foreign direct investment decisions, political risk assessment, international banking and taxation.

**Prerequisite:** FIN 250

**FIN 415      Management of Financial Institutions      (3-0-3)**

Theoretical and practical aspects of decision making in financial institutions including commercial banks, insurance companies, pensions funds and asset management firms. Major topics include interest rate risk management, asset/liability and capital management under current Basel regimes; credit evaluation, lending policies and practices, liquidity management; performance evaluation; investment banking; investment portfolio management; international banking.

**Prerequisite:** FIN 250

**FIN 421      Security Analysis and Portfolio Management      (3-0-3)**

Application of investment theory in selection and analysis of securities and management of portfolios. Selection and management of security portfolios, applying tools and techniques developed within the modern portfolio theory framework. Management of fixed income security portfolios, duration analysis, asset pricing model; investment in options and futures and their role in hedging and speculation; portfolio performance evaluation and monitoring; examination of institutional investment policies.

**Prerequisite:** FIN 320

**FIN 425      Financial Modeling      (3-0-3)**

Practical financial modeling for purposes of financial planning and decision making. Spreadsheet -based financial models. Quantitative modeling applications in financial analysis and planning; valuation techniques including derivative security valuation; capital budgeting; leasing; statistical analysis; risk analysis; optimization techniques; investment analysis and portfolio management.

**Prerequisite:** FIN 310, FIN 320

**FIN 430      Risk Management, Conventional and Islamic Insurance      (3-0-3)**

Principles and practices of insurance and risk management including identification, measurement, and dealing with insurable risk in personal and business situations. Topics include theory of risk; insurance principles and terminology; implementation of risk management strategies through insurance coverage, risk retention, and risk reduction devices; financial aspects of insurance companies and markets; types of insurance coverage; basic features of selected insurance contracts.

**Prerequisite:** FIN 250

**FIN 435      Real Estate Investment and Finance      (3-0-3)**

Overview of real estate markets; analysis of residential and commercial real estate development, mortgage financing and investment decisions. Fundamentals of property valuation, economic factors influencing property values, property management, and appraising principles for residential and income property, leverage, and methods of financing.

**Prerequisite:** FIN 250

**FIN 440      Islamic Finance      (3-0-3)**

Introduction to the theory and practice of Islamic Financial instruments and institutions. Topics include the theory of Islamic banking, structure and management of Islamic banks, financial statements of Islamic banks. The governance in Islamic financial institutions.

Theory of Islamic contracts, Islamic bond instruments (sukuk), Islamic insurance instruments (takaful), risk and liquidity management in Islamic financial institutions. Other topics include cost of capital determination, project evaluation techniques, and accounting practices in the Islamic financial system.

**Prerequisite:** FIN 250, FIN 320

**FIN 450      Financial Policy      (3-0-3)**

Capstone case course examining practical problems in all areas of finance. The course emphasizes the application of financial theories and analytical techniques to solve business problems in both domestic and international settings. Topics covered in the course include financial analysis and planning; working capital management; capital budgeting and cash flow analysis; lease financing; long term financing and capital structure decisions; corporate restructuring, mergers & acquisitions, investment analysis, international finance. The course will be centered around business case analysis.

**Prerequisite:** FIN 310, FIN 320, FIN 425

**FIN 460      Derivatives      (3-0-3)**

Introduction to derivative securities and the markets in which they trade. Explores the regulatory framework for financial derivatives and the operations of derivatives exchanges. A detailed look at the characteristics of futures and option contracts and their associated trading strategies to achieve risk return objectives. No arbitrage principles and pricing of derivative securities.

**Prerequisite:** FIN 320

**FIN 470      Financial Engineering      (3-0-3)**

An introduction to pricing, valuation, and hedging of derivative securities which include equity and index, foreign currency, commodity, fixed-income and interest-rate derivatives. Risk measurement models, risk management and control models, and hedging techniques using derivatives.

**Prerequisite:** FIN 320

**FIN 480      Special Topics in Finance      (3-0-3)**

Focuses on advanced, contemporary, and specialized areas in Finance not covered extensively in other courses.

**Prerequisite:** FIN 310



## GEOLOGY

**GEOL 201**                      **Physical Geology**                      **(2-3-3)**

Introduction to the fundamentals of physical geology. Composition and structure of the Earth, mineral and rock identification, plate tectonics, mountain building, geological structures, earthquakes, volcanism, erosion and sedimentation processes. Laboratory exercises concentrate on mineral and rock identification and the interpretation of topographic and geologic maps. At least one field trip to a nearby locality is required.

**GEOL 202      Applied Geosciences for Scientists and Engineers      (2-3-3)**

Introduction; geologic processes; rocks and minerals; natural resources: hydrocarbons, minerals and ground water; aspects of environmental and engineering geology; geophysics principles and practices; case histories.

**Note:** The Earth Sciences majors cannot take this course for credit.

**GEOL 203**                      **Historical Geology**                      **(2-3-3)**

Introduction to principles useful in studying the Earth's history, and to examine the physical and biological evolution of the Earth from the viewpoint of global tectonics. Laboratory exercises include examination of stratigraphic rock samples, index fossils and their identification, lithostratigraphic correlation, paleoenvironments, interpretation of paleogeographic and geological maps and cross-sections. At least one field trip to a nearby locality is required.

**Corequisite:** GEOL 201

**GEOL 214 Paleontology and Biostratigraphy (2-3-3)**

Introduction to macrofossils and microfossils, including basic aspects of taxonomic theory, classification and principles of nomenclature; a review of the major palynomorphs, such as pollen, spores, chitinozoans and acritarchs; particular emphasis will be placed on the industrial application of these forms to aid palaeoenvironmental and biostratigraphic determinations as applied primarily to oil and gas exploration and production.

**Prerequisite:** GEOL 203

**GEOL 216**                      **Mineralogy and Optics**                      **(3-3-4)**

Systematic mineralogy including detail study of major rock-forming minerals with emphasis on their physical and optical properties, chemical composition, occurrences, and associations. Principles of crystallography, crystal systems, symmetry classes and crystal forms. Crystal chemistry. Structures of minerals. Optical mineralogy. Laboratory exercises include studies of common rock forming minerals using polarizing microscope, morphological crystallography using crystal models, and determination of mineral specimens by physical properties and using hand lens, and recalculations of chemical analysis.

**Prerequisite:** GEOL 201

**GEOL 303      Sustaining the Earth      (3-0-3)**

The course offers a broad coverage of environmental issues, including: sustainability; biodiversity and evolution; food-, soil-, and pest management; water resources and pollution; renewable energy, environmental hazards and human health; air pollution; climate change, and ozone depletion. Each student will present a term project seminar.

**GEOL 305**                      **Structural Geology**                      **(2-3-3)**

Principles of structural geology. Concepts of true and apparent dip of strata, folds, structural contours for homoclinal and complex surfaces, geological cross-sections, block diagrams,

isopachs, faults, intrusive and extrusive igneous structures, impact structures, landslides and sinkholes. Laboratory exercises focus on the interpretation of geological maps and cross-sections and stereographic projection using Schmidt net. Computer software will be used in directional data interpretation, manipulation, and diagram and graph construction. At least one field trip to a nearby locality is required.

**Prerequisite:** GEOL 201

**GEOL 307                      Sedimentation and Stratigraphy                      (3-3-4)**

Sediments and their properties, processes of sedimentation; depositional environments; facies and facies analyses; provenance; principles and fundamentals of stratigraphic units, Walther's law; correlation; overview of seismic and sequence stratigraphy. Laboratory exercises on types, texture and composition of common sedimentary rocks; core description; lithofacies map; facies analyses; correlation. Computer software will be used in stratigraphic column construction and data interpretation. One field trip to nearby area is required.

**Prerequisite:** GEOL 201, GEOL 203

**GEOL 312                      Remote Sensing and GIS Applications in Geology                      (2-3-3)**

Introduction and principles of remote sensing; aerial photography and other remote sensing techniques; principles of photogrammetry and image interpretation for geological information; introduction to the GIS (Geographic Information Systems) and its application in geosciences. Computer software will be used in data processing and interpretation.

**Prerequisite:** GEOL 305

**GEOL 318                      Regional Geology                      (3-0-3)**

Major tectonic elements of the Arabian Peninsula. Rocks and the sedimentary cover in Arabia. Geological, structural and geomorphological evolution of Arabia with emphasis on hydrocarbon potentials, mineral wealth and underground water resources. At least one field trip is required.

**Prerequisite:** GEOL 201

**GEOL 320                      Petrology                      (3-3-4)**

Nature, origin, differentiation and crystallization of magma; Phase relations in silicate melts. Mode of occurrence, textures, petrography and minerals of igneous rocks. Texture, structure, composition, provenance, diagenesis and classification of sedimentary rocks. Distribution and origin of sedimentary rocks in relation of plate tectonics and basin developments. Processes and types of metamorphism. Facies, textures, mineralogy of metamorphic rocks. P-T paths. Relations of rocks to plate tectonics. Laboratory studies of igneous, sedimentary and metamorphic rocks in hand specimens and under microscope. At least one field trip is required.

**Prerequisite:** GEOL 216

**GEOL 328                      Geological Mapping Techniques                      (2-3-3)**

Elementary methods of field observation and geological mapping as applied to various geological terrains. Principles of remote sensing and aerial photography. Emphasis will be on those aspects of rocks, geological structures and stratigraphic principles that are demonstrated in their natural setting in the Eastern Province of Saudi Arabia. Several laboratory exercises will be conducted in the field. Two weekend field trips to nearby localities are required. Computer software will be used in data processing and interpretation.

**Prerequisite:** GEOL 305

**GEOL 341                      Engineering Geology                      (3-0-3)**

Modern concepts of engineering geology. Impact of geology on siting and structures design of engineering projects. Geological and mechanical fundamentals as related to engineering practices, emphasis on parameters of rock mass classification systems and on techniques relevant to site investigation programs. Case histories.

**Prerequisite:** GEOL 201 or Consent of Instructor for non Earth Sciences Majors

**GEOL 355      Geochemistry      (2-3-3)**

Composition of the Earth and nature of geochemical data. Geochemical classification of elements. Crystal-chemical controls of element distribution. Thermodynamics, partial pressure and Eh-pH diagrams. Geochemical cycle and isotope geochemistry.

**Prerequisite:** CHEM 102, GEOL 216

**GEOL 399      Summer Training      (0-0-2)**

A total period of eight weeks of internship in the industry to gain practical experience in the field of geology. The student is required to submit a written report and make an oral presentation at the department based on the experience of the training program.

**Prerequisite:** ENGL 214, Earned Minimum 56 Credit Hours

**GEOL 409      Geology Seminar      (1-0-1)**

Preparation and presentation of selected geological topics. Each student is expected to submit a written report on his topic and make an oral presentation at the class.

**Prerequisite:** Geology Senior Standing

**GEOL 415      Petroleum Geology      (3-0-3)**

Definition and properties of petroleum and natural gas. The origin, migration and accumulation of hydrocarbons as related to source, reservoir and seal rocks and reservoir properties. Structural, stratigraphic and combination traps. Survey of exploration methods. Concept of petroleum province and basin analysis. Computer software will be introduced for basin analysis and data interpretation. At least one field trip is required to investigate the outcrop section of a major reservoir in Saudi Arabia.

**Prerequisite:** Consent of Instructor

**GEOL 420      Geotectonics      (3-0-3)**

Characteristics and origin of the oceanic and continental crust. Major structural elements of lithosphere. Plate tectonic theory. Mountain building and magmatic activities. Tectonic provinces of the continental crust. Transpression and transtension. Basin subsidence mechanisms. Global tectonics and Earth's resources, with special emphasis on the Middle East region.

**Prerequisite:** GEOL 305

**GEOL 423      Hydrogeology      (3-0-3)**

Theory and geology of groundwater occurrence and flow. Introduction to the hydrology of surface and groundwater supplies; water bearing properties of rocks; hydrodynamics of flow through porous materials; flow nets, well hydraulics, analysis and evaluation of pumping test data. Groundwater quality, occurrence of groundwater in various rock types and sediments; field techniques used in groundwater exploration and survey. Computer software will be used in data interpretation, simulation, manipulation, and graphs construction. At least one field trip to a nearby locality is required.

**Prerequisite:** GEOL 201 or Consent of Instructor for non Earth Sciences Majors

**GEOL 430      Field Geology      (0-18-6)**

Six weeks of systematic fieldwork for training in geological techniques. After a brief introduction and rehearsal of basic field procedures and mapping techniques including applications of remote sensing and aerial photography, a specific area will be mapped in detail. The course requires each student to prepare a complete field notebook, geological map, stratigraphic successions, cross-sections, and a comprehensive geological report. The participants of the course are also required to make an oral presentation based on the field report.

**Prerequisite:** GEOL 305, GEOL 307, GEOL 320

**GEOL 431      Geomorphology      (3-0-3)**

Introduction to internal and external Earth processes, and resulting landforms on the Earth's surface. Classification, description, and evolution of landforms. The fluvial and eolian domain. Analysis of geomorphic features using maps and aerial photographs. At least one field trip to a nearby locality is required.

**Prerequisite:** GEOL 201

**GEOL 434      Marine Geology      (3-0-3)**

Introduction to the continental margin geological processes and features: continental shelf, barrier island, reef, atoll, slope, rise, and abyssal plains, submarine canyons and plate-tectonic activity. Worldwide sea level changes through time, oxygen isotope stratigraphy, and paleoceanic circulation. Marine sedimentary rocks of the Arabian Peninsula. At least one field trip to a nearby locality is required.

**Prerequisite:** GEOL 201

**GEOL 435      Petroleum Geochemistry      (3-0-3)**

Overview of the origin of petroleum, its chemical composition, and the methods used in petroleum geochemistry; carbon cycle; composition of biomass; kerogen and coal formation; maturity assessments; biomarkers and molecular geochemistry; geochemical correlation techniques; geochemical prospecting.

**Prerequisite:** GEOL 203, GEOL 415

**GEOL 436      Oceanography      (3-0-3)**

Fundamental oceanographic principles. Distribution of terrigenous and biogenic ocean sediments. Historical overview of seawater formation. Tidal influence, geostrophic force, storms, surface and deep ocean water circulation, photic and aphotic zones, total dissolved solids and formation of manganese nodules. Concept of CCD, lysocline, thermocline, oxygen-minimum layer, pycnocline, nepheloid concentration layer, salinity and temperature gradient, Pleistocene glaciations and worldwide carbon dioxide budget. At least one field trip to a nearby locality is required.

**Prerequisite:** GEOL 201

**GEOL 440      Sedimentology      (2-3-3)**

Elements of sedimentary basin formation, style of sedimentation, provenance, associated facies, and subsequent physicochemical changes through time. Plate-tectonic, climatic, allo- and auto-cyclic constraints on sedimentary rocks. Emphasis on convergent and rifted margin sedimentary record. Usage of several macroscopical and microanalytical tools for detailed sedimentary basin analysis. Computer software will be introduced for basin analysis and data interpretation. At least one field trip is required.

**Prerequisite:** GEOL 307

**GEOL 441      Techniques in Sediment Analysis      (2-3-3)**

Macro- and micro- analysis of geological materials. Fundamental principles and sample preparation techniques for detailed geochemical studies. Determination of bulk and trace element composition, fluid inclusion study, homogenization, pressure-temperature, and *Eh-pH* of the mineralizing solution. Laboratory exercises include: grain-size analysis, heavy mineral and magnetic separation, petrographic slide preparation, staining techniques, vacuum impregnation, peels and slices, scanning electron microscope, X-ray diffraction, X-ray fluorescence, electron probe microanalyzer (EPMA), ICP, and gas chromatography. Individual research project report is required. At least one field trip to a nearby locality is required.

**Prerequisite:** GEOL 216

**GEOL 446      Environmental Geology      (3-0-3)**

Environmental problems, hazards and their mitigation. Critical evaluation of geological processes: volcanic activity, earthquakes, slope failures and landslides, flooding, groundwater movement, solution cavities and sinkholes. Environmental problems associated with human interaction: groundwater pollution, groundwater withdrawal, acid rain, solid waste disposal, land development and urbanization, agricultural activity, soil erosion, and desertification. Current environmental issues. Selected case studies. Computer software related to the subject will be introduced. At least one field trip to a nearby locality is required.

**Prerequisite:** GEOL 201

**GEOL 454      Computational Methods in Geology      (2-3-3)**

Introduction to the modern concepts of quantifying geologic variables. Integration, analysis, and interpretation of geologic data. Application of statistical, spatial, and numerical techniques to characterize oil reservoirs, groundwater aquifers, mineral resources and environmentally contaminated sites. Computer packages are introduced for modeling purposes.

**Prerequisite:** Consent of Instructor for non Earth Sciences Major

**GEOL 456      Economic Geology      (2-3-3)**

Introduction, historical development of economic geology. Origin, classification, occurrences and association of mineral deposits. Metallogenic provinces and epochs. Study of important economic mineral deposits. Laboratory exercise includes ore microscopy and hand specimens identification of common ore minerals and gemstones. Computer software will be introduced for data processing and interpretation. At least one field trip is required.

**Prerequisite:** GEOL 216

**GEOL 460      Mining Geology      (3-0-3)**

Basic concepts and historical developments. Geological principles of ore exploration and appraisal. Methods of ore body sampling, estimation and classification of reserves. Methods of mining and mineral processing. Computer software related to data processing, ore reserve estimation, and interpretation will be used.

**Prerequisite:** GEOL 216

**GEOL 461      Mineral Economics      (3-0-3)**

Basic concepts. Significance of the mineral industries in the economy. Examination and valuation of mineral properties, mine organization and administration, and mine management.

**Prerequisite:** GEOL 216

**GEOL 464      Carbonate Geology      (2-3-3)**

Carbonate rocks, their characteristics, classification, and distribution. Environments of deposition, associations, and economic importance. Relationship to petroleum deposits with special emphasis on shoals and reefs. Study of outcrops, hand specimens and thin sections. At least one field trip is required.

**Prerequisite:** GEOL 307

**GEOL 480      Special Topics**

**(3-0-3)**

Contents to be arranged.

**Prerequisite:** To be set by the Earth Sciences Department.

# **GEOPHYSICS**

## **GEOP 202      Introduction to Geophysics      (3-0-3)**

Introduction to applied and solid-earth geophysics; the gravitational, seismic, magnetic, thermal, and radioactive properties of rocks and earth materials; methods of measurement and their applications to the exploration of the Earth's interior. Physical properties of the earth's interior. Some field trips are required.

**Prerequisite:** MATH 102, PHYS 102

## **GEOP 204      Introduction to Seismology      (3-0-3)**

Body and surface forces, stress, strain, elastic moduli, equation of motion, yield strength. Types of elastic waves, their propagation, reflection/refraction, travel-time curves and their application to the study of the Earth's interior. Causes and effects of earthquakes; methods of locating and determining magnitudes of earthquakes; interpretation of seismograms; occurrence frequency of earthquakes and risk analysis, earthquake prediction, earthquakes related to human activity, seismometry.

**Prerequisite:** GEOP 202

## **GEOP 205      Computational Geophysics      (3-0-3)**

Topics covered include: Fourier transform; partial differential equations of geophysics; linear operators; convolution; correlation techniques; digital filters; the FFT algorithm; analytic continuation; probability distributions; trend surface analysis; with emphasis on computer applications of these tools to geophysical data; MATLAB would be used to illustrate the techniques numerically.

**Prerequisite:** MATH 201, ICS 101 or ICS 102 or ICS 103, GEOP 202

## **GEOP 315      Seismic Exploration I      (2-3-3)**

Principles of the seismic method; exploration objectives and requirements of seismic data acquisition; the seismic pulse - its generation and transmission; partition of seismic energy at an interface; seismic energy reflection, refraction, attenuation, and travel time - distance functions; reflection time corrections; field testing and procedures with emphasis on multiple coverage and design of source and receiver arrays for signal enhancement; well velocity survey; the synthetic seismogram and the convolutional model. The laboratory work includes seismic field demonstrations, computational exercises using software packages. A field trip to a seismic crew is required.

**Prerequisite:** GEOP 202

## **GEOP 320      Seismic Data Processing      (2-3-3)**

Objectives of processing; basic data processing sequence; the digital tape format; demultiplex, trace editing and gain removal; design of digital filters; deconvolution; residual static correction; seismic velocity analysis; migration including Kirchhoff, finite difference, and frequency domain methods; computer lab sessions on the use of common seismic software packages.

**Prerequisite:** GEOP 205, GEOP 315

## **GEOP 399      Summer Training      (0-0-2)**

A continuous period of eight weeks of summer working in the industry to gain practical experience in the fields of geophysics. The student is required to submit a written report and give an oral presentation in a seminar at the department about his experience and the knowledge he gained during his summer work.

**Prerequisite:** ENGL 214, Junior Standing, Approval of the Department

**GEOP 402      Senior Project      (1-6-3)**

Topics will depend on student's and instructor's interest. They may vary from acquisition and interpretation of geophysical data from the field or the laboratory to computer models and simulation of theoretical problems of interest in geophysics, or a mixture of both. Weekly consultations with the instructor as well as a written report are required.

**Prerequisite:** Senior Standing

**GEOP 404      Gravity and Magnetic Exploration      (3-0-3)**

The course is devoted to the gravity and magnetic exploration methods, starting with a survey of the theory of potential, the coverage will include field instruments and procedures, methods for the acquisition, reduction and processing of data. Special emphasis is placed on data analysis and computer modeling.

**Prerequisite:** GEOP 205

**GEOP 405      Seminar      (1-0-1)**

Weekly discussion and presentation of research topics of geophysical interest. The theme of the seminar varies from year to year depending on the interest of the coordinator of the seminar. Participants are expected to make presentations and lead discussions on the subject of interest.

**Prerequisite:** Senior Standing

**GEOP 415      Seismic Exploration II      (3-0-3)**

Topics covered include: seismic resolution; types of events on seismic sections; characteristics of events; vertical seismic profiling; geologic aspects of velocity; seismic response of various stratigraphic and structural features; direct hydrocarbon indicators; 2-D and 3-D seismic exploration technique; introduction to seismic stratigraphy.

**Prerequisite:** GEOP 315

**GEOP 430      Geophysical Well Logging      (2-3-3)**

General aspects of well logging; drilling mud and casing; compositional properties of rocks, porosity, permeability, and fluids content. Logging techniques - resistivity, self-potential, gamma ray, neutron, density, sonic, calipers, dipmeters, etc. Determination of formation factor, water saturation, shaliness, estimation of permeability. Well log patterns of known rock units and the geological interpretation of well logs. Differentiation of oil and gas zones. Correlation between logs and tying wells to seismic sections.

**Note:** Not to be taken for credit with PETE 303.

**Prerequisite:** GEOP 202

**GEOP 450      Electrical Exploration      (3-0-3)**

Electrical properties of minerals and rocks. Principles of resistivity, self-potential, induced polarization, and electromagnetic methods. Emphasis on physical bases, instrumentation, field procedures, and interpretation using electrical software packages.

**Prerequisite:** GEOP 202

**GEOP 455      Geodynamics      (3-0-3)**

Basic physical principles applied to the study of the earth material properties and earth dynamical processes; discussions of a variety of geological phenomena such as heat and fluid flow, rock rheology and deformation, lithospheric flexure and isostatic equilibrium, mechanics of plate tectonics.

**Prerequisite:** GEOP 202, PHYS 301



**GEOP 465      Paleomagnetism      (3-0-3)**

Methods and techniques of paleomagnetism and their application to a variety of geological problems in regional and global tectonics, geochronology, paleogeography, rock fabric analysis, etc. Students conduct a small-scale study as a term project.

**Prerequisite:** GEOP 202

**GEOP 470      Geophysical Engineering      (3-0-3)**

Practical and theoretical aspects of seismic refraction and electrical resistivity methods as applied for siting and control of engineering projects, such as dams, tunnels, highway cuts and water supply. Correlation between parameters of field data and rock mechanics, such as joint frequency, rock quality designation, strength and solution cavities. Interpretation techniques and fieldwork constitute the main part of the course.

**Prerequisite:** GEOP 202

**GEOP 472      Meteorology and Climatology      (3-0-3)**

An introductory course on the atmosphere, weather, and climate. Discussion topics cover: an overview of the Earth's atmosphere, energy in the atmosphere, general atmospheric circulation, atmospheric physics and dynamics, clouds and precipitation, storms, air masses and fronts, weather analysis and forecasting, remote sensing in meteorology, general climatology, climatic classification, climatic change, climate dominated by different air masses, climate and water resources, applied climatology, and weather modification and climate.

**Prerequisite:** Junior Standing

**GEOP 475      Environmental Geophysics      (3-0-3)**

Application of geophysical methods to environmental problems such as impact-assessment, clean-up, city planning, and siting of civic, industrial, and military critical facilities. Techniques include seismic, electrical and electromagnetic sounding, ground-penetrating radar, magnetic, gravity, and borehole geophysics.

**Prerequisite:** GEOP 202

**GEOP 478      Data Inversion in Geophysics      (3-0-3)**

Basic concepts and techniques of inverse theory and application to geophysical problems; focus on linear inverse problems in gravity, magnetic, seismic, and electrical data modeling and interpretation.

**Prerequisite:** GEOP 202, MATH 202

**GEOP 480      Special Topics      (3-0-3)**

Contents to be arranged.

**Prerequisite:** Senior standing, Permission of the Department

## **GENERAL STUDIES**

### **GS 220                      Information Searching Skills                      (2-0-2)**

Acquaintance to printed and electronic information resources, methods of searching for information, searching in the indexes and the abridgments, seeking by subject and word, using electronic information bases and the Internet, practical exercises through searching for information.

**Prerequisite:** ENGL 102

### **GS 318                      World Civilizations                      (3-0-3)**

The development of world civilizations from 1500 AD until the present, examining the peoples, forces and concepts that have shaped the rise of major world civilizations. This includes: the history of nation-states and related inter-nation and inter regional rivalries, colonialism and geographical context, the discovery and exploration of the new world, the role of societal development and intellectual thought, analysis of diverse socio-cultural perspectives and religions in determining the interaction of world cultures and their influence on the development of world civilization.

**Prerequisite:** ENGL 102

### **GS 321                      Principles of Human Behavior                      (3-0-3)**

Understand and explain human behavior: psychological concepts, theories, and scientific methods. Human activities: processing information and world perception, learning, remembering. Behavioral energizers: motivation, emotions and changing (development). Mental processes: critical thinking, and creatively. Individual differences: intelligence and personality. Social interactions and influences. Mental health: stress, adaptation and coping, and psychological disorders.

**Prerequisite:** ENGL 102

### **GS 332                      Principles of Sociology                      (3-0-3)**

Concepts, relevance, development, and research methods of sociology. Major sociological paradigms and theories. Socialization and social interaction. Social groups and institutions: analyses of function and impact. Analyses of everyday social life through sociological concepts, such as social stratification, social control (conformity, deviance and authority), social and cultural changes, and social development.

**Prerequisite:** ENGL 102

### **GS 336                      Work & Society                      (3-0-3)**

Development of Industrial Society. Management and work forces relations. Theories of human relations and interactions. Various economic activities. Theories of motivation, bureaucracy, leadership, emphasizing basic needs and human relations.

**Prerequisite:** ENGL 102

### **GS 342                      International Relations                      (3-0-3)**

The nature of the International community and how states interact. Theories of international relations and the factors that affect the international community. Aspects related to international relations such as globalization, United Nations and other Organizations. Some regional and international current issues.

**Prerequisite:** ENGL 102

**GS 355** **Cultural Anthropology** **(3-0-3)**

The discipline of cultural anthropology including key theoretical and methodological approaches to the study of culture. The nature of ethnographic analysis: how cultural anthropologists understand, describe, explain, and highlight the particularities, similarities, and differences of the human experience. Examine the comparative study of contemporary human societies, cultures, and diversity, including local and regional cultures. How people adapt to, make sense of, and transform their worlds. Examine and understand the cultural dimensions of human life expressed through value of systems, language, and social practices and their meanings.

**GS 420** **Personality Psychology** **(3-0-3)**

Personality definitions, assumptions, different characteristics (traits, dispositions, and styles), and effects on behavior. Measurement of personality. Theories of personality. Personality and related issues; namely: its relation to some psychological concepts and constructs. Culture and gender. Individual well-being.

**Prerequisite:** ENGL 102

**GS 426** **Social Psychology** **(3-0-3)**

The study of the social nature of humans: social psychology notions and development. Exploring and implementing the scientific methods of social psychology. The influence of heredity and culture on the individual. The development of the components of the self. An introduction to social cognition, including person perception, stereotyping, and prejudice. The foundations of social influence, including compliance, persuasion and obedience. Understanding the processes that drive prosocial and antisocial behavior. A comparative approach to the nature of belonging and social relationships. The effects of groups on the individual and vice-versa: group and the self, power, status, and leadership.

**Prerequisite:** ENGL 102

**GS 434** **Mass Media & Society** **(3-0-3)**

An overview and analysis of sociological perspectives regarding the role of mass media in society. Critical analysis of issues in mass media. Mapping mass media structure. The basic functions of communication through analyses of information, opinion, entertainment, advertising and marketing. Ways of directing public opinion. An overview of the impact of mass media in promoting economic products and industries. Effects on society and cultural change. Legal and ethical issues in mass media. History and development of mass media in the Middle East.

**Prerequisite:** ENGL 102

**GS 447** **Globalization** **(3-0-3)**

The nature of globalization including: definitions, concepts, dimensions, and prospects. The historical context of globalization. The global security. International political economy in a global age. International law, international system, and international organizations in a globalized world. Transitional actors in global politics. Globalization and contemporary global issues. The overall impact of globalization and its future prospective locally and internationally.

**Prerequisite:** ENGL 102

# HUMAN RESOURCES MANAGEMENT

## **HRM 301 Human Resources Management (3-0-3)**

Activities and processes of the human resources function that include recruitment, selection, placement, training, career development, performance appraisal and motivation, compensation, and separation. Emphases are put on the role of HRM in organizational strategies and the human resources as a source of competitive advantage. Also included, coverage of the environmental, contextual and global aspects and dimensions of the human resource management function and activities and the case of the Saudi Business environment.

**Prerequisite:** MGT 301

## **HRM 390 Performance Appraisal & Management (3-0-3)**

How employee performance is organized, appraised, and managed to achieve organizational and individual performance goals. Topics include job design standards, employee appraisal systems and techniques, employee behavior and attitudes, employee job-fit, assessment of related HRM functions, performance measurements and their validity, and ethical dimensions of performance appraisal and management. Instructional techniques will include teamwork and oral and written presentations.

**Prerequisite:** HRM 301

## **HRM 401 Staffing & Selection (3-0-3)**

In-depth analysis of the methods used in staffing and selection processes. Methods used to evaluate individuals (e.g., ability tests) as well as methods used to evaluate selection and promotion tools (e.g. reliability, validity, and utility). The processes of designing, administering, revising, and evaluating selection programs that comply with government regulation as well as add value to the organization. Legal guidelines, reliability, validity, utility analysis, evaluation of selection techniques.

**Prerequisite:** HRM 301

## **HRM 402 Training & Development (3-0-3)**

Information and insights into the training and development functions in organizations. The training and development function will be viewed from systems approach, such that it will examine the entire cycle of training and development – from the assessment of training needs to the evaluation of a training program within the context of today's organizations and the trends in the globalized era.

**Prerequisite:** HRM 301

## **HRM 403 Compensation and Benefits Management (3-0-3)**

Focuses on the techniques, processes, and decisions of the design and management of employee compensation. It covers the strategic choices involved in the design and management of compensation. Topics include job analysis, job descriptions and specifications, job evaluation techniques, pay levels determination, labor markets, pay surveys, performance appraisal, incentives, benefits, compensation laws, compensation of special groups, nontraditional forms of compensation such as knowledge and skill-based pay systems, and the role of government and society. Also coverage will include the global aspects of compensation and compensation in the Saudi business environment.

**Prerequisite:** HRM 301

## **HRM 411 International Human Resource Management (3-0-3)**

International dimensions of the core aspects of human resource management, such as linkages with international business strategy and structure, recruitment, compensation and reward management, training and development, performance management, and industrial relations. The connection between corporate strategies and the effective management of human resources, which at times, may require differing policies across countries. The course is based on the notion that multinational enterprises (MNEs) and transnational firms require appropriate structures, policies, and strategies for managing their employees at every level of the enterprise.

**Prerequisite:** HRM 301

## ISLAMIC AND ARABIC STUDIES

**IAS 101      Practical Grammar      (2-0-2)**

Selection of aspects of Arabic grammar essential for written and spoken communication in everyday life with emphasis on correct grammar usage.

**IAS 11                      Belief and its Effects                      (2-0-2)**

The root of the true faith. Special characteristics of Islamic faith. The Islamic view of the universe, mankind and life. Means of enrichment of life and beliefs.

## IAS 131 Objective Writing (1-3-2)

Alphabetization, correct pronunciation and handwriting. Step by step explanation of the principles of the Arabic language using everyday illustrations (excluding grammar and morphology).

(Open for non-Arabic speakers only)

**Prerequisites:** Approval of the Department

**IAS 201                      Objective Writing                      (2-0-2)**

Characteristics and types of formal writing: reports; scientific research; summaries; forms; resumes; evaluations and minutes of meetings.

**Prerequisites:** IAS 101

**IAS 212 Professional Ethics (2-0-2)**

Importance of ethics in Islam and the integration of worship and aspects of professional life. Suitability criteria for employment in Islam. Standards for professional behavior. Employee interaction with others. Application of Islam to professional violations. Saudi Laws and professional behavior.

**Prerequisites:** IAS 111

**IAS 231**      **Grammar and Composition**      **(1–3–2)**

A simplified systematic study of selected important topics of Arabic grammar.

(Open for non-Arabic speakers only)

**Prerequisites:** IAS 131

**IAS 301      Language Communication Skills      (2-0-2)**

Promoting interactive skills and techniques for social, academic and professional life: dialogue; presentations; persuasion and developing a positive approach.

**Prerequisites:** IAS 201

## IAS 322 Human Rights in Islam (2-0-2)

The dignity of mankind and basic human rights. The Islamic viewpoint of human rights, its distinguishing characteristics, and debates related to this issue.

**Prerequisites:** IAS 212

**IAS 331                      Literature and Text                      (1-3-2)**

Reading, understanding and discussion of the meaning of some Quranic *Ayas* and *hadiths*. Selected Islamic stories and Arabic verses.

(Open for non-Arabic speakers only)

**Prerequisites:** IAS 231

**IAS 411**                      **Contemporary Islamic World**                      **(2-0-2)**

An introduction to the Islamic world. Internal challenges relating to the lagging behind in educational and scientific pursuits, differences in opinions, and differing contemporary schools of thought. External forces opposed to Islam. Current Islamic issues and means for solving them. The role played by Islamic organizations.

**Prerequisites:** Junior Standing

**IAS 416                      Al-Sirah Al-Nabawiyyah                      (2-0-2)**

The biography and lifestyle of the Holy Prophet Mohammad (Peace Be Upon Him) portraying and exemplary model for students in their practical life.

**Prerequisites:** Junior Standing

## IAS 418 Contemporary Financial Transactions in Islam (2-0-2)

Contemporary business transactions; corporative structure; Islamic banking; contracts; borrowing and lending; investments (Stocks, Shares, and Bonds).

**Prerequisites:** Junior Standing

## IAS 419 Inimitability of Al-Quran (2-0-2)

Different aspects of inimitability of Al-Quran; rhetorical, metaphysical, legislative; and scientific inimitabilities.

**Prerequisites:** Junior Standing

# INFORMATION AND COMPUTER SCIENCE

## **ICS 101                      Computer Programming                      (2-3-3)**

Overview of computer hardware and software; Programming in FORTRAN with emphasis on modular and structured programming technique; Problem solving and algorithm development; simple engineering and scientific problems.

**Note:** Not to be taken by ICS/SWE students

**Corequisite:** MATH 101

## **ICS 102                      Introduction to Computing I                      (2-3-3)**

Overview of computers and computing. Introduction to a typical object-oriented programming language. Basic data types and operators. Basic object-oriented concepts. Wrapper classes. Console input/output. Logical expressions and control structures. Classes and methods. Arrays and strings.

**Corequisite:** MATH 101 or MATH 132

## **ICS 103                      Computer Programming in C                      (2-3-3)**

Overview of computer hardware and software; Programming in C with emphasis on modular and structured programming technique; Problem solving and algorithm development; Simple engineering and scientific problems.

**Note:** Not to be taken by ICS/SWE students

**Corequisite:** MATH 101 or MATH 132

## **ICS 201                      Introduction to Computing II                      (3-3-4)**

Advanced object-oriented programming; inheritance; polymorphism; abstract classes and interfaces, container and collection classes, packages, object-oriented design, software modeling, event-driven programming, recursion, use of stacks, queues and lists from API, searching and sorting.

**Prerequisite:** ICS 102

## **ICS 202                      Data Structures                      (3-3-4)**

Review of object-oriented concepts; Introduction to design patterns; Basic algorithms analysis; Fundamental data structures - implementation strategies for stacks, queues and linked lists; Recursion; Implementation strategies for tree and graph algorithms; Hash tables; Applications of data structures (e.g. data compression and memory management).

**Prerequisite:** ICS 201

## **ICS 233                      Computer Architecture and Assembly Language                      (3-3-4)**

Machine organization; assembly language: addressing, stacks, argument passing, arithmetic operations, decisions, modularization; Input/Output Operations and Interrupts; Memory Hierarchy and Cache memory; Pipeline Design Techniques; Super-scalar architecture; Parallel Architectures.

**Prerequisite:** COE 202, ICS 201

## **ICS 253                      Discrete Structures I                      (3-0-3)**

Propositional Logic, Predicate Logic, Sets, Functions, Sequences and Summation, Proof Techniques, Mathematical induction, Inclusion-exclusion and Pigeonhole principles, Permutations and Combinations (with and without repetitions), The Binomial Theorem, Recurrence Relations; Graphs terminology and applications, Connectivity, Isomorphism, Euler and Hamilton Paths and Circuits, Planarity and Coloring; Trees terminology and applications.



**Prerequisite:** ICS 102

**ICS 254                      Discrete Structures II                      (3-0-3)**

Number Theory: Modular Arithmetic, Integer Representation, Fermat's Little Theorem, Chinese Remainder Theorem, RSA.; Proof Techniques: Methods of Proofs, Applications from Number Theory, Recursive Definitions; Algorithm Correctness; Relations: Closures and Equivalence Relations, Partial Orderings and Lattices, Hasse Diagrams; Recurrence Relations and Generating Functions; Automata Theory: Finite State Machines, Regular Expressions, DFA, NDFA and their equivalence, Grammars and Chomsky Hierarchy, Introduction to Turing Machines.; Abstract Algebra: Groups, Homomorphisms and Lagrange's Theorem, Applications.

**Prerequisite:** ICS 253

**ICS 309                      Computing and Society                      (2-0-2)**

Impact of Computing on Society; Ethical Foundations; Governance and Regulation; Freedom of Speech; Intellectual Property; Privacy; Security; Professional Responsibility; Leadership challenge.

**Prerequisite:** Junior Standing

**ICS 324                      Database Systems                      (3-3-4)**

Basic database concepts, conceptual data modeling, relational data model, relational theory and languages, database design, SQL, introduction to query processing and optimization, and introduction to concurrency and recovery.

**Prerequisite:** ICS 202

**ICS 343                      Fundamentals of Computer Networks                      (3-3-4)**

Introduction to computer networks and layered architectures: connectivity, topology, circuit and packet switching, TCP/IP and ISO models; Application layer: C/S model, DNS, SMTP, FTP, WWW, socket programming and network security; Transport layer: TCP and UDP, congestion control; Network layer: internetworking, addressing and routing algorithms and protocols; Data link layer: framing, flow and error control protocols, PPP, MAC and LANs; Physical layer: principles of data communications, circuit switching, coding, multiplexing and transmission media.

**Note:** Not to be taken for credit with COE 344

**Prerequisite:** ICS 201

**ICS 350                      Begin Cooperative Work                      (0-0-0)**

See contents in ICS 351.

**Prerequisite:** Same as in ICS 351

**ICS 351                      Cooperative Work                      (0-0-9)**

A continuous period of 28 weeks spent as a normal employee in industry, business, or government agencies with the purpose of familiarizing students with the real world of work and enabling them to integrate their classroom learning to a real work environment. During this period, a student is exposed to a real-life work in the field. Each student is required to participate with at least one project. Students are required to submit progress reports during the work period. Students are also required to give a presentation and submit a final report on their experience and the knowledge they gained during their cooperative.

**Prerequisite:** ICS 324, SWE 311, ENGL 214, Major GPA  $\geq 2$ , Completion of at least 85 hours, Department Approval

**ICS 352                      End Cooperative Work                      (0-0-0)**

See contents in ICS 351.

**Prerequisite:** Same as in ICS 351

**ICS 353                      Design and Analysis of Algorithms                      (3-0-3)**

Algorithms and Problem Solving; Basic Algorithmic Analysis; Advanced algorithmic analysis; Advanced Data Structures; Algorithmic strategies & Analysis of fundamental computing algorithms; Basic computability; The complexity classes P and NP.

**Prerequisite:** ICS 202, ICS 253

**ICS 355                      Theory of Computing                      (3-0-3)**

Regular Grammars: equivalence of DFA, NDFA and regular expressions, pumping lemma, emptiness and membership. Context-Free Grammars: parsing and ambiguity, normal forms, applications, equivalence of PDA's and CFG's, pumping lemma, emptiness and membership. Turing Machine: programming techniques for Turing machines, equivalence of one-tape and multitape TM's, universal Turing-machine. Undecidability: recursively enumerable and recursive languages, undecidability, problem reduction, undecidable problems of CFG's, RE's and TM's.

**Prerequisite:** ICS 253

**ICS 381                      Principles of Artificial Intelligence                      (3-0-3)**

Introduction to Artificial Intelligence (AI) history and applications; First order logic; State space representation; Blind and heuristic search; Constraint satisfaction and planning; Knowledge representation; Reasoning in uncertain situations; Machine learning; Prolog programming; Natural language processing, Expert systems and real AI applications.

**Prerequisite:** ICS 253

**ICS 399                      Summer Training                      (0-0-0)**

A summer period of 8 weeks spent as a trainee in industry, business, or government agencies for the purpose of familiarizing the student with the real job world and enabling him to apply and relate his academic knowledge to a real work environment. The student is required to participate in computer science related activities and use his time to get acquainted with the computer science related functions and resources used by his employing organization. Besides progress reports, the student is required to submit a final report and do a presentation on his experience and the knowledge he gained during his summer training program. The student receives a zero-credit Pass/Fail grade.

**Prerequisite:** ICS 324, SWE 311, ENGL 214, Junior Standing, Department Approval

**ICS 410                      Programming Languages                      (3-0-3)**

Programming Paradigms: Object-oriented, imperative, functional, and logic. Application development in these paradigms. Fundamentals of Language Design: Syntax and Semantics. Language implementation: virtual machines; compilation, interpretation, and hybrid.

**Prerequisite:** ICS 202

**ICS 411                      Senior Project                      (1-6-3)**

Project-oriented course in which students work in teams on an applied real-world problem of their interest, go through its software development lifecycle in order to develop a prototype software solution for the problem at hand. The senior project offers the opportunity to integrate

the knowledge acquired in preceding courses, as well as promote and instill communication skills, writing skills, and lifelong self-learning.

**Prerequisite:** ICS 324, SWE 311, ENGL 214, Senior Standing

**ICS 412                      Compiler Construction Techniques                      (3-0-3)**

Compiler techniques and methodology; Organization of compilers. Lexical and syntax analysis; Parsing techniques; Object code generation and optimization, detection and recovery from errors; Contrast between compilers and interpreters.

**Prerequisite:** ICS 202, ICS 254

**ICS 415                      Computer Graphics                      (3-0-3)**

Applications of Computer Graphics; Graphics systems and devices; Output Primitives and their Attributes; Geometric Transformations; Window to Viewport Mapping and Clipping; Curves and Surfaces; Three-Dimensional viewing; Hidden surface removal; illumination and color models, Animation.

**Prerequisite:** ICS 202

**ICS 424                      Advanced Database Systems                      (3-0-3)**

Advanced data models: object-oriented model, and object-relational model, conceptual database design. Transaction processing: transactions, failure and recovery, and concurrency control techniques. Database backup and recovery. Query processing and optimization. Database security. Distributed databases: distributed data storage, distributed query processing, distributed transaction processing and concurrency control. Homogeneous and heterogeneous solutions, client-server architecture. XML and relational databases. Introduction to data warehousing, introduction to other current trends in database systems.

**Prerequisite:** ICS 324

**ICS 426                      Data Warehousing and Data Mining                      (3-0-3)**

Review of relational databases and Conjunctive queries, Data Warehousing Concepts and OLAP, Data Warehouse Design and Development, Information and data Integration, OLAP Technology for Data Mining. Data Mining: Primitive, Languages and Application Developments.

**Prerequisite:** ICS 324

**ICS 431                      Operating Systems                      (3-3-4)**

This course introduces the fundamentals of operating systems design and implementation. Topics include history and evolution of operating systems; Types of operating systems; Operating system structures; Process management: processes, threads, CPU scheduling, process synchronization; Memory management and virtual memory; File systems; I/O systems; Security and protection; Distributed systems; Case studies.

**Prerequisite:** ICS 233

**ICS 436                      Systems and Networking Administration                      (2-3-3)**

Install and upgrade different popular operating systems. Managing File Systems. Managing User Accounts. Setting up X Windows System. Configuring Printing Services. Upgrading and installing software packages. Backing up data. Tuning kernel parameters. Configuring and managing various protocols: DNS, DHCP, Routing, Electronic Mail, and Network File System. Managing and troubleshooting computer systems and networks. Network and System Security.

**Prerequisite:** ICS 343 or COE 344

**ICS 437                      Distributed Systems                      (3-0-3)**

Introduction to Distributed Systems; Distributed Systems Architecture; Computer Networks for distributed systems; Distributed Objects and Remote Invocation; Distributed Naming; Distributed File Systems; Security; Synchronization; Distributed Coordination and Agreement; Distributed Transactions; Distributed Replication; Distributed Multimedia Systems, Distributed Shared Memory; Case Studies such as CORBA, MACH, DCOM, and GLOBE.

**Prerequisite:** ICS 343 or COE 344

**ICS 443                      Network Design and Management                      (3-0-3)**

Overview of network design and management; Design methodologies; Network management strategies; Network configuration management; Network management protocols: SNMP, and RMON; Network management tools and systems; Network management applications; Desktop and web-based network management; Network troubleshooting.

**Prerequisite:** ICS 343

**ICS 444                      Computer and Network Security                      (3-0-3)**

Introduction to computer and network security; Security services: confidentiality, integrity, availability, accountability; Hacker techniques and attack types; Public and private key encryption; Authentication; Digital signature; User identification and access control; Computer viruses, Trojans and worms; Risk management and analysis; Information security process; Internet security: security protocols such as IPsec, SSL, TLS, email and web security; Security technologies and systems: Firewalls, VPN and IDS.

**Note:** Not be taken for credit with SWE 421

**Prerequisite:** ICS 343 or COE 344

**ICS 446                      Cluster Computing                      (3-0-3)**

Introduction to high performance computing: types of parallel computers, system architectures, performance measures; Message passing programming; Complexity analysis of parallel algorithms; Embarrassingly parallel computations; Partitioning and divide-and-conquer strategies; Pipelined computations; Synchronous computations; Load balancing and termination detection; Programming with shared memory; Parallel sorting algorithms; Numerical algorithms; Parallel image processing; Searching and optimization; Project/Programming assignments.

**Prerequisite:** ICS 202, Junior Standing

**ICS 447                      Computer Network Technologies                      (3-0-3)**

Various advanced topics on LANs and internetworking technologies will be addressed. Topics include: Performance measures and evaluation techniques; Advanced network architectures and differentiated services in IP networks; High-speed access technologies; Switched, Fast and Gigabit Ethernet; VLANs; Wireless LANs; ISDN and ATM; Frame Relay; Mobile computing and mobile IP; VPN and Enterprise networks; Emerging network trends and technologies.

**Prerequisite:** ICS 343 or COE 344

**ICS 454                      Principles of Cryptography                      (3-0-3)**

Classical cryptography; Secret Key Encryption; Perfect Secrecy. Cryptanalysis; Block and Stream cipher; Data Encryption Standard (DES) and Advanced Encryption Standard (AES); Public Key Encryption; Diffie-Hellman Key Exchange; RSA, ElGamal and Rabin's Cryptosystems; Authentication and Digital Signatures; One-time signatures; Randomized Encryption; Rabin and ElGamal signature schemes; Digital Signature Standard (DSS)

Cryptographically Secure Hashing; Message Authentication Codes; Network Security; Secure Socket Layer (SSL); IPsec.

**Prerequisite:** ICS 254, ICS 353

**ICS 481                      Artificial Neural Networks                      (3-0-3)**

Introduction to neural computing: Real vs. artificial neurons; Threshold logic; Training a linear threshold unit, the perceptron rule; Multilayer feed-forward networks and the back propagation algorithm; The Hopfield net; Self-organizing maps; Radial basis functions; Adaptive resonance theory; Applications of Neural Networks (ANN).

**Prerequisite:** Senior Standing

**ICS 482                      Natural Language Processing                      (3-0-3)**

This course examines a range of issues concerning computer systems that can process human languages. Among the issues to be discussed are morphological and syntactic processing, semantic interpretation, discourse processing and knowledge representation.

**Prerequisite:** Senior Standing

**ICS 483                      Computer Vision                      (3-0-3)**

Image acquisition, The digital image and its properties, Image preprocessing, Segmentation (thresholding, edge- and region-based segmentation), Shape representation and object recognition, Motion analysis, Case studies (object recognition / object tracking).

**Note:** Not to be taken for credit with COE 487 or EE 410

**Prerequisite:** Senior Standing

**ICS 484                      Arabic Computing                      (3-0-3)**

This course examines a range of issues concerning computer concepts related to Arabic. Among the issues to be discussed are: Arabic Language Characteristics, Arabic Character Sets, Standardization, Unicode, Arabization systems, Arabic software tools, Arabic programming languages and Introduction to Arabic Computations.

**Prerequisite:** Senior Standing

**ICS 485                      Machine Learning                      (3-0-3)**

Introduction to machine learning; Concept learning; Supervised learning - decision tree learning; Unsupervised learning - clustering. Artificial neural networks. Evaluating hypotheses; Bayesian learning; Computational learning theory; Instance based learning. Genetic algorithms; Learning sets of rules - Inductive Logic Programming; Reinforcement learning; Analytical learning.

**Prerequisite:** Senior Standing

**ICS 486                      Multi-Agent Systems                      (3-0-3)**

Agents, agent definitions and classification; Multi-agent systems (MAS) and their characteristics; Models of agency, architectures and languages, logics for MAS, deductive and practical reasoning agent, reactive and hybrid agents; Distributed problem solving and planning; Coordination mechanisms and strategies; Learning in MAS; Interaction, negotiation and coalition formation; Applications of agent technology (agents in electronic commerce and information retrieval).

**Prerequisite:** ICS 381

**ICS 488                      Soft Computing                      (3-0-3)**

Introduction to Soft Computing, Fuzzy Sets Theory, Fuzzy Logic, Artificial Neural Networks, Probabilistic Reasoning, Genetic Algorithms, Neuro-Fuzzy Technology, Combination of

**Prerequisite:** STAT 319, Senior Standing

**(3-0-3)**

**Prerequisite:** Senior Standing.

**(3-0-3)**

**Prerequisite:** Senior Standing

# INDUSTRIAL AND SYSTEMS ENGINEERING

## **ISE 100      Introduction to Technology      (2-3-3)**

Overall survey of technologies in different areas such as computers, IT, communications, oil and gas, construction and manufacturing. Emphasis of the course on systems approach on addressing problems.

## **ISE 201      Introduction to Industrial and Systems Engineering      (1-0-1)**

An introduction to and overview of the profession, including career planning, professionalism, ethics and teamwork Nature of the Industrial Engineer job, Selected areas of IE such as quality, optimization, productivity, process improvement. Industry site visits, industrial speakers, Case studies from IE applications.

**Prerequisite:** MATH 102

## **ISE 205      Engineering Probability and Statistics      (3-0-3)**

Data description and presentation. Basic concepts in probability. Random variables and probability distributions. Sampling distribution. Point estimation of parameters. Statistical intervals for a single sample. Statistical intervals for two samples. Laboratory projects consisting of selected applications.

**Prerequisite:** MATH 201

## **ISE 303      Operations Research I      (3-0-3)**

Modeling in Operations Research. Linear Programming: Simplex Method, Duality, Sensitivity Analysis. Network Models; Shortest-Route Problem, PERT/CPM, Maximum Flow Problem, Minimal Spanning Tree Problem, Transportation and Assignment Problems. Goal Programming.

**Prerequisite:** ISE 201, ISE 205

## **ISE 304      Principles of Industrial Costing      (3-0-3)**

Introduction to basic costing concepts and behavior, with emphasis on manufacturing optimization through labor and materials cost analysis, operation and overhead cost calculations, product cost estimating, and finally setting product selling price. Study of the principles of costing systems and techniques of analysis and cost control. Emphasis on interpretation and use of costing principles for decision making.

**Prerequisite:** ISE 205

## **ISE 305      Optimization Methods      (2-3-3)**

Unconstrained optimization, necessary and sufficient conditions for unconstrained minima. Derivative-free algorithm. The steepest decent and Newton algorithms. Conjugate gradient and Quasi-Newton methods. Constrained optimization: Karush-Kuhn-Tucker conditions for optimality, algorithms for constrained optimization including SUMT, approximation and methods of feasible directions. Case studies in different engineering discipline.

**Prerequisite:** ISE 303

## **ISE 307      Engineering Economic Analysis      (3-0-3)**

Introduction to concepts of economic decision-making from a cash flow view point. It includes present worth analysis, cash flow equivalence, rates of return, replacement analysis, benefit-cost analysis, depreciation and taxes, and projects break-even point, selection, and sensitivity analysis.

**Prerequisite:** Third Year

**ISE 320      Quality Control and Industrial Statistics      (3-0-3)**

Introduction to quality control and process improvement. Cost of quality and the effects of quality on productivity. Concepts of variation. Statistical process control (SPC tools). Control charts for variables and attributes and their applications in process control. Process capability studies. Acceptance sampling. Case studies in applied quality control.

**Prerequisite:** ISE 205

**ISE 322      Manufacturing Technology      (3-3-4)**

Manufacturing methods of metals and plastics including metal casting, forming, machining, welding, and plastic processing. Laboratory experiments and demonstrations in material behavior, forming, casting, welding and machining operations, metrology and dimensional control.

**Prerequisite:** ME 216 and ME 217, CE 101

**ISE 323      Work and Process Improvements      (2-3-3)**

History of Methods Design & Work Measurement Methods design. Process analysis. Operation analysis. Introduction to human engineering. Standardization. Work measurement. Predetermined motion-time systems. Standard data. Work sampling. Term project.

**Prerequisite:** ISE 205

**ISE 325      Engineering Statistics      (3-0-3)**

Review for estimation. Test of hypothesis for single and two samples. Applications of test of hypothesis in engineering. Simple and multiple linear regression and their applications. Design and analysis of single-factor experiments: analysis of variance. Design of experiments with several factors. Case studies in engineering statistics.

**Prerequisite:** ISE 205

**ISE 350      Begin Cooperative Work      (0-0-0)**

See contents in ISE 351.

**Prerequisite:** Same as ISE 351

**ISE 351      Cooperative Work      (0-0-9)**

The Cooperative Work Program accounts for nine (9) credit hours, involves either a team-based or a single student-based project that is geared toward an integrated application of several pieces of Systems Engineering knowledge learned by the student in his undergraduate education thus far. The co-op project must address technical aspects of the practice of Systems Engineering, including analysis, experimentation and design, by utilizing the problem-solving techniques covered in the various required (core) and elective courses offered at the Systems Engineering department.

**Prerequisite:** Completion of 85 Credit Hours, Fulfillment of Departmental Requirements, ENGL 214

**ISE 352      End Cooperative Work      (0-0-0)**

See contents in ISE 351.

**Prerequisite:** Same as ISE 351

**ISE 361      Fundamentals of Data Base Systems      (2-3-3)**

This is a first course in database management systems, teaching database concepts, data modeling and database design. Fundamental database concepts, Relational Data Manipulation,



Data modeling, Capturing Business Rules, Normalization, Database system development process, Transaction, Processing, Distributed Processing, Data Warehouses, and Databases on the Web. Concepts and tools will be integrated in a small-group term project by designing and implementing an actual information system.

**Prerequisite:** Junior Standing

**ISE 390      Seminars      (0-0-0)**

The purpose of this course is to raise students' awareness of contemporary issues in their discipline and otherwise. The student has to attend a required number of seminars, workshops, professional societal meetings or governmental agency conferences; at least half of these should address issues in his discipline. The student has to attend a required number of industrial visits.

**Prerequisite:** Junior Standing

**ISE 391      Industrial Engineering Design      (1-3-2)**

Introduction to engineering design, formulation of design problems, the design process, design phases, IE and the design process, Quality function deployment for specifying design requirements, design strategies, generating alternatives, probabilistic consideration in design, communication issues, design evaluation, selection and implementation. Discussion of case studies including operations systems, manufacturing, quality, ergonomics, layout and scheduling. Includes team project with an application in manufacturing or service industry.

**Prerequisite:** ISE 205, ENGL 214, Junior Standing

**ISE 399      Summer Training      (0-0-0)**

A continuous period of 8 weeks of training spent in industry to gain exposure and appreciation of the systems engineering profession. Students are required to submit a report and make a presentation about their summer training experience and knowledge gained before receiving a grade of Pass or Fail for the course.

**Prerequisite:** Junior Standing, Approval of the Department, ENGL 214

**ISE 402      Production Systems and Inventory Control      (3-0-3)**

Element of functional organization. Forecasting in production systems. Product and process design considerations. Deterministic and stochastic inventory systems. Production scheduling and line balancing. Capacity planning. Material requirement planning (MRP). Computer applications in production control. Case studies and applications.

**Prerequisite:** ISE 205

**ISE 405      Stochastic Systems Simulation      (2-3-3)**

Basic discrete-event simulation modeling, queuing models, simulation languages, review of basic probability and statistics, random-number generators, generating random variables, output data analysis, validation of simulation models. A simulation language is used in the lab to illustrate simulation models on real case studies.

**Prerequisite:** ISE 205

**ISE 411      Productivity Engineering and Management      (3-0-3)**

Introduction to productivity, productivity factors, measurement of productivity, planning for productivity, total productivity model, product base productivity improvement, employer based productivity improvement, productivity improvement programs, case studies and class project.

**Prerequisite:** Junior Standing

**ISE 420      Quality Improvement Methods      (3-0-3)**

Introduction to principles and philosophies of total quality management, advance methods for process control, six sigma approach to quality, Quality function deployment (QFD) and Taguchi approach to quality and parameter optimization.

**Prerequisite:** ISE 320

**ISE 421      Operations Research II      (3-0-3)**

Following topics from operations research with an emphasis on modeling and implementation are covered; integer programming, dynamic programming and nonlinear programming. Implementation using modeling software and spreadsheet is demonstrated on examples and case studies.

**Prerequisite:** ISE 303

**ISE 422      Facility Layout and Location      (3-0-3)**

Introduction to facility planning issues. Material handling. Facility location and layout and computer-aided techniques and packages. Storage and warehousing functions, emphasizing quantitative and simulation techniques.

**Prerequisite:** ISE 303

**ISE 425      Queuing Systems      (3-0-3)**

Introduction to Queuing Models and Their Applications, Elements and Characteristics of Queuing Models, Single Server queue, Birth Death Processes, M/M/1, M/M/s, M/G/1, Little Law, Priority Queues, Network of Queues.

**Prerequisite:** Senior Standing

**ISE 429      Maintenance Planning and Control      (3-0-3)**

Maintenance Organization, Maintenance strategy, Forecasting maintenance work, Maintenance capacity planning, Component replacement decision models, Maintenance Measurement and Standards, Scheduling of maintenance, Maintenance material control, Quality of maintenance jobs, Maintenance productivity, Maintenance audit, Maintenance management information systems, Case Studies.

**Prerequisite:** Senior Standing

**ISE 443      Human Factors Engineering      (2-3-3)**

Study of human response into man-machine systems. Study of visual displays as a medium of input. Auditory and tactual displays. Human control of systems. Control tools and related devices. Applied anthropometry and workplace design. Physical space arrangement, Environment, Illumination, Atmospheric conditions and noise.

**Prerequisite:** ISE 205

**ISE 447      Decision Making      (3-0-3)**

Basic, decision-making model under certainty with multiple criteria as well as under pure Uncertainty, Risk, Risk with information and conflict with single criteria. Structuring decision problems as well as applications in systems engineering are emphasized through problem sets, case studies and term project.

**Prerequisite:** ISE 205, Junior Standing

**ISE 448      Sequencing and Scheduling      (3-0-3)**

Scheduling problems, optimality of schedules, processing, basic single machine results, precedence constraints and efficiency, constructive algorithms for flow-shops and job-shops, dynamic programming approaches, branch and bound methods, integer programming formulations, hard problems and NP-completeness. Heuristic methods: general approaches and worst-case bounds, simulated annealing approach.

**Prerequisite:** ISE 303

**ISE 460      Industrial Process Re-Engineering      (3-0-3)**

Introduction to function and process organization, strategy plan and business context, stockholder analysis, value and non value activities, process identification, process architect and align, understanding of existing process, mapping and process evaluation, measures and target setting, process visioning, process renew and re-engineering, element for essential and sustainability, continues improvements.

**Prerequisite:** ISE 323

**ISE 461      Computer Aided Manufacturing and Robotics      (3-0-3)**

High volume discrete parts production systems. Fundamentals of CAD/CAM. Computers in manufacturing. Computer process monitoring. Systems for manufacturing support. Group technology and integrated manufacturing systems. Case studies for robots in industry. CAD, CAM using computer graphics laboratory.

**Prerequisite:** ISE 322

**ISE 463      Theory of Stochastic Processes      (3-0-3)**

Basic review of probability, statistical independence, conditional expectation and characteristic function. Introduction to stochastic processes, stationarity and ergodicity. Markov chains and Poisson processes. Linear models of continuous- and discrete- time stochastic processes. Engineering applications.

**Prerequisite:** ISE 325

**ISE 464      Industrial Information Systems      (3-3-4)**

Design of industrial information systems. Focus on the planning, control of the flow of engineering and industrial information. Information systems requirements, analysis, and design. Students are required to work on a project of applied nature.

**Prerequisite:** ISE 361

**ISE 465      Industrial Safety      (3-0-3)**

The scope of occupational safety: Human safety, Environmental safety, Setting safety standard: Safety administration, Legal aspect of industrial safety.

**Prerequisites:** Junior Standing

**ISE 470      Supply Chain Systems Modeling      (3-0-3)**

This course adopts a modeling approach to supply chains that is designed to study trade-offs between system costs and customer service. Topics covered include supply chain design, multi-location inventory-distribution models, bullwhip effect, delayed differentiation, and ecommerce and supply chain. The key insights provided by such system-wide models will be illustrated through the use of software packages, real cases discussion and presentations and term projects. In addition, the course will highlight the role of information technology in supporting supply chain operations.

**Corequisite:** ISE 402 or Approval of the Department

**ISE 480 Reliability and Maintainability (3-0-3)**

Introduction to Reliability Engineering, hazard and reliability functions, analyzing reliability data, reliability prediction and modeling, fault tree construction and decision tables, maintainability, maintenance and availability, reliability improvement.

**Prerequisite:** ISE 325

**ISE 490 Senior Design Project (0-0-3)**

A design course that draws upon various components of the undergraduate curriculum. The project typically contains problem definition, analysis, evaluation and selective of alternatives. Real life applications are emphasized where appropriate constraints are considered. Oral presentation and a report are essential for course completion. The work should be supervised by faculty member(s). Team projects are acceptable wherever appropriate.

**Prerequisite:** ISE 390

**ISE 491 Special Topics in Operation Research (3-0-3)**

A course in an area of operation research reflecting current theory and practice.

**Prerequisite:** Approval of the Department

**ISE 492 Special Topics in Production and Quality Control (3-0-3)**

A course in an area of production and quality control reflecting current theory and practice.

**Prerequisite:** Approval of the Department

**ISE 493 Special Topics in Reliability and Maintenance (3-0-3)**

A course in an area of reliability and maintenance reflecting current theory and practice.

**Prerequisite:** Approval of the Department

**ISE 496 Industrial Strategic Planning & Balanced Scorecard (3-0-3)**

Introduction to Strategic Planning and BSC, development of strategy plans, Creating the Strategy Focused Organization, Building Strategy Map, Building Strategy Map for Private sectors, Building Strategy Map for non-profit organizations, Develop Balanced Scorecard Cooperate, Creating Business Unit Synergy (Department BSC), Individual BSC (Defining Personal and Team Objectives).

**Prerequisite:** Senior Standing or Approval of the Department

# MATHEMATICS

## **MATH 001                      Preparatory Mathematics I                      (3-1-4)**

Concepts and manipulations in algebra. Introduction to concepts of calculus. Preparation for rigorous study of mathematics.

## **MATH 002                      Preparatory Mathematics II                      (3-1-4)**

Concepts and manipulations in algebra. Trigonometry. Elementary analytic geometry. Introduction to concepts of calculus. Preparation for rigorous study of mathematics.

**Prerequisite:** MATH 001 or its equivalent.

## **MATH 101                      Calculus I                      (4-0-4)**

Limits and continuity of functions of a single variable. Differentiability. Techniques of differentiation. Implicit differentiation. Local extrema, first and second derivative tests for local extrema. Concavity and inflection points. Curve sketching. Applied extrema problems. The Mean Value Theorem and applications.

**Prerequisite:** One year preparatory mathematics or its equivalent

## **MATH 102                      Calculus II                      (4-0-4)**

Definite and indefinite integrals of functions of a single variable. Fundamental Theorem of Calculus. Techniques of integration. Hyperbolic functions. Applications of the definite integral to area, volume, arc length and surface of revolution. Improper integrals. Sequences and series: convergence tests, integral, comparison, ratio and root tests. Alternating series. Absolute and conditional convergence. Power series. Taylor and Maclaurin series.

**Prerequisite:** MATH 101

## **MATH 131                      Finite Mathematics                      (3-0-3)**

Linear equations and inequalities. Systems of linear equations. Basic material on matrices. Elementary introduction to linear programming. Counting techniques. Permutations and combinations. Probability for finite sample space. Basic concepts in statistics. Topics in the mathematics of finance.

**Prerequisite:** One year preparatory mathematics or its equivalent

## **MATH 132                      Applied Calculus                      (3-0-3)**

The derivative. Rules for differentiation. Derivative of logarithmic, exponential, and trigonometric functions. Differentials. Growth and decay models. Definite and indefinite integrals. Techniques of integration. Integrals involving logarithmic, exponential and trigonometric functions. Integration by tables. Area under a curve and between curves. Functions of several variables. Partial derivatives and their applications to optimization.

**Prerequisite:** One year preparatory mathematics or its equivalent

## **MATH 201                      Calculus III                      (3-0-3)**

Polar coordinates, polar curves, area in polar coordinates. Vectors, lines, planes and surfaces. Cylindrical and spherical coordinates. Functions of two and three variables, limits and continuity. Partial derivatives, directional derivatives. Extrema of functions of two variables. Double integrals, double integrals in polar coordinates. Triple integrals, triple integrals in cylindrical and spherical coordinates.

**Prerequisite:** MATH 102

## **MATH 202                      Elements of Differential Equations                      (3-0-3)**

First order and first degree equations. The homogeneous differential equations with constant coefficients. The methods of undetermined coefficients, reduction of order, and variation of parameters. The Cauchy-Euler equation. Series solutions. Systems of linear differential equations. Applications.

**Prerequisite:** MATH 201

**MATH 232                      Introduction to Sets and Structures                      (3-0-3)**

Elementary logic. Methods of proof. Set theory. Relations and functions. Finite and infinite sets. Equivalence relations and congruence. Divisibility and the fundamental theorem of arithmetic. Well-ordering and axiom of choice. Groups, subgroups, symmetric groups, cyclic groups and order of an element, isomorphisms, cosets and Lagrange's Theorem.

**Prerequisite:** MATH 102

**MATH 260      Introduction to Differential Equations & Linear Algebra                      (3-0-3)**

Systems of linear equations. Rank of matrices. Eigenvalues and eigenvectors. Vector spaces, subspaces, bases, dimensions. Invertible matrices. Similar matrices. Diagonalizable matrices. Block diagonal and Jordan forms. First order differential equations: separable and exact. The homogeneous differential equations with constant coefficients. Wronskian. Non-homogeneous differential equations. Methods of undetermined coefficients and variation of parameters. Systems of differential equations. Non-homogeneous systems.

**Note:** Not to be taken for credit with MATH 202 or MATH 280

**Prerequisite:** MATH 102

**MATH 280                      Introduction to Linear Algebra                      (3-0-3)**

Matrices and systems of linear equations. Vector spaces and subspaces. Linear independence. Basis and dimension. Inner product spaces. The Gram-Schmidt process. Linear transformations. Determinants. Diagonalization. Real quadratic forms.

**Corequisite:** MATH 201

**MATH 301                      Methods of Applied Mathematics                      (3-0-3)**

Special functions. Bessel's functions and Legendre polynomials. Vector analysis including vector fields, divergence, curl, line and surface integrals, Green's, Gauss' and Stokes' theorems. Sturm-Liouville theory. Laplace transforms. Fourier series and transforms. Introduction to partial differential equations and boundary value problems in rectangular, cylindrical and spherical coordinates.

**Prerequisite:** MATH 202 or MATH 260

**MATH 302                      Engineering Mathematics                      (3-0-3)**

Vector analysis including vector fields, gradient, divergence, curl, line and surface integrals, Gauss' and Stokes' theorems. Introduction to complex variables. Vector spaces and subspaces. Linear independence, basis and dimension. Solution of linear equations. Orthogonality. Eigenvalues and eigenvectors. Applications to systems of differential equations.

**Note:** Not to be taken for credit with MATH 280 or MATH 301

**Prerequisite:** MATH 201

**MATH 305                      Development of Mathematics                      (3-0-3)**

History of numeration: Egyptian, Babylonian, Hindu and Arabic contributions. Algebra: including the contributions of Al-Khwarizmi and Ibn Kura. Geometry: areas, approximation of  $\pi$ , the work of Al-Toussi on Euclid's axioms. Analysis. The calculus: Newton, Leibniz,

Gauss. The concept of limit: Cauchy, Laplace. An introduction to some famous old open problems.

**Prerequisite:** MATH 102 or MATH 132

**MATH 311                      Advanced Calculus I                      (3-0-3)**

The real number system. Continuity and limits. Uniform continuity. Differentiability of functions of one variable. Definition, existence and properties of the Riemann integral. The fundamental theorem of calculus. Sequences and series of real numbers.

**Prerequisite:** MATH 232

**MATH 321                      Introduction to Numerical Computing                      (3-0-3)**

Floating-point arithmetic and error analysis. Solution of non-linear equations. Polynomial interpolation. Numerical integration and differentiation. Data fitting. Solution of linear algebraic systems. Initial and boundary value problems of ordinary differential equations.

**Note:** Not to be taken for credit with CISE 301

**Prerequisite:** MATH 201, ICS 101 or ICS 102 or ICS 103

**MATH 322                      Quantitative Methods for Actuaries                      (3-0-3)**

Algorithms; simplex and dual method; linear and quadratic programming; Solution of non-linear equations; finite differences; cubic splines; individual risk models; life tables. Floating-point arithmetic and error analysis. Interpolation. Polynomial interpolation. Numerical integration and differentiation. Data fitting. Solution of linear algebraic systems. Initial and boundary value problems of ordinary differential equations. This course section is designed to meet the Actuarial Science course degree requirement.

**Note:** Not to be taken for credit with Math 321 or CISE 301

**Prerequisite:** MATH 201, ICS 102 or ICS 103

**MATH 330                      Euclidean and Non-Euclidean Geometry                      (3-0-3)**

Axiomatic approach to Euclidean geometry. Use of logic in mathematical reasoning. Hilbert's formulation. Removal of the parallel axiom. The discovery of non-Euclidean geometries. Independence of the parallel postulate. The question of the geometry of physical space. Geometric transformations and invariance under groups of transformations. Hyperbolic geometry.

**Prerequisite:** MATH 232

**MATH 345                      Modern Algebra I                      (3-0-3)**

Review of basic group theory including Lagrange's Theorem. Normal subgroups, factor groups, homomorphisms, fundamental theorem of finite Abelian groups. Examples and basic properties, integral domains and fields, ideal and factor rings, homomorphisms. Polynomials, factorization of polynomials over a field, factor rings of polynomials over a field. Irreducibles and unique factorization, principal ideal domains.

**Prerequisite:** MATH 232

**MATH 355                      Linear Algebra                      (3-0-3)**

Theory of vector spaces and linear transformations. Direct sums. Inner product spaces. The dual space. Bilinear forms. Polynomials and matrices. Triangulation of matrices and linear transformations. Hamilton-Cayley theorem.

**Prerequisite:** MATH 280

**MATH 399                      Summer Training                      (0-0-2)**

Students are required to spend one summer working in industry prior to the term in which they expect to graduate. Students are required to submit a report and make a presentation on their summer training experience and the knowledge gained.

**Prerequisite:** ENGL 214, Junior Standing, Approval of the Department

**MATH 401                      Methods of Applied Mathematics II                      (3-0-3)**

Introduction to linear spaces and Hilbert spaces. Strong and weak convergence. Orthogonal and orthonormal systems. Integral Equations: Fredholm and Volterra equations. Green's Function: Idea of distributions, properties of Green's function and construction. Any one of the following topics: Asymptotic Methods: Laplace method, Steepest descent method, Perturbation Theory: regular and singular perturbations, Integral Transforms: Fourier, Laplace, Mellin and Hankel transforms.

**Prerequisite:** MATH 301

**MATH 411                      Advanced Calculus II                      (3-0-3)**

Theory of sequences and series of functions. Continuity and differentiability of functions of several variables. Partial derivatives. The Chain rule. Taylor's theorem. Maxima and minima. Integration of functions of several variables. Convergence and divergence of improper integrals. Derivative of functions defined by improper integrals.

**Prerequisite:** MATH 311

**MATH 412                      Advanced Calculus III                      (3-0-3)**

Functions of bounded variation. The Riemann-Stieltjes integral. Implicit and inverse function theorems. Lagrange multipliers. Change of variables in multiple integrals. Vector functions and fields on  $\mathbb{R}^n$ . Line and surface integrals. Green's theorem. Divergence theorem. Stokes' theorem.

**Prerequisite:** MATH 411

**MATH 421                      Introduction to Topology                      (3-0-3)**

Topological Spaces: Basis for a topology, The order topology. The subspace topology. Closed sets and limit points. Continuous functions. The product topology, The metric topology. Connected spaces. Compact spaces. Limit point compactness. The countability axioms. The separation axioms. The Urysohn lemma. The Urysohn metrization theorem. Complete metric spaces.

**Prerequisite:** MATH 311

**MATH 425                      Graph Theory                      (3-0-3)**

Graphs and digraphs. Degree sequences, paths, cycles, cut-vertices, and blocks. Eulerian graphs and digraphs. Trees, incidence matrix, cut-matrix, circuit matrix and adjacency matrix. Orthogonality relation. Decomposition, Euler formula, planar and nonplanar graphs. Menger's theorem. Hamiltonian graphs.

**Prerequisite:** MATH 260 or MATH 280 or MATH 302

**MATH 430                      Introduction to Complex Variables                      (3-0-3)**

Complex numbers and the complex plane. Arguments and roots, roots of unity. De Moivre's theorem. Basic topological definitions. Analytic functions. Limits. Continuity. Differentiability. Cauchy-Riemann conditions. Elementary functions. Branch cuts. Convergence of complex series. Complex integration. Cauchy's theorem. Cauchy's integral formula. Morera's and Liouville's theorems. Taylor's and Laurent's series. Residues and



poles. Rouché's theorem. Fundamental theorem of algebra. Evaluation of improper integrals. Meromorphic functions. Basic concepts of conformal mapping.

**Prerequisite:** MATH 201

**MATH 431 Introduction to Measure Theory and Function Analysis (3-0-3)**

Lebesgue integrable functions. Fatou's lemma. Dominated convergence theorem. Measurable functions. Measurable sets, non-measurable sets. Egoroff's theorem. Convergence in measure.  $L_p$ -spaces, Riesz-Fischer theorem, geometry of Hilbert spaces. Orthonormal sequences. Fourier series. Bounded linear functionals. Hahn-Banach theorem. Linear functionals on Hilbert and  $L_p$ -spaces.

**Prerequisite:** MATH 311

**MATH 440 Differential Geometry (3-0-3)**

Manifolds in  $\mathbb{R}^n$  and their orientability. Tensor fields. Curves in 3-dimensional Euclidean space: the Frenet frame and formulae, curvature and torsion, natural equations. Surfaces in 3-dimensional Euclidean space: the first and second fundamental forms, the classification of surfaces, the fundamental theorem.

**Prerequisite:** MATH 260 or MATH 280 or MATH 302

**MATH 442 Calculus of Variations and Optimal Control (3-0-3)**

Introduction to the calculus of variations. Euler-Lagrange, Weierstrass, Legendre and Jacobi necessary conditions. Formulation of optimal control problems. Bolza, Mayer and Lagrange formulations. Variational approach to optimal control. Pontryagin maximum principle.

**Prerequisite:** MATH 202

**MATH 450 Modern Algebra II (3-0-3)**

Finite and finitely generated Abelian groups. Solvable groups. Nilpotent groups. Sylow theorems. Factorization in integral domains. Principal ideal domains. Fields. Field extensions. Finite fields. An introduction to Galois theory.

**Prerequisite:** MATH 345

**MATH 452 Applied Algebra (3-0-3)**

Boolean algebras. Symmetry groups in three dimensions. Polya-Burnside method of enumeration. Monoids and machines. Introduction to automata theory. Error correcting codes.

**Prerequisite:** MATH 345

**MATH 455 Number Theory (3-0-3)**

Divisibility and primes. Congruences. Positive roots. Quadratic reciprocity. Arithmetic functions. Diophantine equations. Applications (e.g. cryptography or rational approximations).

**Prerequisite:** MATH 232 or Senior Standing

**MATH 460 Applied Matrix Theory (3-0-3)**

Review of the theory of linear systems. Eigenvalues and eigenvectors. The Jordan canonical form. Bilinear and quadratic forms. Matrix analysis of differential equations. Variational principles and perturbation theory: the Courant minimax theorem, Weyl's inequalities, Gershgorin's theorem, perturbations of the spectrum, vector norms and related matrix norms, the condition number of a matrix.

**Prerequisite:** MATH 260 or MATH 280 or MATH 302

**MATH 465                    Ordinary Differential Equations                    (3-0-3)**

Existence, uniqueness and continuation of solutions to initial value problems: scalar, 1st order systems and linear systems. Linear systems: solution matrix, fundamental solution matrix. Variation of constants method. Phase space analysis. Autonomous systems. Definitions of Stability. Stability for linear and almost linear systems. Basic concepts of Liapunov's method.

**Prerequisite:** MATH 202, MATH 280

**MATH 470                    Partial Differential Equations                    (3-0-3)**

First order quasilinear equations. Lagrange method and Characteristics. Classification of linear second order PDEs. Brief review of separation of variables. The one dimensional wave equation: its solution and characteristics. Cauchy problem for the wave equation. Laplace's equation: The maximum principle, uniqueness theorems. Green's function. Neumann's function. The heat equation in one dimension.

**Prerequisite:** MATH 301

**MATH 471                    Numerical Analysis I                    (3-0-3)**

Floating-point, round-off analysis. Solution of linear algebraic systems: Gaussian elimination and LU decomposition, condition of a linear system, error analysis of Gaussian elimination, iterative improvement. Least squares and singular value decomposition. Matrix eigenvalue problems.

**Prerequisite:** MATH 321 or CISE 301

**MATH 472                    Numerical Analysis II                    (3-0-3)**

Approximation of functions: Polynomial interpolation, spline interpolation, least squares theory, adaptive approximation. Differentiation. Integration: basic and composite rules, Gaussian quadrature, Romberg integration, adaptive quadrature. Solution of ODEs: Euler, Taylor series and Runge-Kutta methods for IVPs, multistep methods for IVPs, systems of higher-order ODEs. Shooting, finite difference and collocation methods for BVPs. Stiff equations.

**Prerequisite:** MATH 321 or CISE 301

**MATH 480                    Linear & Nonlinear Programming                    (3-0-3)**

Formulation of linear programs. Basic properties of linear programs. The simplex method. Duality. Necessary and sufficient conditions for unconstrained problems. Minimization of convex functions. A method of solving unconstrained problems. Equality and inequality constrained optimization. The Lagrange multipliers theorem. The Kuhn-Tucker conditions. A method of solving constrained problems.

**Prerequisite:** Junior Standing

**MATH 485                    Wavelets and Applications                    (3-0-3)**

Wavelets. Wavelet transforms. Multiresolution analysis. Discrete wavelet transform. Fast wavelet transform. Wavelet decomposition and reconstruction. Applications such as boundary value problems, data compression, etc.

**Prerequisite:** MATH 301 or EE 207 or CISE 315

**MATH 490                    Seminar in Mathematics                    (1-0-1)**

This course provides a forum for the exchange of mathematical ideas between faculty and students under the guidance of the course instructor. The instructor arranges weekly presentations by himself, other faculty members and/or students, of lectures or discussions on topics or problems of general interest. The course culminates in the presentation by each

**Prerequisite:** Any two of MATH 301, MATH 311, MATH 321, MATH 345

Industrial and environmental problems. Theoretical foundations and computational methods involving ordinary and partial differential equations.

Variable contents. Open for Senior students interested in studying an advanced topic in mathematics with a departmental faculty member.

**Prerequisite:** Senior Standing, Permission of the Department Chairman upon recommendation of the instructor.

# MECHANICAL ENGINEERING

**ME 201**                      **Dynamics**                      **(3-0-3)**

Kinematics of rectilinear and curvilinear motion of particles. Dynamics of particles and systems of particles. Kinematics of rotation and plane motion of rigid bodies. Work and energy relations. Impulse and momentum principles. Dynamics of rigid bodies in plane motion.

**Prerequisite:** CE 201

<b>ME 203</b>	<b>Thermodynamics I</b>	<b>(3-0-3)</b>
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System and control volume concepts. Properties of a pure substance. Work and heat. The first law of thermodynamics as applied to a system and a control volume, internal energy, enthalpy. The second law of thermodynamics. Carnot cycle, entropy, reversible and irreversible processes. Applications of steady-state, steady-flow, uniform-state, uniform-flow, and other processes.

**Prerequisite:** MATH 102, PHYS 102

<b>ME 204</b>	<b>Thermodynamics II</b>	<b>(3-0-3)</b>
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Vapor power cycles, Rankine, reheat, and regenerative cycles. Maxwell relations, ideal and real gases, equations of state, generalized charts. Gas-vapor mixtures, psychrometric charts, ideal solutions. Chemical reactions. Fuels and combustion processes.

**Prerequisite:** ME 203

**ME 205**                      **Materials Science**                      **(2-3-3)**

Introduction to the properties of engineering materials: mechanical, electrical, and chemical. Fundamentals of crystallography. Impurities and imperfections in solids. Atomic vibrations and diffusion. Single phase metals and alloys; elastic and plastic deformation, recrystallization, fracture, fatigue, and creep. Multiphase materials; phase diagrams with emphasis on iron-iron carbide system. Heat treatment processes such as annealing, normalizing, and quenching. Studies of widely used engineering materials; steels, plastics, ceramics, concrete, and wood.

**Note:** For non ME students

**Prerequisite:** CHEM 102, MATH 102

**ME 210                      Mechanical Engineering Drawing & Graphics                      (2-3-3)**

Graphical Interpretation of machine components and assemblies through the study of orthographic projection to include auxiliary views; section drawings and full dimensioning; translation of design instruction into detailed and assembly drawings; drawing conventions including weldments, piping, referencing and surface finish notation; selection of tolerances based on design requirements.

**ME 216                      Materials Science and Engineering                      (3-0-3)**

Atomic bonding in solids, bonding forces and energies, primary and secondary bonds. The structure of crystalline solids, lattice, unit cell, and crystal systems, density computation, crystal directions and planes, linear and planar atomic densities. Impurities and imperfections in solids: point, line and interfacial defects. Atomic vibration and diffusion. Mechanical properties of materials. Elastic and plastic deformation and recrystallization. Phase diagrams of single phase & multiphase materials with emphasis on iron-iron carbide system (steel & cast iron). Thermal processing of metals & alloys: annealing, normalizing, quenching and tempering, composite materials, polymers. Impact, fracture, fatigue and creep properties and introduction to fracture mechanics.

**Corequisite : ME 217**

**Prerequisite:** CHEM 101, MATH 102, PHYS 102

**ME 217                      Materials Lab                      (0-3-1)**

The laboratory experiments are focused on introducing the basic techniques of metallographic, sectioning, polishing, etching, light metallographic and microstructure analysis. Determining mechanical properties (hardness, tensile, fatigue and creep properties) of steels, cast irons and non ferrous as well as some polymeric materials and their structure properties relationship. Emphasizing and illustrating importance of these properties in manufacturing and design. Simple spread sheet based data analysis using the hardness, tensile, fatigue and creep tests results.

**Corequisite :** ME 216

**ME 218                      Introduction to Mechanical Engineering Design                      (1-3-2)**

Tools for design process; Introduction to Mechanical engineering design process; Applications of scientific and engineering tools; Open-ended problem solving; Team-based projects; Design for manufacture; Ethical issues in design process; Communication skills.

**Prerequisite:** PHYS 102, ME 210

**ME 307                      Machine Design I                      (3-0-3)**

Design process, review of stress, strain and deformation analysis as applied to mechanical design; properties of materials; review of static failure theories; designing against fatigue failures; element design; shafts, keys, couplings, power screws; bolted, riveted and welded joints.

**Corequisite :** ME 322, ME 323

**Prerequisite:** ME 218, CE 203

**ME 308                      Machine Design II                      (3-3-4)**

Design of elements: bearings (journal and anti-friction), springs, spur, helical, bevel and worm gears; flexible drives (belts and chains); clutches and brakes; design optimization. Laboratory sessions to supplement and to apply the material covered in the lectures. Consideration of manufacturing aspects of the design (limits and fits). Study of projects considering the different stages of their design, manufacturing and assembly.

**Prerequisite:** ME 307

**ME 309                      Mechanics of Machines                      (3-0-3)**

Kinematics of mechanisms, vector method of analysis of plane mechanisms. Static and dynamic analysis of machines, inertia forces, gyroscopic forces. Static and dynamic balancing, balancing machines. Dynamics and balancing of reciprocating engines. Flywheels, kinematic and dynamic analysis of cam mechanisms. Elements of mechanical vibrations, critical speeds and torsional vibrations.

**Prerequisite:** ME 201

**ME 311                      Fluid Mechanics                      (3-0-3)**

Definition and properties of fluids. Fluid statics with applications. Basic fluid dynamic equations of continuity, energy and momentum with applications to different flow situations and flow measurement. Viscous effects, boundary-layer concepts, laminar and turbulent flow in pipes, open channel flow, fluid dynamics forces on immersed bodies. Modeling and dimensional similarity. Introduction to turbomachinery.

**Prerequisite:** MATH 201, ME 201, ME 203

**ME 315                      Heat Transfer                      (3-0-3)**

An introduction to heat transfer by conduction, radiation, and convection. Steady-state solution for heat conduction applied to wall and pipe insulation, heat sources, and extended surfaces (fins). Unsteady heat transfer to plates, cylinders and spheres (Heisler charts). Black and gray body radiation systems and electric network analogy. Practical hydraulic and thermal analysis of forced and natural convection system with application to heat exchangers.

**Prerequisite:** ME 311

**ME 316                      Thermofluids Lab                      (0-3-1)**

This lab course will deal with equal emphasis on fluid mechanics and heat transfer. All experiments conducted in this lab combine elements of theory and practice. Many of the concepts and basic theories which the student learns in the lectures of ME 311 and ME 315 are demonstrated and confirmed in the lab through different experiments.

**Corequisite:** ME 315

**Prerequisite:** ME 311

**ME 322                      Manufacturing Processes                      (3-0-3)**

Manufacturing methods of metals and plastics including: metal casting, bulk forming, sheet metal forming, machining, welding, and plastic processing. Both quantitative and qualitative study of manufacturing processes with emphasis on process selection for optimum design.

**Corequisite:** ME 323

**Prerequisite:** CE 101 or ME 210, ME 216, ME 217

**ME 323                      Manufacturing Lab                      (0-3-1)**

This lab course is a co requisite of ME 322. The laboratory experiments and demonstrations are focused on lab learning of various manufacturing processes –mainly casting, welding, sheet metal , extrusion ,forging, polymers processing, precision measurements and metrology – dimensional variability modeling, machining (turning, drilling, and Milling) processes and Process Capability, CAD /CAM and CNC machining demonstration – Using the spreadsheet based data analysis of experimental data obtained in various experiments. Possible Industrial trips

**Corequisite:** ME 322

**Prerequisite :** CE 101 or ME 210, ME 216, ME 217

**ME 350                      Begin Cooperative Work                      (0-0-0)**

See contents in ME 351.

**Prerequisite:** Same as in ME 351

**ME 351                      Cooperative Work                      (0-0-9)**

A period of 28 weeks of industrial employment for Applied Mechanical Engineering students to work in appropriate industries or firms. Students are evaluated on their performance on the job and are required to submit an extensive formal report on their experience.

**Prerequisite:** ENGL 214, ME 307, ME 309, ME 315

**ME 352                      End Cooperative Work                      (0-0-0)**

See contents in ME 351.

**Prerequisite:** Same as in ME 351

**ME 399                      Summer Training                      (0-0-0)**

A continuous period of 8 weeks of summer training spent in the industry working in any of the fields of mechanical engineering. The training should be carried out in an organization with an interest in one or more of these fields. On completion of the program, the student is required to submit a formal written report of his work.

**Prerequisite:** ENGL 214, Junior Standing, Approval of the Department

**ME 406                      Manufacturing and Design                      (3-0-3)**

Dimensional metrology, basic statistical concepts in characterizing the variability of measurements, and introduction to statistical manufacturing process control. Process capability analysis. Design considerations in manufacturing. Abrasive machining and non-traditional metal removal processes, CAD/CAM - Numerical Control machining. Powder metal processing. Manufacturing with Polymers, Rapid Prototyping. Design for Manufacturability and Economics of Manufacturing. Design and Manufacturing Case Studies.

**Corequisite:** ME 407

**Prerequisite:** (ME 322 and ME 323) or ISE 322

**ME 407                      Advanced Manufacturing Lab                      (0-3-1)**

Laboratory demonstrations and experiments and hands on experience of: Measurements (Dimensional Metrology), Variability and Distributions, Manufacturing Tolerances and Process Capability Studies, Surface Roughness Analysis ,Experimental Data Analysis to Develop Empirical Models-Use of Excel, and other statistical software's, Advanced Experiments in Machining .Machining Forces and Torque Models. Non Traditional manufacturing, CAD/CAM and CNC machining, Polymers processing and Rapid Prototyping. Integrated Manufacturing Project.

**Corequisite:** ME 406

**Prerequisite:** (ME 322 and ME 323) or ISE 322

**ME 408                      Rapid Prototyping and Digital Manufacturing                      (2-3-3)**

The Rapid Prototyping course highlights the many technologies (3D Printing, SLA, SLS, SLM, LOM, and FDM) and concept modeling, rapid prototyping and digital manufacturing technologies, along with common features, that are available within the industry. Preparation, consideration factors, and analysis of rapid prototyping and other valuable topics are included in the course. Advantages and limitations of the various rapid prototyping technologies. Rapid tooling. Making informed rapid prototyping choices. Group projects to gain hands on experience in Rapid Prototyping and parts realization.

**Prerequisite:** Senior Standing, ME 322, ME 323

**ME 409                      Design and Manufacturing of Composite Structures                      (3-0-3)**

This course provides basic competency in the design and manufacture of fiber-reinforced polymer composite structures. It will provide knowledge and understanding of the key aspects of composites design and various methods of composites manufacture. In addition, the course will introduce micromechanics, mechanical performance, durability, repair, recycling and applications of composites.

**Prerequisite:** Senior Standing

**ME 410                      Ceramics                      (3-0-3)**

Fundamentals of ceramic materials including: atomic bonding, crystal structure, defects, physical properties, phase diagrams, and ceramic microstructure; Classification of ceramic materials including oxides, silicates, carbides, nitrides, glasses, cements, clays, refractories, and

glass-ceramics; Ceramic synthesis and processing; Ceramic properties including mechanical, thermal, dielectric, magnetic, and optical.

**Prerequisite:** (ME 216 and ME 217) or ME 205

**ME 411                      Senior Design Project I                      (1-0-1)**

This capstone design project course integrates various components of the curriculum in comprehensive engineering experience so that the basic sciences, mathematics, and engineering sciences which the student has learned in his freshman-to-senior years of study can be applied. It considers design of a complete project or system including establishment of objectives and criteria, formulation of the problem statements, preparation of specifications, consideration of alternative solutions, feasibility considerations, and detailed engineering designs. The design should take into consideration appropriate constraints such as economic factors, safety, reliability, ethics and environmental and social impact. Submission of a written report is an essential requirement for completion of the course. Team design projects, where appropriate, are highly encouraged.

**Prerequisite:** Senior Standing

**ME 412                      Senior Design Project II                      (0-6-2)**

Continuation and completion of project started in ME 411. Oral presentation and submission of final written report of the design project are essential requirements for the completion of the course.

**Prerequisite:** ME 411

**ME 413                      Systems Dynamics and Control                      (2-3-3)**

Dynamics of mechanical, fluid, electrical and thermal systems. Equations of motion. Dynamic response to elementary systems. Transfer functions and pole-zero diagrams. Simulation of dynamics of complex systems. Dynamic stability of systems. Open and closed-loop systems. Basic control actions. Laboratory sessions involve use of computers for simulation of dynamic systems and analysis of control systems.

**Prerequisite:** MATH 301, ME 201

**ME 414                      Design Project I                      (1-0-1)**

This is first part of AME specific Capstone Design Project course introduced to prepare a professionally written ME416 proposal by the project team and advisor as prerequisite course for ME416. This course will facilitate the ground work completed in every respect to complete the meaningful projects in ME 416 from the day 1 of the project. And the proposal should be in a prescribed form with Gantt chart, and budget with material procurement forms (strategy and approval of ME workshop as well as other lab resources commitment), expected project deliverables and well defined roles of multiple faculty (if involved) in supervision of the project. The video lectures of the ME 414 with all prescribed forms with instructions will be available to all the enrolled students on the Web with some model (sample) project proposals. Team design projects, where appropriate, are highly encouraged. Students will work closely with their project adviser and are expected to spend about 3 hours per week /per student on the project.

**Corequisite:** ME 307

**ME 416                      Design Project II                      (0-6-2)**

The second part of this capstone design project course is completed in semester following the COOP Training and integrates various components of the curriculum in comprehensive engineering experience so that the basic sciences, mathematics, and engineering sciences which the student has learned in his freshman-to-senior years of study can be applied. It considers



design of a complete project or system including establishment of objectives and criteria, formulation of the problem statements, preparation of specifications, consideration of alternative solutions, feasibility considerations, and detailed engineering designs. The design should take into consideration appropriate constraints such as economic factors, safety, reliability, ethics and environmental and social impact. Oral presentation and submission of final written report of the design project are essential requirements for the completion of the course. Students Project Team will work closely with their project adviser and are expected to spend about 6 hours per week /per student on the project.

**Prerequisite:** ME 414

**ME 422                      Propulsion Systems                      (3-0-3)**

Aerothermodynamics of aerospace vehicle engines, combustion, thrust and efficiency. Gas turbine engines: turbojet, turbofan, turboprop; ramjet and scramjet, typical engine performance. Aerothermodynamics of inlets, combustors and nozzles. Introduction to propellers, turbocompressors and turbines. Introduction to rockets and performances of rocket vehicle engines. Chemical and electrical driven rocket engines.

**Note:** Not to be taken for credit with AE 422

**Prerequisite:** ME 204, ME 311

**ME 423                      Energy Conversion                      (3-0-3)**

Energy sources and their classification. Conventional energy conversion; power plant and vapor cycles. Renewable energy; solar energy with emphasis on solar cells, wind energy, OTEC systems, geothermal energy. Nuclear fission and types of fission reactors.

**Prerequisite:** ME 204, ME 315

**ME 424                      Maintenance Engineering                      (3-0-3)**

Introduction to maintenance engineering; Condition monitoring of machines, plants & structures, various methods of condition monitoring: vibration acoustic emission, temperature, etc. and their practical applications. Interpreting the results of condition monitoring. Economics of Maintenance, Optimal maintenance strategies: Inspection intervals planning for maintenance crew, forecasting the spare parts and determining optimal stocking policy.

**Corequisite:** Senior Standing in ME or AME

**ME 425                      Compressible Fluid Flow                      (3-0-3)**

Fundamentals of compressible fluid flow (gas dynamics) in relation to effects of area change (nozzles and diffusers), friction and heat interaction (Fanno and Rayleigh lines and isothermal flow), combustion waves (deflagration, explosion and detonation waves), normal and oblique shock waves and their effects on flow properties (extended diffusers and supersonic airfoils). Applications to flow through pipelines, subsonic, sonic and supersonic flights, turbomachinery and combustion.

**Note:** Not to be taken for credit with AE 325

**Prerequisite:** ME 311

**ME 427                      Turbomachinery                      (3-0-3)**

Thermo-fluid dynamics aspects of fluid flow, kinematic relations and efficiencies of turbomachines. Two dimensional cascades; Turbine and Compressor cascade correlations and performance. Axial Turbines (two dimensional analysis), Axial Flow Compressors and Fans (two dimensional analysis), Centrifugal Compressors and Fans, Radial Flow Turbines, and preliminary design fundamentals of turbomachines and three dimensional considerations.

**Prerequisite:** ME 204, ME 311

**ME 428                      Structure of Flight Vehicles                      (3-0-3)**

Statically determinate and indeterminate structures; aerodynamic and inertia loads, load factors; elasticity of structures, stress-strain relationships; mechanical properties of vehicle materials; fatigue; strength-weight comparisons of materials; sandwich constructions; stresses in beams, shear flow in thin webs, closed-section box beams; deflection analysis of structural systems; Castigliano's theorems, Rayleigh-Ritz method, finite difference method; redundancy in structures.

**Note:** Not to be taken for credit with AE 328

**Prerequisite:** CE 203

**ME 430                      Air Conditioning                      (3-0-3)**

Thermodynamics of moist air; construction of the psychrometric chart; psychrometric processes; psychrometric systems; industrial processes, air conditioning systems; Air Conditioning for comfort and health- Indoor air quality, cooling and heating load calculations, duct design and air distribution methods; cooling towers.

**Prerequisite:** ME 204, ME 315

**ME 431                      Refrigeration                      (3-0-3)**

Mechanical vapor compression refrigeration cycles (single-stage and multi-stage); refrigerant compressors; refrigerants; absorption refrigeration systems; thermoelectric cooling; flash cooling; gas cycle refrigeration; ultra-low-temperature refrigeration (cryogenics); food refrigeration; transport refrigeration; Design and performance evaluation problems in refrigeration systems and applications.

**Prerequisite:** ME 204, ME 315

**ME 432                      Internal Combustion Engines                      (3-0-3)**

Types of engines and their operation; Four and two stroke engines; Thermodynamics of engine cycles; Engine design and performance parameters; Operating characteristics of spark and compression ignition engines; Thermochemistry in-cylinder combustion and combustion abnormalities; Analysis of fuel-air cycles; Analysis of intake, fuel and exhaust systems; Turbocharging and supercharging; Performance characteristics of actual engines.

**Prerequisite:** ME 204

**ME 433                      Fundamentals of Combustion                      (3-0-3)**

Combustion modes. Chemical thermodynamics and chemical kinetics. Conservation equations of reacting flows. Multi-species transport. Ignition, flammability, and extinction. Premixed and Non-premixed flames. Combustion instabilities. Turbulent combustion. Liquid and solid burning. Pollutant Emissions.

**Prerequisite:** ME 204

**ME 434                      Wind Engineering                      (3-0-3)**

Wind characteristics, boundary layer, turbulence, surface roughness, and measurements. Loads on static structures, wind tunnel modeling, wind induced vibrations, flutter, buffeting. Additional selected topics such as airborne pollution, sand motion, vehicle aerodynamics.

**Prerequisite:** ME 311

**ME 435                      Thermal Power Plants                      (2-3-3)**

Forms of energy, oil, gas and coal. Combustion processes, energy cycles. Steam generators and their component design, turbines, load curves. Field trips to power plants and other energy installations during laboratory hours.

**Prerequisite:** ME 204, ME 315

**ME 436                      Fluid Power Systems                      (3-0-3)**

Study of fluid power systems as used in industrial applications to transmit power by the flow of hydraulic fluids. Fluid power circuit diagrams including components such as valves, pumps, motors, filters, reservoirs and accumulators. Analysis of fluid leakage, hydrostatic transmissions, hydraulic stiffness, and performance of positive displacement pumps and motors.

**Prerequisite:** ME 311

**ME 437                      Design and Rating of Heat Exchangers                      (3-0-3)**

Heat transfer mechanism leading to basic heat exchanger equations; classification and analyses of heat exchangers including geometry; heat transfer and flow friction characteristics; compact and shell and tube heat exchanger application and design procedures; fouling and its effect on life cycle analysis; maintenance methodology; flow induced vibration and noise in heat exchangers.

**Prerequisite:** ME 315

**ME 438                      Pumping Machinery                      (3-0-3)**

Terminology and description of typical pump machinery. Momentum and energy transfer between fluid and rotor; Performance characteristics of centrifugal and axial flow fans, compressors and pumps; Various types of losses; Axial and radial thrust in dynamic pumps and thrust balancing device; Common problems in centrifugal pump operation; Positive displacement pumps; Water hammer problems in pump systems; Special problems in pump design and applications.

**Prerequisite:** ME 311

**ME 439                      Solar Energy Conversion                      (3-0-3)**

Thermal aspects of solar energy conversion. Solar radiation measurement and prediction. Selected topics in heat transfer. Flat plate and focusing collector analysis. Solar energy storage. Solar systems including hot water, space heating and cooling, distillation and thermal power conversion.

**Prerequisite:** ME 315

**ME 440                      Convective Heat and Mass Transfer                      (3-0-3)**

Boundary layers; laminar boundary layer heat transfer; turbulent boundary layer heat transfer; free convection boundary layers; enclosures; convection mass transfer; boiling and condensation; pool boiling; two-phase flow; laminar and turbulent film condensation.

**Prerequisite:** ME 315

**ME 441                      Energy and the Environment                      (3-0-3)**

General introduction. Engineering and environment. Overview of environmental issues. Case studies in design for the environment. Automobiles and the environment. Batteries and the environment. Power plants and the environment. Refrigeration and the environment. Environmental life cycle assessments. Pollution control technologies and instrumentation. Thermodynamic assessment of environmental impacts. Case studies in mechanical engineering for environmental modeling. Smog control. CFCs and ozone layer. Acid rain. Global warming

and climate change. Toxic metals. Environmental policy. Economic analysis. Environmental risk and decision.

**Prerequisite:** ME 203 or equivalent

**ME 442                      Design of PV-Solar Systems                      (3-0-3)**

The design of photovoltaic solar systems course covers the principles of photovoltaics and how to effectively incorporate photovoltaic systems with emphasis on stand-alone systems with a brief introduction to grid connected electrical systems. The content of the course includes system advantages and disadvantages, site evaluation, component operation, system design and sizing, installation requirements and recommended practices for important applications. Topics include : Introduction to Photovoltaic Systems, Solar Radiation, Site Surveys and Preplanning for Photovoltaic Systems, Photovoltaic System Components and Configurations, Cells, Modules, and Arrays for Photovoltaic Systems ,Batteries, Charge Controllers ,and Inverters , Photovoltaic System Sizing, Photovoltaic Systems Mechanical Integration, Photovoltaic Systems Electrical Integration, Installation, Commissioning, Maintenance, and Troubleshooting, Photovoltaic Systems Economic Analysis . PV Systems Design Software will be used throughout the course.

**Prerequisite:** Senior Standing, EE 204, EE 306

**ME 443                      Mechanics of Robotic Manipulators                      (3-0-3)**

Basic configurations of robots and their industrial applications, Kinematics of robotic manipulators; coordinate transformations and workspace calculations, Robotic forces, moments, torques and compliant motions, Introduction to robot motion dynamics and control.

**Prerequisite:** ME 309

**ME 444                      Introduction to Mechatronics                      (2-3-3)**

A multidisciplinary course that introduces the design and realization of mechatronics; Electro-mechanical systems controlled by microcontroller technology; Instrumentation and measurement system analysis and design; sensors and actuators; computer data acquisition and control; The integration of mechanisms, materials, sensors, interfaces, actuators, microcontrollers, and information technology.

**Prerequisite:** EE 202 or EE 204, Junior Standing

**ME 445                      Principles of Nanostructure Materials & Sensor Technology                      (3-0-3)**

Technological needs, justification and scope; Nanostructure materials and their properties; Top down and bottom up manufacturing techniques as typified by electrochemical and laser machining, chemical vapor deposition (CVD), Physical vapor deposition (PVD), Sputtering, Sol-gel synthesis and Ball milling; Industrial applications and future potential; Introduction to sensor basics; Primary sensor mechanisms, electrical measurement techniques, Characterization of sensors, Sensor fabrication principles; Enabling technologies; Applications in Saudi oil, gas, petrochemical industry and utilities.

**Prerequisite:** (ME 216 and ME 217) or ME 205

**ME 446                      Computational Fluid Dynamics and Heat Transfer                      (3-0-3)**

Introduction to computational fluid dynamics as an engineering tool for the analysis and design of thermal-fluid systems; Fundamental equations of fluid mechanics in differential and integral form and common approximations; Discretization and solution methods for incompressible flow; Application of numerical techniques to the solution of some practical fluid flow and heat transfer problem; Turbulence models and their implementation in CFD; Application of commercial CFD codes to illustrative fluid flow and heat transfer problems.

**Prerequisite:** ME 315

**ME 450                      Mechanical Engineering Experimentation                      (2-3-3)**

Functional description of measuring instruments. Performance characteristics of instruments. Planning of experiments. Analysis of experimental data. Data acquisition and processing. Measuring devices for Mechanical Engineering applications and selected experiments.

**Prerequisite:** EE 202 or EE 204, ME 316

**ME 451                      Design and Analysis of Engineering Experiments                      (3-0-3)**

The course deals with basic statistics, design of experiments, uncertainty and error analysis general characteristics of measurement systems, statistical analysis of experimental data, empirical modeling, experimental uncertainty analysis, as well as guidelines for planning and documenting experiments. Illustrative examples from industry and case studies of planned engineering experiments.

**Prerequisite:** EE 204, ME 307, ME 315

**ME 452                      Measurements and Lab Project                      (0-3-1)**

Basic instrumentation and measurements in conducting the experiments -such as force, displacement, pressure, temperature, humidity, fluid level, fluid velocity, and flow rate, etc. Output signals, computerized data acquisition systems. Last 5 lab sessions will be devoted to group projects to integrate the knowledge in developing experimental system and experimental strategy (in ME 451 and ME452) in any of the following area: vibration analysis and condition monitoring, thermo fluid, manufacturing processes, materials testing, and characterization, or industry. Projects will be planned by course instructors a head of time (semester prior to teaching) in collaboration with other (Guest) faculty member or specialist from industry). The projects will be assigned at the beginning of the course.

**Corequisite:** ME 451

**ME 459                      Design and Operation of Renewable Energy Systems                      (3-0-3)**

The course is primarily devoted to wind power and solar photovoltaic technologies, their engineering fundamentals, conversion characteristics, operational considerations to maximize output, and emerging trends. Explores all aspects of a variety of wind and solar energy systems, including both stand-alone and grid-connected systems. The discussion of wind power includes the theory of induction machine performance and operation as well as generator speed control, while the solar PV section includes array design, environmental variables, and sun-tracking methods. Latest technologies and developments in the field contra-rotating wind turbines, offshore wind farms, and photovoltaic technologies. Determining economic profitability of potential RE energy projects primarily wind and solar. Use of software tools in integrating the components of RE projects including energy storage, power electronics, and design of both stand alone and grid connected system, plant economics.

**Prerequisite:** Senior Standing, EE 204, EE 306

**ME 460                      Thermal Desalination Systems                      (3-0-3)**

Seawater composition. The need for water desalination. Classification of desalination processes. Single effect evaporation. Thermal vapor compression systems. Multiple effect evaporation. Multistage flash distillation, once through MSF, Brine mixing and recirculation MSF. Reverse osmosis. Desalination using renewable energy sources. Economic analysis of desalination processes

**Prerequisite:** ME 315, ME 204

**ME 461                      Risk Management Tools in Systems Design and Operation                      (3-0-3)**

The assessment and management of risk, uncertainty, and reliability are critical to the success of any engineering venture today, this course deals with understanding, theory and methodology and tools in assessment and management of risk, uncertainty, and reliability in engineering systems and enterprises. Quantification of Risk and its Impact. Applications will be explored through case studies in some of the following area; environmental, water resources and technology management, clean energy, safety-critical systems, and reliability modeling of multiple failure modes in complex systems. Risk Assessment and management in systems operation.

**Prerequisite:** Senior Standing

**ME 462                      Products and Systems Reliability                      (3-0-3)**

Fundamentals of probability theory. Reliability in Design- Probabilistic models of load (stress) and resistance (strength) variables. Stress-strength interference models in probabilistic design. Monte Carlo simulation. Hazard functions and reliability models for random and wear-out failures. Hazard plotting and reliability estimation. System reliability – series, parallel , and n-out of k and series parallel systems, Failure rate endurance testing and failure data analysis. Accelerated life testing. Reliability in systems operation: availability, spare parts computation and maintenance strategies. Use of Excel and other reliability software in reliability analysis and predictions.

**Prerequisite:** ME 307

**ME 463                      Tool Design                      (3-0-3)**

Limits, fits, tolerance charts. Part analysis, process selection and operations sequence planning. Integrating and combining operations. Workpiece control, cutting tools, dies, and work holding devices. Tooling Design in manufacturing - specifically for machining, and sheet metal forming Metal cutting economics and process selection.

**Prerequisite:** ME 307

**ME 464                      Quality in Manufacturing                      (3-0-3)**

Principles of dimensional metrology and geometrical accuracy. Concepts of attaining and maintaining manufacturing accuracy. Principles of precision measuring instruments and machines. Process capability evaluation and quality control.

**Prerequisite:** ME 322, ME 323

**ME 465                      Designing Robust Products and Systems                      (3-0-3)**

This course will introduce the Taguchi design improvement technique. Students will gain hands-on application experience to design robust products and processes as well as solve production problems by reducing performance variations. The tools to robustly design components, products and systems and their manufacturing process will be reviewed. The course emphasized the use of Taguchi's Robust Design Technique as an effective ways to reduce the product design cycle, especially when coupled with computational simulation techniques. Real-life examples will be used to show the applicability of Taguchi's methodology to optimize products, components and processes. Main topics covered by the course are: Introduction to the Engineering Design Process, Design of Experiments using the Taguchi Method, Robust Design.

**Prerequisite:** ME 406 or ME 451

**ME 466                      Fundamentals of Heat Treatment                      (3-0-3)**

Principles of phase transformations, heat treatment, and mechanical properties as applied to ferrous and non-ferrous metals and alloys. Heat treatment processes including: normalizing,

hardening, tempering, annealing, surface hardening. Applications of heat treatment and surface hardening techniques; Experimental aspects of heat treatment science and technology will be covered using lab resources of Materials Science Lab, Advanced Materials Science Lab and ME Workshop.

**Prerequisite:** ME 322, ME 323

**ME 468                      Casting and Welding Engineering                      (3-0-3)**

Metallurgical and engineering principles applied to melting, casting and solidification. Testing and evaluation of castings; Foundry processes; Introduction to the metallurgy of welding; Material and process selection, codes and specifications, weldment design and testing; Welding defects; Analysis of industrial welding processes; Laboratory experience in foundry, production and evaluation of weldments; Casting and welding demonstrations ,experimentation and project(s) work will be conducted in Casting and Welding areas of ME Workshop. Two industrial visits will be made.

**Prerequisite:** ME 322, ME 323

**ME 469                      Computer-Aided Manufacturing                      (3-0-3)**

High volume discrete parts production systems; CAD/CAM fundamentals; Numerical Control (NC) manufacturing systems. Part Programming; NC justification, advances in NC (CNC, DNC, adaptive control); Tooling for NC and CNC; Overview of group technology, flexible manufacturing systems (FMS), and robotics in manufacturing. Related laboratory experiments, CNC Programming, and projects will be done on CNC machines and associates CAD/CAM software available in ME Workshop.

**Prerequisite:** ME 322, ME 323

**ME 471                      Mechanical Metallurgy                      (3-0-3)**

Review of mechanical properties of metals and alloys. Introduction to theory of elasticity. Elements of theory of plasticity; flow curve, yield criteria, plastic stress-strain relationship, introduction to slipline fields. Metallurgical aspects of plastic deformation. Metalworking processes: Forging, rolling, extrusion, and drawing.

**Prerequisite:** ME 216, ME 217

**ME 472                      Corrosion Engineering I                      (3-0-3)**

Technical and economical aspects of corrosion problems. Types of corrosion; pitting, crevice, intergranular, galvanic and stress corrosion cracking. Mechanisms and prevention of corrosion failures. Cathodic protection of pipelines and submerged structures. Principles of inhibition of corrosion in process industries. Behavior of iron, copper, aluminum and their alloys in corrosive environments. Metallurgical aspects of corrosion. Design considerations in prevention of corrosion failures.

**Prerequisite:** ME 216, ME 217

**ME 473                      Corrosion Engineering II                      (3-0-3)**

Review of important principles of corrosion protection; Effect of atmospheric composition, climatic condition and industrial pollution on metallic corrosion; Erosion and cavitation; High-pressure and high-temperature corrosion; Corrosion in steam generation plants, pressure vessels and its mitigation; Reinforced concrete corrosion; Design of cathodic protection systems for various structures; Surface preparation, applications and designing of coating systems; Seawater-induced corrosion and scaling in major desalination plant components; Laboratory studies related to inspection and testing of coating, evaluation of inhibitors, cathodic protection measurements and corrosion resistance of materials.

**Prerequisite:** ME 472

**ME 474                      Physical Metallurgy                      (3-0-3)**

Review of crystal structures, dislocation and slip phenomena, plastic deformation. Metals and alloy systems. Diffusion in solids Strengthening mechanisms. Heat treatment of metals, phase transformations. Metallurgical aspects of failure.

**Prerequisite:** ME 216, ME 217

**ME 475                      Mechanical Behavior of Materials                      (3-0-3)**

Elements of theories of elasticity and plasticity. Dislocations and plastic deformation. Behavior of materials under static loading. Fracture and fracture mechanics. Fatigue, creep, impact, and wear failures. Environmentally induced cracking. Basic metallurgical failure analysis. Laboratory demonstrations and experimental projects. Use of relevant software for data analysis.

**Prerequisite:** ME 307

**ME 476                      Non-Metallic Materials                      (3-0-3)**

Structure of nonmetallic materials. Ceramic materials, glass and vitreous products, concrete and related materials of construction, refractory materials, composite materials, polymers.

**Prerequisite:** ME 216, ME 217

**ME 477                      Non-Ferrous Extractive Metallurgy                      (3-0-3)**

Physical and chemical principles involved in the extraction of non-ferrous metals. Principles of hydrometallurgical and pyrometallurgical processes. Extraction of aluminum, copper, nickel, silver and gold. Refining processes for non-ferrous metals.

**Prerequisite:** ME 204, ME 216, ME 217

**ME 478                      Iron and Steel Making                      (3-0-3)**

Introduction to extractive metallurgy and iron ore dressing including the following topics: iron ores, mining, and ore dressing. Production of pig iron. The blast furnace. Production of steel. Bessemer process, basic oxygen process, open-hearth process, direct reduction process, and electric-furnace process. Continuous casting.

**Prerequisite:** ME 216, ME 217

**ME 479                      Modern Materials                      (3-0-3)**

Electrical, magnetic, optical and thermal properties of materials. Advanced ceramics, composites. Advanced engineering plastics. High temperature materials. Advanced coatings. Advanced material processing such as rapid solidification and powder metallurgy; selection of modern materials.

**Prerequisite:** ME 216, ME 217

**ME 480                      Plastics Materials and Processing                      (3-0-3)**

Thermoplastic and thermosetting polymers, their properties and engineering applications. Plastic manufacturing processes, equipment and mold design. Plastic materials and process selection.

**Prerequisite:** ME 205 or (ME 216 and ME 217)

**ME 481                      Advanced Dynamics                      (3-0-3)**

The foundation of dynamics leading to Lagrange's equations and Hamilton's principle. Variation problems in mechanics. General three-dimensional kinematics and dynamics. Stability of motion. Self-excited vibrations, and non-linear vibrations.

**Prerequisite:** ME 201



**ME 482                      Mechanical Vibrations                      (3-0-3)**

Free and forced vibrations; Applications to systems with one-, two-, and multi-degree of freedom; Viscous, hysteretic, and Coulomb damping; Response to general periodic excitations; Transient vibration and the phase method; Principal and coupled coordinates; Dynamic vibration absorbers; Energy methods and Rayleigh's principle; Laboratory sessions on vibration measuring instruments, vibration measurement techniques, and experiments to illustrate various vibration phenomena studied.

**Prerequisite:** ME 201

**ME 483                      Mechanisms                      (2-3-3)**

Kinematic pairs, kinematic chain, mobility of planar and space mechanisms, inversion. Vector and complex algebra methods of analysis of plane mechanisms. Centros and mechanical advantage. Hartmann's construction and Euler-Salvarey equation. Kinematics of gears and simple, compound, reverted and epicyclic gear trains. Synthesis and analysis of cam mechanisms. Universal joints. Synthesis of function, path and motion generating mechanisms. Laboratory sessions to include graphical and computer methods of analysis and synthesis of mechanisms.

**Prerequisite:** ME 309

**ME 484                      Acoustics                      (3-0-3)**

Fundamentals of vibrations. Plane and spherical acoustic waves. Radiation, transmission and filters. Loudspeakers and microphones. Speech, hearing, noise and intelligibility. Architectural acoustics. Acoustic measurements and demonstration of measurement apparatus. Case studies.

**Prerequisite:** ME 201, MATH 301

**ME 485                      Mechanical System Design                      (3-0-3)**

Mechanical systems: definition and classification; the engineering design process; Need, identification and problem definition; Concept generation and evaluation; Embodiment design. Modeling and simulation; Materials selection and materials in design; Materials processing and design; Design for X. Risk, reliability and safety; Robust and quality design; Economic decision making; Cost evaluation; Legal and ethical issues in design; Detail design; Case studies; Projects.

**Prerequisite:** Senior Standing

**ME 486                      Optimization of Mechanical Systems                      (3-0-3)**

Formulation and simulation of mechanical engineering systems involving dynamics, kinematics, and machine design and thermo-fluid systems; The concept of optimization; Analytical and numerical methods such as unconstrained and constrained optimization, Lagrange multipliers, linear programming for optimum design of mechanical systems. Lab demonstration sessions involve formulation and solution of optimization problems using computers and existing software packages during the design process.

**Prerequisite:** ME 307, ME 315

**ME 487                      Mechanics of Materials                      (3-0-3)**

Analysis of stress and strain in two and three dimensions. Equilibrium, compatibility and stress-strain relations. Analysis of torsion; non-circular sections. Saint-Venant's theory, membrane analogy, hollow sections. Thick walled cylinders. Membrane stresses in thin shells. Bending of flat plates. Energy theorems.

**Prerequisite:** CE 203

**ME 488                      Systems Control                      (3-0-3)**

Classical control techniques: basic control actions; Design of system by means of root-locus method and Bodes plots; Control system synthesis. Modern control techniques: state variable representation. State variable feedback; Linear quadratic controller; Laboratory demonstration sessions involve utilization of control of software for analysis and design of control system.

**Corequisite:** ME 413

**ME 489                      Finite Element Analysis in Mechanical Design                      (3-0-3)**

Introduction to Finite Element Method and its application in different mechanical problems including: static loading of beam and beam structure, free vibration of beam and beam structures, 2-D plane stress and plane strain, elasticity, and 2-D steady state heat conduction. Using a commercial FE software, in solving various 2-D and 3-D design problems.

**Prerequisite:** ME 307

**ME 490                      Special Topics in Mechanical Engineering                      (3-0-3)**

**Prerequisite:** To be set by the ME Department

**ME 491                      Special Topics in Energy                      (3-0-3)**

**Prerequisite:** To be set by the ME Department

**ME 492                      Special Topics in Dynamics & Control                      (3-0-3)**

**Prerequisite:** To be set by the ME Department

**ME 493                      Special Topics in Materials & Manufacturing                      (3-0-3)**

**Prerequisite:** To be set by the ME Department

**ME 494                      Fundamentals of Nondestructive Evaluation                      (3-0-3)**

Principles of ultrasonic and elastic wave propagation; Ultrasonic transducers, and instrumentation; Ultrasonic inspection techniques; Defects and material ultrasonic characterization; Introduction to acoustic emission AE techniques; AE data collection and analysis; Industrial applications of AE; Basic principles of magnetic particle inspection MPI; MPI techniques and equipment; Application of MPI; Fundamental Eddy current concepts; Eddy current instrumentation, and inspection principles; Techniques for liquid penetrant inspection, and applications; Fundamental theory of radiation; Equipment, and inspection techniques for radiation testing; Selected radiographic application; Radiation safety.

**Prerequisite:** Senior Standing

**ME 495                      Directed Research / BSc Research Thesis                      (3-0-3)**

A well monitored and structured BSC Thesis/Directed Research Course for Active Research Projects-which could be taken only as a onetime Elective Special Topic. It is only open to students having a GPA of 3 or above and consent of instructor is mandatory. Faculty conducting the course must submit a formal well written program of research work and deliverables and grading policy in semester prior to enrollment for approval from department. Students can start working on the topics a head of time prior to formal enrollment as a course after its approval.

**Prerequisite:** Senior Standing or Consent of the Instructor

# MANAGEMENT

## **MGT 210 Business Communication (3-0-3)**

Communication process, communication styles, and communication forms in organizations. Emphases are on developing skills essential for effective communication. Coverage includes fundamentals of business writing, patterns of business messages, report writing, public speaking and oral reporting, verbal and nonverbal communication, use of visual and presentation aides, and cultural and international dimensions of communication.

**Prerequisite:** ENGL 214

## **MGT 301 Principles of Management (3-0-3)**

Overview of the evolution of management thought; the business environment and context; the basic functions of planning, organizing, staffing, leading and controlling; the basic processes of leadership, decision making, communication, and motivation; groups, teams, conflict, power, and politics; and overview of the fields of human resources management, operations management, management information systems, international management, and organizational change and development.

**Prerequisite:** ENGL 214

## **MGT 310 Organization Behavior (3-0-3)**

Deals with behavior of individuals and groups in organizations and the related organizational processes, influences, and consequences. Emphasis is on individual, group, and organizational performance. Topics include an overview of the field of organizational behavior, organizational structure and design, organizational culture, learning, personality, attitudes and perceptions, motivation theories and their application, stress and stress management, teams and group dynamics, communication, decision making, conflict and conflict management, leadership, influence, power, organizational politics, organizational change and development, and organizational behavior in the global context. Instructional techniques will include teamwork and oral and written presentations.

**Prerequisite:** MGT 301

## **MGT 311 Legal Environment ( in Arabic) (3-0-3)**

Business legal system in Saudi Arabia, legal concepts dealing with business activities and traders, Saudi Arabian laws that govern the establishment and operations of corporations and other business enterprises, negotiable instruments , external legal frameworks and their relationships to the Saudi Arabian business legal environment.

## **MGT 312 Ethics and Social Responsibility (3-0-3)**

Explore ethical questions that confront a manager when facing social, political, and legal issues in the conduct of day-to-day business and long-term planning. Examine the role of business in formulating social conscience, and learn how to recognize and address ethical issues and critically think about ethics and social responsibility in the business context.

**Prerequisite:** MGT 301

## **MGT 350 Begin Cooperative Work (0-0-0)**

See contents in MGT 351.

**Prerequisite:** Same as in MGT 351

## **MGT 351 Management Cooperative Work (0-0-6)**

Twenty-eight weeks of practical training in Management or related area in a selected organization. The training program must be approved and the student's progress during his co-op period must be monitored. The student is expected to write a co-op report under the supervision of a faculty member in accordance with university regulations.

**Prerequisite:** ENGL 214, At least 85 credit hours

**MGT 352    End Cooperative Work** **(0-0-0)**

See contents in MGT 351.

**Prerequisite:** Same as in MGT 351

**MGT 412    Entrepreneurship and Small Business Management** **(3-0-3)**

Starting, planning, organizing, and managing a small Business. Coverage include the foundations of entrepreneurship, the entrepreneurial thinking and mind, identifying opportunities, developing a business plan, ownership issues, financing the venture, marketing strategies, human resources planning and management, facilities acquisition and operation, materials and supplies management, profit and cash flow planning and management, budgeting and controlling, use of computer and technology, and the future of family-ownership.

**Prerequisite:** MGT 301, MKT 250, FIN 250

**MGT 413    International Management** **(3-0-3)**

This course examines cross-cultural and international management issues, and analyzes the problems of managing in an international marketplace. It focuses on cultural and regional diversity and differences, political and economic influences, global market factors, and other contingencies with which managers of multinational enterprises must contend. The course covers an array of management practices – from human resource staffing, to leading and motivating a multi-cultural workforce, to creating strategic alliances for both large and small international firms.

**Prerequisite:** MGT 301

**MGT 430    Organizational Leadership** **(3-0-3)**

This course focuses on leadership concepts, theories and applications of managerial leadership. The topic of leadership effectiveness is of special interest in this course. The course covers many issues related to leadership such as the nature of managerial work, perspective on effective leadership behavior, participative leadership, delegation and empowerment, power and influence, theories of leadership, strategic leadership, developing leadership skills, ethical leadership and diversity.

**Prerequisite:** MGT 301

**MGT 440    International Business** **(3-0-3)**

A survey of international business operations, including organization structure, finance, marketing, cultural differences, global trade, capital markets and economic growth, impact of international organizations and regional trading blocs, corporate global competitiveness, and global strategies.

**Prerequisite:** MGT 301

**MGT 449    Strategic Management** **(3-0-3)**

This is a capstone course in the College. It integrates the knowledge gained in other courses to develop the strategic perspective of the organization internal operation and its competitive position in its environment. Students will be put into the position of strategic managers or

**Prerequisite:** MGT 301

**Prerequisite:** MGT 301

**Prerequisite:** MGT 301 or HRM 301

# MANAGEMENT INFORMATION SYSTEMS

## **MIS 215 Principles of Management Information Systems (3-0-3)**

Information systems concepts and principles with managerial emphasis. Information systems for operational, tactical and top management. Strategic impact of technologies on organizations.

## **MIS 300 Fundamentals of Electronic Commerce (2-2-3)**

E-Commerce fundamentals; E-Commerce business models; infrastructure; electronic payment systems and E-commerce security; Development, implementation, marketing and managing E-Commerce applications. Benefits and limitations, legal, ethical and global issues.

**Prerequisite:** MIS 215 or ICS 102

## **MIS 301 Business Systems Analysis & Design (2-2-3)**

Examining the design of information systems from a problem-solving perspective. Providing a methodological approach to developing computer systems including feasibility studies, systems planning, analysis, design, testing, implementation, and maintenance. Emphasis is on the strategies and techniques of systems analysis and design for producing logical methodologies for dealing with complexity in the development of information systems.

**Prerequisite:** MIS 215

## **MIS 302 Business Applications Development (3-0-3)**

Programming process with emphasis on program design and quality assurance and control. End user systems versus traditional systems development issues. Advanced HCI concepts and principles. Common business topics: data validation, report taxonomy, files and database processing. RAD methodologies, techniques, and tools. RAD success and risk factors. User documentation development techniques and tools. Application deployment issues. Emphasis on the development of end-user-focused, high quality business applications with user-centered-design and using RAD methodologies, techniques, and tools.

**Prerequisite:** ICS 102

## **MIS 311 Business Data Management (2-2-3)**

Data resource management concepts. Database support for various levels of management. Relational database model. Database life cycle. Conceptual data modeling. Database logical and physical design. Database integrity. Database languages and technologies. Data and database administration.

**Prerequisite:** ICS 102

## **MIS 315 MIS Innovation and New Technologies (3-0-3)**

Introduction to MIS Innovation and New Technologies. Nurturing an Entrepreneurial Innovative Environment. Understand the Business Value of Innovation. Innovation with Online Communities; Social Web Networks. Re-engineer business processes with Innovations and New Technologies.

**Prerequisite:** MIS 215

## **MIS 320 Knowledge Management (3-0-3)**

Introduction to Knowledge Management (KM) – Knowledge Management (KM) to gain competitive advantage. KM for innovation, KM's emerging systems (Enterprise 2.0, Semantic Web), E-Knowledge Management. KM Development Methods.

**Prerequisite:** MIS 215

**MIS 325 Human Resources Information Systems (3-0-3)**

Introduction to Human Resource Information Systems (HRIS): Strategic role of Human Resource Information Systems (HRIS) in the effective management of organizations, HRIS capabilities and limitations, Organizational needs for HRIS, Evaluation and selection factors of an appropriate HRIS, HRIS software application packages for management decision-making. Role of HRIS in current Information Technology topics (Internet, Privacy, Security).

**Prerequisite:** MIS 215

**MIS 345 Information Technology in Society (3-0-3)**

Impact of IT on individuals, organizations, society, and quality of life. Social and ethical considerations. Computer and Internet crimes. Intellectual property rights. Risks of IT. Human computer interaction. Data protection. National and international legal environment of IT. E-Government issues. Health and work hazards related to IT.

**Prerequisite:** MIS 215

**MIS 350 Begin Cooperative Work (0-0-0)**

See contents in MIS 351.

**Prerequisite:** Same as in MIS 351

**MIS 351 Cooperative Work (0-0-6)**

A 28 week industry-based learning for MIS students to get practical experience in the area of Management Information Systems with reputable business organizations as approved by the Department and guided by a coop advisor. Evaluation of performance through submission of progress reports, employer's feedback, final report, and presentation. Student's defense of his coop work by a panel of faculty members inclusive of the coop advisor.

**Prerequisite:** ENGL 214, At least 85 credit hours

**MIS 352 End Cooperative Work (0-0-0)**

See contents in MIS 351.

**Prerequisite:** Same as in MIS 351

**MIS 355 Enterprise Systems (3-0-3)**

Architecture, setup, configuration, operations and management of system that is of "enterprise class". Fundamentals of business process and business process re-engineering concepts. Selection, process mapping, GAP analysis, and implementation of enterprise systems. Enterprise modules and decision analysis tools. Use of project management techniques to emphasize team dynamics and management skills.

**Prerequisite:** MIS 215

**MIS 365 Enterprise Architecture (3-0-3)**

Introduction to Enterprise Architecture: Enterprise architecture frameworks, Systems integration, Infrastructure and content management, System administration, Data/information architecture and data integration, Risk management, Software as a service. Emerging technologies.

**Prerequisite:** MIS 215

**MIS 375 Human Computer Factors in Systems Design (3-0-3)**

Factors related to both people interaction with technology, and the ways of technology effects on humans' performance. An introduction to human related to the design of information

systems. Emphasis on the human component of human-computer interaction (HCI), and the process of user-centered design and evaluation. Develop knowledge and skills of creating enhanced human-computer interfaces and user-computer interaction designs.

**Prerequisite:** MIS 215

**MIS 405 IS Project Management (3-0-3)**

Project management fundamentals and strategies. Project management body of knowledge. Human aspect of project management. Project Management processes, methods, techniques, tools, and implementation issues. Systematic methodology for initiating, planning, executing, controlling, and closing projects in team based environment.

**Prerequisite:** MIS 301

**MIS 410 Management Support Systems (2-2-3)**

Introduction to Management Support Systems (MSS): Decision Support Systems, Collaborative Work Systems, Executive Support Systems, Expert Systems, and Neural Networks. Impact of MSS on decision making. Exposure to MSS tools and development methods. Integration of MSS. Team projects to develop MSS.

**Prerequisite:** MIS 311

**MIS 411 Database Applications Development (3-0-3)**

Multi-tier application architecture concepts and technologies. Advanced SQL including procedural, embedded SQL, client-side and server-side SQL. Transaction management, consider multi-user system including concurrency control and security. Advanced database concepts including distributed and object-oriented databases, and data warehouse. Database application implementation issues Special emphasis is on development of client/server database applications.

**Prerequisite:** MIS 311

**MIS 415 Computer Supported Collaborative Work (2-2-3)**

Comprehensive overview of Computer Supported Collaborative Work (CSCW), Group Dynamics, Collaboration Architectures, Groupware and Group Tools, Asynchronous and Synchronous Collaboration, Video in Collaboration, Web-based Collaboration, Collaborative Virtual Environments, Facilitation and leadership, Integration with other computerized systems, Exposure to literature and cases and Team-based projects.

**Prerequisite:** MIS 311

**MIS 490 Information Resources Management (3-0-3)**

Theories and practices in the management of organizational information systems resources. Frameworks for introduction, evolution and assimilation of information systems into an organization. Align IT strategy with business strategy. Roles of IT and people using, developing. Managing systems. Global concepts of IT. Societal and ethical issues.

**Prerequisite:** MIS 405

**MIS 499 Special Topics in MIS (3-0-3)**

Coverage of the contemporary and advanced MIS topics such as data management, information processing, decision making, social implications of IT, and emerging technologies.

**Prerequisite:** MIS 311



# MARKETING

## **MKT 250 Principles of Marketing (3-0-3)**

Introduction to the basic concepts and principles of marketing. Focuses on providing students with a conceptual framework for understanding the role of marketing in society and the firm. Topics include the marketing concept, market segmentation, target marketing, demand estimation, product management, channels of distribution, promotion, and pricing.

**Prerequisite:** ENGL 214

## **MKT 410 Consumer Behavior (3-0-3)**

Introduction to the concepts and frameworks for understanding the behavior of consumers relating to evaluation, choice, purchase, consumption, and disposal of products. Topics include examination of consumer motivations in product choice, consumer perceptions, learning, attitudes, information processing, and decision making. Also included are the influence of culture, social class, family, and reference groups on the behavior of consumers.

**Prerequisite:** MKT 250

## **MKT 345 Marketing Research (3-0-3)**

Introduction to the concepts, principles, and techniques used in gathering, analyzing, and interpreting data for marketing decisions. Topics include the role of information in marketing decisions, research problem formulation, research design methods, measurement and design of research instruments, sampling design, data collection methods, data analysis, and presentation of research results.

**Prerequisite:** MKT 250, STAT 211

## **MKT 350 Begin Cooperative Work (0-0-0)**

See contents in MKT 351.

**Prerequisite:** Same as in MKT 351

## **MKT 351 Cooperative Work (0-0-6)**

Twenty-eight weeks of practical training in marketing or related area in a selected organization. The training program must be approved and the student's progress during his co-op period must be monitored. The student is expected to write a co-op report under the supervision of a faculty member in accordance with university regulations.

**Prerequisite:** ENGL 214, At least 85 credit hours

## **MKT 352 End Cooperative Work (0-0-0)**

See contents in MKT 351.

**Prerequisite:** Same as in MKT 351

## **MKT 360 Product & Brand Management (3-0-3)**

Examination of concepts, tools, and frameworks used in management of the product component of marketing strategy. Topics include formulation of product strategy and policy, brand management, packaging and labeling, product portfolio and life cycle management, and new product development.

**Prerequisite:** MKT 250

## **MKT 370 Integrated Marketing Communications (3-0-3)**

Focuses on the promotion aspect of the marketing mix. Discusses the elements of the promotional mix (advertising, personal selling, sales promotion, direct marketing, and public relations) and their use in creating synchronized, multi-channel, customer-based communications. Topics include communication theory, setting communication objectives, message planning and evaluation, and choice of communications media.

**Prerequisite:** MKT 250

**MKT 380     Marketing Channels     (3-0-3)**

Examines issues and strategies relating to the distribution of products/services to final consumers or end-users. Both distribution channel management and physical distribution issues are examined. Emphasis is on the role such strategies play in the overall marketing plan. Topics include physical distribution strategies, warehousing and inventory management, distribution channel design, selection, and management, channel conflict, cooperation, and channel control.

**Prerequisite:** MKT 250

**MKT 420     International Marketing     (3-0-3)**

Focuses on the application of marketing principles and strategies to international markets. Emphasizes the need for modification and/or adaptation of marketing thinking and practice in foreign markets to accommodate national/regional environmental differences. Topics include analysis of the international market environment, assessing global market opportunities, foreign market entry modes, and developing product, pricing, promotion, and distribution strategies for international markets.

**Prerequisite:** MKT 250

**MKT 430     Services Marketing     (3-0-3)**

Focuses on the processes of planning, organizing, and implementing marketing efforts in service organizations. Topics include examination of differences between services and physical goods, frameworks for understanding and positioning service organizations in the marketplace, creating and delivering services, costing and pricing issues for services, and management of demand and customer mix of service organizations.

**Prerequisite:** MKT 250

**MKT 440     Retail Management     (3-0-3)**

Introduction to principles and methods applied in the management of retail operations. Topics include analysis of retail structure, strategic planning for retail operations, financing retail operations, organizing and staffing a retail enterprise, location and site decisions, merchandise planning, store design and layout, buying and inventory management, pricing, developing customer support services, and franchising.

**Prerequisite:** MKT 250

**MKT 450     Strategic Marketing     (3-0-3)**

Analytical integration of concepts, tools, and frameworks for analyzing, planning, implementing, and controlling marketing strategies and policies. Adopts a problem-solving orientation and holistic, integrated view of product, pricing, promotion, and distribution issues. Topics include strategies for building customer satisfaction, market-oriented strategic planning, frameworks for analyzing and managing product portfolios, demand estimation and forecasting, analysis of business and consumer markets, new product development, and pricing, promotion, and distribution strategies.

**Prerequisite:** MKT 250

**MKT 460 Advertising (3-0-3)**

Examines the role of advertising and sales promotion in the marketing program. Adopts a communication-theory perspective to management of advertising and sales promotion activities. Advertising-related topics include organization of advertising activities, setting advertising objectives, planning and developing advertising campaigns, message and media strategies, budgeting advertising expenses, and evaluation and control of the advertising efforts.

**Prerequisite:** MKT 250

**MKT 470 Personal Selling and Sales Management (3-0-3)**

Provides an appreciation and understanding of the role of the salesperson focusing what is required to make an effective sales presentation. Topics include; the approach, qualifying prospects, questioning to determine needs, presentation and demonstration of product benefits, handling objections, and closing the sale. Also covered are the role and responsibilities of the sales manager related to planning, implementing, and controlling the firm's personal selling function. Topics here include; analysis and design of sales territories, recruitment, selection, training, motivation, and compensation of sales personnel, evaluation of sales performance, and ethical issues arising in sales and sales force management.

**Prerequisite:** MKT 250

**MKT 480 Internet Marketing (3-0-3)**

Examines use of the Internet in the marketing of goods and services. Topics include basic issues in web site development, online marketing research, and use of the internet for direct marketing, marketing communications, and product distribution. Real world projects will provide opportunities for application.

**Prerequisite:** MKT 250

**MKT 490 Business-to-Business Marketing (3-0-3)**

Examination and analysis of the unique aspects of marketing goods and services to organizational buyers rather than final consumers. Topics include in-depth examination of business to business markets, complex nature of business-to-business buying behavior, methods of business-to-business market research, developing business-to-business marketing strategy, roles of product strategy, personal selling, promotion, distribution, and pricing strategies in business-to-business marketing.

**Prerequisite:** MKT 250

**MKT 495 Special Topics in Marketing (3-0-3)**

Focuses on specific areas of marketing that reflect contemporary topics not covered by the listed courses.

**Prerequisite:** MKT 250

# **OPERATIONS MANAGEMENT**

## **OM 210      Operations Management      (3-0-3)**

Production systems; capacity and facility location problems; layout planning; forecasting; production scheduling and control; inventory and quality control.

**Prerequisite:** STAT 211

## **OM 310      Quantitative Methods for Management      (3-0-3)**

Decisions theory, linear programming, simplex method and duality. Inventory control under certain and uncertain demand. Network models including traveling salesman problem, maximal flow problem and PERT/CPM networks.

**Prerequisite:** OM 210

## **OM 320      Introduction to Supply Chain Management      (3-0-3)**

The Course is designed to introduce the students to the subject of “Supply Chain Management”. This course contents includes, but not limited to the following: Supply Chain Management & Competitive strategy, Customer fulfillment strategy, Design and Analysis of Global Supply Chain Management, In addition the course addresses recent developments in Supply Chain Management, such as Chain Optimization, Collaboration & Integration.

**Prerequisite:** MGT 301, OM 210

## **OM 405      Production Planning and Control      (3-0-3)**

Facilities location and design. Job design, line balancing, aggregate planning, project planning, project management, operations, scheduling, inventory management.

**Prerequisite:** OM 310

## **OM 407      Quality Control and Reliability      (3-0-3)**

Analysis and design of quality control systems and procedures. Topics to include inspection policies, sampling, reliability engineering, and product testing.

**Prerequisite:** STAT 211

## **OM 420      Operations Research      (3-0-3)**

Integer programming, dynamic programming, simulation, queuing theory, Markov process.

**Prerequisite:** OM 310

# PHYSICAL EDUCATION

## **PE 001      Preparatory Health and Physical Education I      (0-2-1)**

Basics of personal health. Diseases, causes and prevention. Nutrition: balanced diet. Health related fitness: body composition, cardiovascular endurance and flexibility test. Physical Education: fundamental and practice of specified sports. Topics related to health education represent 20% of the course.

## **PE 002      Preparatory Health and Physical Education II      (0-2-1)**

Addictive habits, risk and prevention. Muscular strength, definition and assessment. Obesity, definition, risk and prevention. Physical Education: fundamental and practice of specified sports. Topics related to health education represent 20% of the course.

**Prerequisite :** PE 001

## **PE 101      Health and Physical Education I      (0-2-1)**

Health: blood pressure, heart rate, cholesterol. Safety: CPR (Cardio Pulmonary Resuscitation) and techniques. Physical Education: rules, tactics and practice of specified sports. Topics related to health education represent 20% of the course.

**Prerequisite :** Freshman Standing

## **PE 102      Health and Physical Education II      (0-2-1)**

Body Structure: skeletal system, muscular system. Sports injuries. Physical Education: rules, tactics and practice of specified sports. Topics related to health education represent 20% of the course.

**Prerequisite :** PE 101

# **PETTROLEUM ENGINEERING**

## **PETE 201                      Introduction to Petroleum Engineering                      (1-0-1)**

The course's main goal is to provide the student with an overview of the petroleum industry: its history, technical achievements, role in the global economy and future prospects. A brief introduction to modern exploration, production and processing operations is included as well as highlights of the petroleum industry in Saudi Arabia and the Middle East. The PETE curriculum at KFUPM is also highlighted.

## **PETE 203                      Drilling Engineering I                      (2-3-3)**

The course introduces the basic concepts, theory and practices in drilling engineering. Topics include an introduction to drilling engineering, rotary drilling systems and operations, well control and monitoring systems. Specifically, drilling fluids, drilling hydraulics, formation pore and fracture pressure estimation, design of mud weight and kick evaluation are discussed. Some practical applications such as cementing and basic concepts of casing, drilling bits and bottom-hole assembly are presented. Laboratory sessions cover drilling fluids and cement formulation and testing. A rig-floor simulator is used to demonstrate drilling operations and control.

**Prerequisite:** CHEM 101, PETE 201

## **PETE 204                      Reservoir Rock Properties                      (2-3-3)**

Basic petrophysical properties of reservoir rocks are covered including porosity, permeability, fluid saturation, electrical conductivity, capillary pressure, and relative permeability. Applications of Darcy's law to flow in porous media are also presented. Laboratory experiments illustrate measurement of various rock properties.

## **PETE 205                      Petroleum Fluid Properties                      (2-3-3)**

The phase behavior of hydrocarbon systems as related to petroleum recovery is introduced. This includes ideal and real gas behavior, single and multi-component two-phase systems, and properties of reservoir fluids under various conditions of pressure and temperature. Laboratory tests include determination of various properties of oil and gas mixtures.

**Prerequisite:** ME 203

## **PETE 301                      Reservoir Engineering                      (3-0-3)**

The course covers the general material balance equation and its application to determine initial oil and gas in place. Various steady and unsteady-state water influx models are presented along with concepts of fractional flow and the theory of immiscible displacement. The theory is then extended to two-dimensional systems whereby the effects of areal and vertical sweep efficiencies on waterflood performance predictions are highlighted.

**Prerequisite:** PETE 204, PETE 205

## **PETE 302                      Well Completion                      (3-0-3)**

The student is introduced to subsurface operations needed to prepare the well for production after being drilled and cased. Parts covered include:-well completion designs based upon reservoir, mechanical and economic considerations, the production system, comprising bottom-hole, tubing, choke and surface facilities, subsurface production control, completion and work-over fluids, perforation, remedial cementing, sand control, and well stimulation operations.

**Prerequisite:** PETE 203

**PETE 303                      Well Logging                      (3-3-4)**

The course introduces the student to modern well logging techniques and covers both open-hole and cased-hole log interpretation methods. The objective is to provide insight into the basic well logging methods that are employed to derive petrophysical properties for hydrocarbon exploration and production. Discussions also touch on production logging. Concepts of logging program design are presented with examples of applications. All concepts covered are demonstrated through laboratory experiments.

**Prerequisite:** EE 204, PETE 204

**PETE 304                      Drilling Engineering II                      (3-0-3)**

The course presents an overview of drilling engineering with in-depth treatment of casing, rotary drilling bit, drill string and bottom-hole assembly design/evaluation. The student also gains good understanding of the factors affecting the rate of penetration. Various drilling techniques such as horizontal and directional drilling, coiled tubing, multi-lateral drilling, and wellbore surveying techniques are also introduced in addition to well design for safety and efficiency. Other topics include drilling costs and economics and recent advances in drilling engineering.

**Prerequisite:** CE 202, PETE 203

**PETE 305                      Reservoir Description                      (3-0-3)**

The principles and techniques of petroleum reservoir description are covered through utilization of subsurface data from geological and engineering sources. univariate and bivariate description methods are used along with other techniques to estimate reserves.

**Prerequisite:** PETE 303, STAT 319

**PETE 306                      Well Testing                      (3-0-3)**

Basic theory and modern practices and applications of well testing are covered. This includes derivation of diffusivity equation and its solutions for slightly compressible fluids within infinite- and finite-acting systems. The student is then introduced to the principles and techniques of well test analysis and evaluation supported by analysis of well tests from vertical and horizontal wells to determine well and reservoir parameters using conventional and modern well test analysis. Well test design and instrumentation are also covered.

**Prerequisite:** PETE 301

**PETE 399                      Summer Training                      (0-0-0)**

A student of junior standing spends a period of eight summer weeks working in the industry to gain exposure to and appreciation of the petroleum engineering profession. On-the-job training can be acquired in any field of petroleum engineering. On completion of the training, the student is required to write a brief report on his work.

**Prerequisite:** ENGL 214, PETE 203, Completion of a minimum of 85 credit hours.

**PETE 402                      Reservoir Simulation                      (2-3-3)**

The course introduces the student to the basic theory and practices in reservoir simulation. The formulation of equations governing single phase and multi-phase flow in porous media are discussed. The use of finite difference methods to solve ordinary and partial differential equations are then presented followed by discussion of various techniques to solve systems of linear equations. Finally the concepts presented are demonstrated through applications using a black oil simulator.

**Prerequisite:** PETE 301, PETE 305

**PETE 403                      Petroleum Production Engineering                      (3-0-3)**

The course introduces the student to topics of inflow and outflow performance, multi-phase flow in pipes, nodal analysis and production optimization and artificial lift with stress on electric submersible pumps and gas lift systems. Oil and water treatment and separation processes are introduced. Theoretical background calculations as well as design and economic applications are covered in sufficient details.

**Prerequisite:** CHE 204

**PETE 406                      Improved Oil Recovery                      (3-0-3)**

The course provides an introduction to current techniques of improved oil recovery such as thermal processes, chemical flooding and miscible-gas displacement. The advantages and drawbacks of each technique are discussed and linked to typical selection criteria for target reservoirs. A simple performance prediction procedure for each process is also covered.

**Prerequisite:** PETE 301

**PETE 407                      Petroleum Economics                      (3-0-3)**

The course provides an introduction to the standards and practices of economic analysis in the petroleum industry. Brief review of the principles of economic evaluation, typical decision making situations including risk analysis, alternative reservoir depletion schemes utilizing decline curve analysis, secondary stage development options, and various improved oil recovery methods. Analysis involves reserve estimation and forecasting of capital investment, operating cost, and manpower requirement.

**Prerequisite:** PETE 301

**PETE 408                      Seminar                      (0-2-1)**

Lectures are presented on subjects related to preparation of technical presentations, use of visual aids, and platform and vocal techniques. The student is required to prepare and deliver a number of presentations on selected subjects. Each presentation is discussed and methods for improvements are highlighted. The student is evaluated on all presentations. The student is also required to attend Departmental and SPE local chapter seminars.

**Prerequisite:** PETE 399

**PETE 409                      Artificial Lift                      (3-0-3)**

Artificial lift methods in oil wells are studied from the basic theoretical and design aspects. Methods include gas lift, electric submersible pumping, and sucker-rod pumping systems. Principles of multi-phase flow are integrated with system performance and coupled with inflow performance to predict overall well performance.

**Prerequisite:** PETE 302

**PETE 410                      Natural Gas Engineering                      (3-0-3)**

The course familiarizes the student with methods to estimate gas reserves for volumetric and water-drive gas reservoirs, and with performance analysis of gas-condensate reservoirs. The course also covers the derivation of the basic flow equations for real gas and their solutions and applications for analyzing gas well testing, including hydraulically-fractured gas wells. Other topics include deliverability testing of gas wells, decline curve analysis, calculation of static and flowing bottomhole pressures, fundamentals of gas treatment processes and equipment, gas flow rate measurement, compression and transmission. The course also covers field development plans through integration of gas material balance equation and field deliverability tests.

**Prerequisite:** PETE 306



**PETE 411                      Senior Design Project                      (0-9-3)**

A student team employs experimental and/or theoretical approaches with possible application of computer techniques to integrate various components of the curriculum in a comprehensive engineering design experience. Under the supervision of a faculty member, the team develops a complete project including identification of a problem, formulation of design, preparation of specifications, and consideration of alternative feasible solutions both technically and economically. The student team has to submit a detailed final project report and present their work to an examining committee.

**Prerequisite:** GEOL 318, PETE 402

**PETE 412                      Formation Damage                      (3-0-3)**

The course covers methods of diagnosis, prevention and treatment of formation damage in petroleum reservoirs. Mechanism of damage from various sources such as scale and asphaltene precipitation, mud solids, cement filtrates and completion fluids is presented. Techniques used to diagnose damage and remediate its effects are emphasized.

**Prerequisite:** PETE 302

**PETE 417                      Surface Facilities                      (3-0-3)**

Operation and design of oil, gas and water surface handling and processing facilities are presented. Topics include gas/oil separation, oil sweetening and de-emulsification, produced water treatment, and gas treatment. Laboratory demonstrations cover design principles and operations of facilities.

**Prerequisite:** CHE 204

**PETE 418                      Modern Petroleum Production                      (3-0-3)**

The course covers advanced treatment of modern petroleum production engineering. This encompasses deliverability from vertical, horizontal and multilateral/multi-branch wells. Diagnosis of well performance including elements of well testing and production logging are also covered. The function of the production engineer is defined in the context of well design, stimulation and artificial lift.

**Prerequisite:** PETE 403

**PETE 421                      Directional Drilling                      (3-0-3)**

Directional drilling design including horizontal and multi-lateral wells is covered along with the theory of deviation, monitoring and control. Offshore drilling techniques from fixed and floating drilling structures are also presented.

**Prerequisite:** PETE 304

**PETE 422                      Well Control                      (3-0-3)**

Theory of pressure control in drilling operations and during well kicks is covered. Topics include abnormal pressure detection, fracture gradient determination, casing setting depth selection and advanced casing design. Theoretical aspects are demonstrated using well control simulators.

**Prerequisite:** PETE 304

**PETE 424                      Rock Mechanics                      (3-0-3)**

The student is introduced to rock mechanics as an essential tool in petroleum engineering. Topics include mechanical properties of rocks and their laboratory determination; acoustics in rock mechanics; in-situ stress conditions and their determination; failure of rocks; stresses in

boreholes and borehole failure mechanisms; and sand production. A brief introduction to hydraulic fracturing, reservoir compaction and surface subsidence is also provided.

**Prerequisite:** PETE 304

**PETE 431                      Reservoir Management                      (3-0-3)**

Techniques that utilize geological, geophysical and petroleum engineering data to predict and manage the behavior of hydrocarbon reservoirs are introduced. Field operating plans to optimize profitability are covered through highlighting the principles of planning, implementing, monitoring, and evaluating reservoir performance. Real case studies constitute an integral part of the course.

**Prerequisite:** PETE 301

**PETE 432                      Water Flooding                      (3-0-3)**

Basic theoretical and design aspects of water flooding processes are introduced. The course starts with a review of capillary phenomena and relative permeability characteristics of reservoir rocks. Theory of immiscible displacement including piston-like and frontal advance mechanisms is then presented and applied to injectivity analysis and performance prediction of linear and pattern floods including heterogeneous reservoirs. Problems encountered in water flooding projects such as scaling are also covered.

**Prerequisite:** PETE 301

**PETE 452                      Naturally-Fractured Reservoirs                      (3-0-3)**

The course covers different aspects of fractured reservoirs including rock characteristics, effect of fractures on reservoir performance, pressure testing, production performance, and effect on water and/or gas flooding. Applications to horizontal/multi-lateral wells are presented.

**Prerequisite:** PETE 306

**PETE 453                      Production Logging                      (3-0-3)**

The course aims to develop the student's skills to identify undesired changes in well performance and to propose suitable solutions. The course covers production logging techniques and tools (Flowmeter, Gradiomanometer, cement evaluation, noise & temperature) and cased-hole logging techniques and tools (thermal decay time, reservoir saturation, formation resistivity). Field examples in vertical and horizontal wells are discussed.

**Prerequisite:** PETE 303

**PETE 490                      Special Topics in Petroleum Engineering I                      (3-0-3)**

The course presents a special topic in one area of the petroleum engineering discipline. Topics are selected according to faculty expertise and availability and students' interest and enrollment. A detailed description and syllabus of the course is announced one semester in advance.

**Prerequisite:** Senior Standing

**PETE 491                      Special Topics in Petroleum Engineering II                      (3-0-3)**

The course presents a special topic in one area of the petroleum engineering discipline. Topics are selected according to faculty expertise and availability and students' interest and enrollment. A detailed description and syllabus of the course is announced one semester in advance.

**Prerequisite:** Senior Standing

# PHYSICS

## **PHYS 101                      General Physics I                      (3-3-4)**

First course of calculus-based, general physics sequence. Topics covered include: particle kinematics and dynamics; conservation of energy and linear momentum; rotational kinematics; rigid body dynamics; conservation of angular momentum; simple harmonic motion; gravitation; the static and dynamics of fluids.

**Corequisite:** MATH 101

## **PHYS 102                      General Physics II                      (3-3-4)**

A continuation of PHYS 101. Topics covered include: wave motion and sound; temperature, first and second law of thermodynamics; kinetic theory of gases; coulomb's law; the electric field; Gauss' law; electric potential; capacitors and dielectrics; D.C. circuits; the magnetic field; ampere's and Faraday's laws.

**Prerequisite:** PHYS 101

**Corequisite:** MATH 102

## **PHYS 133                      Principles of Physics                      (3-3-4)**

This is a non-calculus based physics course. Topics include: Particle kinematics and dynamics, work, energy, and power. Kinetic theory of gases. Temperature, first and second laws of thermodynamics. Heat transfer. Wave motion and sound. Electricity and magnetism. Light and optics.

## **PHYS 201                      General Physics III                      (3-3-4)**

A continuation of PHYS 101 and 102. Topics covered include: inductance; magnetic properties of matter, electromagnetic oscillations and waves; geometrical and physical optics. Relativity, introduction to quantum physics, atomic and molecular physics, nuclear physics, particle physics and cosmology.

**Note:** For non-Physics Majors

**Prerequisite:** PHYS 102, MATH 102

## **PHYS 203                      Electrical and Magnetic Properties of Materials                      (3-0-3)**

The course material includes the following topics: Concepts of Modern Physics: photons, electronic structure of isolated atoms; atoms bonding, crystal structure, energy bands in solids, insulators, semiconductors and conductors; electrons and holes in semiconductors, drift and diffusion, mobility, recombination and lifetime, conductivity; PN junctions, I (V) characteristic, applications; photo detectors, Light emitting diodes, Solar-cell, Bipolar transistor, MOSFET and JFET, Lasers, Magnetic Properties, Use of computer to simulate the effect of various physical properties of semiconductors on the I (V) characteristics of devices.

**Prerequisite:** PHYS 102

## **PHYS 211                      Optics                      (2-3-3)**

An introductory course in Geometrical and Physical Optics. Topics covered include: nature and propagation of light; image formation-paraxial approximation; optical instruments; superposition of waves; standing waves beats; fourier analysis of harmonic periodic waves and wavepackets; two-beam and multiple-beam interference; polarization; Fraunhofer and Fresnel diffraction; holography; lasers.

**Prerequisite:** PHYS 102

**PHYS 212                      Modern Physics                      (3-3-4)**

Special relativity; quantum mechanics: the particle and wave aspects of matter; quantum mechanics in one and three dimensions, quantum theory of the hydrogen atom; atomic physics; statistical physics; selected topics in solid state physics; nuclear physics.

**Note:** Not to be taken for credit with PHYS 201

**Prerequisite:** PHYS 102

**PHYS 215                      Introduction to Astronomy                      (3-0-3)**

An elementary introduction to astronomy. Topics covered include: Celestial mechanics; the solar system; stellar measurement; stellar magnitudes and spectra; galaxies; cosmology.

**Prerequisite:** PHYS 102

**PHYS 234                      The Physics of How Things Work                      (3-0-3)**

The underlining physical principals of how everyday devices and systems work. Examples include: transistors, radios, lasers, medical imaging, nuclear power plants, atomic clocks, cars and computers.

**Prerequisite:** PHYS 102

**PHYS 261                      Energy                      (3-0-3)**

A survey of energy sources and resources; a quantitative evaluation of energy technologies; the production, transportation, and consumption of energy. Topics covered include: Nuclear energy; fossil fuels; solar energy; wind energy; hydropower; geothermal energy; MHD; energy storage and distribution; automotive transportation.

**Prerequisite:** PHYS 102

**PHYS 271                      Introduction to Special Relativity                      (3-0-3)**

Topics covered include: Properties of space-time; the Lorentz transformation; paradoxes; four vector formulations of mechanics and electromagnetism.

**Prerequisite:** PHYS 102

**PHYS 301                      Classical Mechanics I                      (3-0-3)**

Topics covered include: Newton's laws of motion and conservation theorems, oscillations; non-linear oscillations and chaos; Computational study of forced oscillatory motion and nonlinear motion; gravitation; Hamilton's variational principle – Lagrangian and Hamiltonian Dynamics; Central force; Motion in a non-inertial reference frame.

**Prerequisite:** MATH 202, PHYS 101

**PHYS 302                      Classical Mechanics II                      (3-0-3)**

Topics covered include: Planetary motion; dynamics of a system of particles; motion in a non-inertial reference frames; dynamics of rigid bodies; coupled oscillations; continuous systems; special theory of relativity; Computational study of coupled oscillatory motion and Euler's equations.

**Prerequisite:** PHYS 301

**PHYS 303                      Experimental Physics I                      (2-3-3)**

An introductory course in electronics and the methods of experimental physics. The physics of semi-conductors; junction transistor; amplifiers; feedback circuits; oscillators; nonlinear devices; digital electronics; digital logic; counters and registers; analog-to-digital converters.

**Prerequisite:** PHYS 102

**PHYS 304                      Experimental Physics II                      (1-3-2)**

Method of experimental physics. Analysis of experimental data. Relationship between theory and experiment. Curve fitting processes; fundamental of the theory of statistics; evaluation of experimental data; estimation of errors. Selected experiments in physics will be performed in conjunction with lecture material.

**Prerequisite:** PHYS 303

**PHYS 305                      Electricity and Magnetism I                      (3-0-3)**

Introduction to classical electromagnetic theory based on vector calculus. Electrostatics; Laplace and Poisson's equations; Dielectric media and magnetostatics fields in matter; Computer will be used to solve electromagnetic problems.

**Prerequisite:** PHYS 102, MATH 202

**PHYS 306                      Electricity and Magnetism II                      (3-0-3)**

A continuation of Physics 305. Topics covered include electrodynamics; electromagnetic waves; electromagnetic radiation and relativity.

**Prerequisite:** PHYS 305

**PHYS 307                      Laser Molecular Spectroscopy                      (3-0-3)**

Introduction to lasers; laser in time-resolved and in frequency-resolved spectroscopy; basic elements of spectroscopy; rotational, vibrational, and electronic spectroscopy.

**Prerequisite:** PHYS 212 or PHYS 201

**PHYS 315                      Astrophysics                      (3-0-3)**

Basic methods of obtaining information about stars: stellar positions, size, luminosity, spectra. Methods of deducing stellar parameters from those observations. Newtonian gravitation, spectral analysis, Doppler shift, interaction of matter and radiation. Modeling the structure of stars. Pulsating stars, novae and supernovae. Collapsed stars (white dwarfs, neutron stars, and black holes). Stellar systems and clusters, Galaxies, systems of galaxies, filament and voids.

**Prerequisite:** PHYS 212 or PHYS 201

**PHYS 323                      Physics of Nuclear Reactors                      (3-0-3)**

Nuclear reactions and fission; the multiplication factor and nuclear reactor criticality; homogeneous and heterogeneous reactors; the one-speed diffusion theory; reactor kinetics; multi group diffusion theory; Computer will be used in simple criticality calculations and reactor kinetics.

**Prerequisite:** PHYS 212 or PHYS 201, MATH 202

**PHYS 353                      Radiation and Health Physics                      (3-3-4)**

A survey course in safety from ionizing radiation. Topics covered include: properties of ionizing radiation; interaction of radiation with matter, detection methods, dosimetry, biological effects of radiation, external and internal radiation protection.

**Prerequisite:** PHYS 212 or PHYS 201

**PHYS 365                      Introduction to Medical Physics                      (3-0-3)**

Topics: biomechanics, sound and hearing, pressure and motion of fluids, heat and temperature, electricity and magnetism in the body, optics and the eye, biological effects of light, use of ionizing radiation in diagnosis and therapy, radiation safety, medical instrumentation.

**Prerequisite:** PHYS 201 or PHYS 212

**PHYS 371                      Methods of Theoretical Physics                      (3-0-3)**

A one-semester course of mathematical topics chosen because of their importance and usefulness to physics. Topics covered may include functions of a complex variable; contour integration; partial differential equations; special functions; numerical techniques.

**Note:** Not to be taken for credit with MATH 301

**Prerequisite:** MATH 202

**PHYS 373                      Introduction to Computational Physics                      (2-3-3)**

Computer simulation of physical systems. Topics covered include: simulation techniques; programming methods; comparison of ideal and realistic systems; limitations of physical theory; behavior of physical systems.

**Note:** Not to be taken for credit with MATH 321 or CISE 301

**Prerequisite:** PHYS 212 , ICS 101 or ICS 102 or ICS 103

**PHYS 399                      Summer Training                      (0-0-2)**

Students are required to spend one summer working in industry prior to the term in which they expect to graduate. They will be required to write a report and present it in a seminar at the Department.

**Prerequisite:** ENGL 214, Junior Standing, Approval of the Department

**PHYS 401                      Quantum Mechanics and Applications I                      (3-0-3)**

This course deals with the fundamentals of non-relativistic quantum mechanics. Failures of classical physics in describing microscopic phenomena. Mathematical tools and basic postulates of Quantum Mechanics. Matrix formulation of Quantum Mechanics. The Schrodinger equation and its application to various one-dimensional systems. Orbital angular momentum. Applications of Quantum Mechanics to the study of three-dimensional systems. Wavefunctions for some of the above systems and related expectation values obtained via computer packages.

**Prerequisite:** PHYS 301

**PHYS 402                      Quantum Mechanics and Applications II                      (3-0-3)**

This course is continuation of Physics 401. Addition of angular momenta. Time-independent perturbation theory. The variational method and its applications. Schrodinger, Heisenberg and Interaction pictures. Time-dependent perturbation theory. Scattering Theory. Identical particles systems. Approximate solutions of several Schrodinger equations obtained via computer packages.

**Prerequisite:** PHYS 401

**PHYS 403                      Senior Physics Laboratory                      (0-6-2)**

A number of experiments selected both for their importance in the historical development of physics and their educational value in presenting the techniques used in experimental physics correlation of the experimental work with theory are stressed.

**Prerequisite:** PHYS 304

**PHYS 404                      Physics Project Laboratory                      (0-6-2)**

A laboratory course, which offers an opportunity for student to carry out experimental projects, based on their special interests and ideas to study physical phenomena. Faculty help students to determine the feasibility of proposed projects.

**Prerequisite:** Senior Standing

**PHYS 409                      Physics Seminar                      (1-0-1)**

Students are given the opportunity to present and attend lectures on topics of current research interest.

**Prerequisite:** Senior standing

**PHYS 411                      Advanced Optics                      (3-0-3)**

An advanced study of Physical Optics. Topics covered are: Fourier transforms and applications, theory of coherence, interference spectroscopy, auto correlation function, fluctuations, optical transfer functions, diffraction and Gaussian beams, Kirchhoff diffraction theory, theory of image formation, spatial filtering, aberrations in optical images, interaction of light with matter, crystal optics, nonlinear optics, lasers.

**Prerequisite:** PHYS 211, PHYS 306

**PHYS 412                      Physics of Lasers                      (3-0-3)**

Topics covered are: Stimulated emission and coherence; population inversion; Gaussian beam propagation; optical resonators and cavity modes; stability criteria; unstable resonators; phase conjugate resonators; oscillation threshold and gain; line broadening; gain saturation; density matrix formulation and semi-classical theory of laser; lasers without inversion; Q-switching, mode-locking and pulse compression.

**Prerequisite:** PHYS 211, PHYS 212

**PHYS 416                      Cosmology and the Early Universe                      (3-0-3)**

Distance scale of the universe. Hubble expansion and modeling by non-Euclidean spaces. The steady state models: Einstein, De Sitter, Lemaitre. Continuous creation models: Bondi, Hoyle-Harlikar. The relativistic evolution equation and friedmann's expanding models. Cosmology and nucleosynthesis. Gamow's big bang model. Phase transitions and the thermal history of the universe. Problems of the standard model of cosmology: horizons and structure formation. Solution by inflationary models using grand unified field theories, their problems and the revised inflationary scenarios.

**Prerequisite:** PHYS 212 or PHYS 201, Math 202

**PHYS 422                      Nuclear and Particle Physics                      (3-0-3)**

Study of Nuclear and Particle Physics with the help of Quantum Mechanics. Topics covered include: nuclear properties, forces between nucleons, nuclear models, radioactive decays and detectors, nuclear reactions, accelerators. Fundamental particles, forces, the subnuclear zoo. Two-body bound and scattering problems, nuclear forces, models, etc. studied both analytically and via computer packages.

**Prerequisite:** PHYS 401

**PHYS 430                      Thermal and Statistical Physics                      (4-0-4)**

Statistical physics, developing both thermodynamics and statistical mechanics simultaneously. Concepts of temperature, laws of thermodynamics, entropy, thermodynamic relations, free energy. Applications to phase equilibrium, multicomponent systems, chemical reactions, and

thermodynamic cycles. Application of statistical mechanics to physical systems; introduction to treatment of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics with applications. Computational aspects of free-energy entropy magnetization for various classical and quantum distributions.

**Corequisite:** PHYS 401

**PHYS 432                      Introduction to Solid State Physics                      (3-0-3)**

Introductory concepts in crystal diffraction and the reciprocal lattice. Crystal bonding; lattice vibrations; thermal properties of insulators; free electron theory of metals; band theory; semiconductors, introduction to superconductivity. Simple band structure calculations using computer software packages.

**Prerequisite:** PHYS 401

**PHYS 434                      Introduction to the Physics of Surface                      (3-0-3)**

A course may be offered in conjunction with current research at the Surface Science Laboratory. Topics covered include: preparation of clean surfaces; experimental methods such as XPS, UPS, Auger, and LEED; thin films; surface states; temperature effects.

**Corequisite:** PHYS 432

**PHYS 435                      Superconductivity                      (3-0-3)**

Experiment and phenomenology, the two fluid model. Perfect conductance and electrodynamics of superconductors. Thermodynamics of the phase transition, type I and type II superconductors. Ginzburg Landau phenomenological theory of type II superconductors: coherence length, vortices, Abrikosov vortex lattice, critical fields and vortex flow dynamics. The microscopic theory of BCS and the concept of electron pairing. High  $T_c$  superconductivity.

**Prerequisite:** PHYS 401

**PHYS 441                      Particle Physics                      (3-0-3)**

Topics covered include: accelerators and detectors; the subnuclear zoo; symmetries and conservation laws; the quark model; the gauge principle.

**Prerequisite:** PHYS 401

**PHYS 442                      Relativistic Quantum Mechanics                      (3-0-3)**

Topics covered include: relativistic spin zero particle; the Klein-Gordon equation; relativistic spin one-half particles; the Dirac equation; propagation theory.

**Corequisite:** PHYS 402

**PHYS 461                      Introduction to Plasma Physics                      (3-0-3)**

An introduction to plasmas. Topics covered include: single-particle motions; plasmas as fluids; waves in plasmas; diffusion and resistivity; equilibrium and stability; a simple introduction to kinetic theory; nonlinear effects; controlled fusion.

**Prerequisite:** PHYS 306

**PHYS 493                      Selected Topics in Physics                      (1 to 3)**

Selected topics of special interest to students. This course may be repeated for credit as an investigation in depth of a single topic or as a survey of several topics.

**Prerequisite:** Consent of the Instructor

**PHYS 495                      Guided Studies                      (1-0-1)**



Guided reading and reporting on special topics by individual students under the guidance of faculty members.

**Prerequisite:** Consent of the Instructor

## **PREPARATORY YEAR PROGRAM**

### **PYP 001                      Preparatory Physical Science                      (2-0-2)**

Introduction to physical Science, measurements, motion, Newton's Laws, momentum and energy, wave motion, the atom, elements and compounds, states of matter, the Periodic Table.

### **PYP 002                      Preparatory Computer Science                      (0-2-1)**

Introduction to computer systems components. Windows operating systems and its utilities. Hands-on exposure to applications software. Introduction to Internet tools and technologies.

### **PYP 003                      University Study Skills                      (0-2-1)**

The course will cover some of the key skills needed by college students including: goal-setting, motivation, time and stress management, classroom skills, preparing for exams, and analytical/critical thinking.

### **PYP 004                      Preparatory Engineering Technology                      (0-2-1)**

An introduction to various engineering disciplines. Topics include: Graphical Design, Pneumatics, Automotive Engineering, Measurement Tools and Sensors. Students work in groups to turn a simple design created through “*SolidWorks*” into a real model using CNC machines. Introduction to Robotics.

# STATISTICS

## **STAT 201                    Introduction to Statistics                    (2-2-3)**

Descriptive statistics: measures of location, dispersion, and skewness. Probability. Random variables. Normal and binomial probability distributions. Sampling distribution of the mean. Estimation. Testing hypotheses. Regression and correlation. Applications using statistical packages.

**Note:** Not to be taken for credit with Stat 319 or ISE 205

**Prerequisite:** MATH 102

## **STAT 211                    Statistics for Business I                    (3-0-3)**

Data description: Frequency table, histogram, measures of central tendency, scatter diagram and correlation. Probability theory; sampling; probability distributions; point and confidence interval estimation; application for managerial decision. A statistical package will be used.

**Note:** Not open for credit to Statistics or Mathematics Majors. Not to be taken for credit with ISE 205, STAT 201 and STAT 319.

**Prerequisite:** MATH 131, MATH 132

## **STAT 212                    Statistics for Business II                    (3-0-3)**

Hypothesis testing for means and variances; index numbers and time series; simple linear progression and correlation analysis; multiple regression analysis; the chi-squared and F distributions and their applications. A statistical package will be used.

**Note:** Not open for credit to Statistics or Mathematics Majors. Not to be taken for credit with ISE 205, STAT 201 and STAT 319.

**Prerequisite:** STAT 211

## **STAT 213                    Statistical Methods for Actuaries                    (2-2-3)**

Descriptive Statistics: Frequency table; histogram, measure of central tendency and variability, scatter diagram and correlation. Probability theory; sampling techniques; probability distributions; estimation; hypothesis testing for means and variances; index number and introductory time series analyses; simple linear regression and correlation analysis; multiple regression analysis; the chi-squared and F distributions and their applications; application for financial decisions; application using statistical packages.

**Note:** Not to be taken for credit with STAT 201, STAT 211, STAT 212, or STAT 319.

**Prerequisite:** MATH 102

## **STAT 301                    Introduction to Probability Theory                    (3-0-3)**

Basic classical models of probability. Set functions. Axiomatic definition of probability. Conditional probability and Bayes' theorem. Random variables and their types. Distributions, moments, and moment generating functions. Special discrete and continuous distributions. Random vectors and their distributions. Marginal and conditional distributions. Independent random variables. Functions of random variables. Sums of independent random variables. Weak law of large numbers and the central limit theorem.

**Prerequisite:** MATH 201, STAT 201 or STAT 212 or STAT 213 or STAT 319

## **STAT 302                    Statistical Inference                    (3-0-3)**

Random sampling and the sampling distributions: t, chi-square, and F. Order Statistics. Methods of estimation: maximum likelihood and moments. Properties of a good estimator: unbiasedness, consistency, efficiency, sufficiency, and approximate normality. Testing of

simple hypotheses, the Neyman-Pearson lemma. Testing composite hypotheses, uniformly most powerful and likelihood ratio tests. Bayesian statistics.

**Prerequisite:** STAT 301

**STAT 310                      Regression Analysis                      (3-0-3)**

Simple linear regression: The least squares method, parameter estimation, confidence intervals, tests of hypotheses and model adequacy checking. Multiple linear regression, including estimation of parameters, confidence intervals, tests of hypotheses and prediction. Model adequacy checking and multicollinearity. Polynomial regression. Variable selection and model building.

**Prerequisite:** STAT 201 or STAT 212 or STAT 213 or STAT 319

**STAT 319                      Probability and Statistics for Engineers and Scientist                      (2-3-3)**

Presentation and interpretation of data, elementary probability concepts, random variables and probability distributions, binomial, Poisson, exponential, Weibull, normal and lognormal random variables. Estimation, tests of hypotheses for the one sample problem. Simple and multiple linear regression, application to engineering problems. The lab session will be devoted to problem solving using statistics software.

**Note:** Not open for credit to Statistics or Mathematics Majors. Cannot be taken for credit with ISE 205 or STAT 201.

**Prerequisite:** MATH 102

**STAT 320                      Statistical Quality Control                      (3-0-3)**

How control charts work. Control chart methods for attributes and variables. Process-control chart techniques. Process-capability analysis. Acceptance-sampling by attributes and variables.

**Note:** Not to be taken for credit with ISE 320

**Prerequisite:** STAT 201 or STAT 212 or STAT 213 or STAT 319

**STAT 325                      Non Parametric Statistical Methods                      (3-0-3)**

One sample problem, the sign, and Wilcoxon signed rank tests. Two-Sample problem, Wilcoxon rank sum and Mann-Whitney tests. Kruskal-Wallis test for one-way layout. Friedman test for randomized block design. Run test for randomness. Goodness of fit tests.

**Prerequisite:** STAT 201 or Consent of the Instructor

**STAT 342                      Applied Statistics                      (3-0-3)**

Review for descriptive statistics, estimation, and testing hypotheses. Simple linear regression. One way analysis of variance. Multiple regression. Randomized block designs. Factorial experiments. Random and mixed effect models.

**Note:** Not to be taken for credit with STAT 310 and/or STAT 430

**Prerequisite:** STAT 201 or STAT 212 or STAT 213 or STAT 319

**STAT 355                      Demographic Methods                      (3-0-3)**

Scope of demography. Vital events. Demographic survey. History of world population and distribution. Demographic transition. Fertility and its measures. Mortality and its measures. Direct and indirect standardization. The life table. Construction of a life table. Stationary population. Stable population. Migration. Theories of migration. Consequences of migration. Population estimates and projections.

**Prerequisite:** STAT 201 or STAT 212 or STAT 213 or STAT 319

**STAT 361                      Operational Research I                      (3-0-3)**

Problem solving and decision making. Linear programming: formulation, the graphical method, the simplex method, sensitivity analysis, and duality. Transportation and assignment problem. Integer programming. Project scheduling PERT/CPM.

**Note:** Not to be taken for credit with ISE 303

**Prerequisite:** STAT 201 or STAT 212 or STAT 213 or STAT 319

**STAT 365                      Data Collection and Sampling Methods                      (3-0-3)**

Concept of data collection. Sample surveys, finite and infinite populations, execution and analysis of samples. Basic sampling designs: simple, stratified, systematic, cluster, two-stage cluster. Methods of estimation of population means, proportions, totals, sizes, variances, standard errors, ratio, and regression.

**Prerequisite:** STAT 201 or consent of the instructor

**STAT 375                      Categorical Data Analysis                      (3-0-3)**

2x2 contingency tables, two-way contingency tables, three-way and higher dimensional contingency tables. Loglinear models for contingency tables. Logistic regression. Building and applying loglinear models.

**Prerequisite:** STAT 201 or STAT 212 or STAT 213 or STAT 319

**STAT 399                      Summer Training                      (0-0-2)**

Students are required to spend one summer working in industry prior to the term in which they expect to graduate. Students are required to submit a report and make a presentation on their summer training experience and the knowledge gained.

**Prerequisite:** ENGL 214, Junior Standing, Approval of the Department

**STAT 415                      Stochastic Processes                      (3-0-3)**

Basic classes of stochastic processes. Poisson and renewal processes with applications in simple queuing systems. Discrete and continuous time Markov chains. Birth-death and Yule processes. Branching models of population growth and physical processes.

**Prerequisite:** STAT 301

**STAT 416                      Stochastic Processes for Actuaries                      (3-0-3)**

Basic classes of stochastic processes. Poisson (regular, compound, compound surplus, and non-homogenous) and renewal processes with applications in simple queuing systems and actuarial science. Discrete and continuous time Markov chains. Birth-death and Yule processes. Branching models of population growth processes. Actuarial risk models; simulation. Arithmetic and geometric Brownian motions, and applications of these processes such as in computation of resident fees for continuing care retirement communities, and pricing of financial instruments.

**Note:** Not to be taken for credit with STAT 415

**Prerequisite:** STAT 301

**STAT 430                      Experimental Design                      (3-0-3)**

Importance of statistical design of experiments. Single-factor and multifactor analysis of variance. Factorial designs. Randomized blocks. Nested designs. Latin squares. Confounding and 2-level fractional factorials. Analysis of covariance.

**Prerequisite:** STAT 302

**STAT 435                      Linear Models                      (3-0-3)**

Review of multiple regression. The general linear model. Quadratic forms. Gauss- Markov theorem. Multivariate normal distribution. Computational aspects. Full rank models. Models not of full rank. Computer applications.

**Prerequisite:** STAT 310

**STAT 440                      Multivariate Analysis                      (3-0-3)**

Introduction to multivariate analysis. Multivariate normal distribution theory. Distribution of the sum of product matrix. Inference about the parameters of the multivariate normal distribution. Comparison of means. Linear models. Principal components. Factor analysis. Classification and discrimination techniques.

**Prerequisite:** STAT 310

**STAT 460                      Time Series                      (3-0-3)**

Examples of simple time series. Stationary time series and autocorrelation. Autoregressive moving average processes. Modeling and forecasting with ARMA processes. Maximum likelihood and least squares estimator. Non-stationary time series.

**Prerequisite:** STAT 310

**STAT 461                      Operational Research II                      (3-0-3)**

Inventory models. Waiting line models. Decision Analysis. Multicriteria decision problems. Markov process. Dynamic programming. Calculus-based Procedures.

**Note:** Not to be taken for credit with ISE 421

**Prerequisite:** STAT 301, STAT 361

**STAT 470                      Senior Project in Statistics                      (1-3-2)**

This course is designed to draw upon various components of the undergraduate curriculum. The project could be in the area of data analysis, sampling survey, experimental design, regression analysis, multivariate data analysis, time series and etc. A report is essential for course completion.

**Prerequisite:** Senior Standing

**STAT 475                      Statistical Models for Life time Data                      (3-0-3)**

Life tables, graph and related procedures. Single samples: complete or Type II censored data and Type I censored data for exponential, Weibull, gamma and other distributions. Parametric regression for exponential, Weibull and gamma distributions. Distributions- free methods for proportional hazard and related regression models.

**Prerequisite:** STAT 302, STAT 310

**STAT 499                      Topics in Statistics                      (3-0-3)**

Variable contents. Open for senior students interested in studying an advanced topic in statistics with a departmental faculty member.

**Prerequisite:** Senior standing, permission of the Department Chairman upon recommendation of the instructor.

# SOFTWARE ENGINEERING

## **SWE 205                      Introduction to Software Engineering                      (3-0-3)**

Introduction to software engineering and software processes. Construction techniques and principals. Concepts of Programming Languages: Syntax and semantics. Analysis and Design Modes. Ethical and professional responsibilities.

**Prerequisite:** ICS 102

## **SWE 215                      Software Requirements Engineering                      (2-3-3)**

Requirements engineering process. Methods, tools and techniques for eliciting, organizing and documenting software requirements. Analysis and validation techniques, including need, goal, and use case analysis. Requirements documentation standards. Traceability. Requirements management. Handling requirements changes. Students participate in a group project on software requirements.

**Prerequisite:** ICS 201, SWE 205

## **SWE 311                      Principles of Software Engineering                      (3-3-4)**

History and overview of software engineering. Software processes. Software project management. Software requirements and specification. Software design. Software testing and validation. Software metrics. Software quality assurance. Software evolution. Using APIs. Software tools and environments.

**Note:** Not to be taken by SWE students

**Prerequisite:** ICS 202

## **SWE 312                      User Interface Design                      (3-0-3)**

Study of both theoretical and practical issues in human-computer interfaces. User interface design process. Usability engineering. Development, programming, and evaluating interface designs. Design of windows, and menus. Commands and natural languages I/O. Visual prototyping. User manuals, online help and tutorials. Students participate in a group project on software user interface design.

**Prerequisite:** SWE 205

## **SWE 316                      Software Design and Architecture                      (3-0-3)**

Study of design concepts and notations. Architecture, middleware architectures, design patterns, frameworks and components. Designing for qualities such as performance, security, reusability, reliability. Metrics and measurement. Basics of software evolution, reengineering, and reverse engineering. Students participate in a group project on software design.

**Prerequisite:** ICS 202, SWE 215

## **SWE 321                      Formal Methods and Models in Software Engineering                      (3-0-3)**

Mathematical foundations for formal methods. Formal languages and techniques for specification and design, including specifying syntax using grammars and finite state machines. Analysis and verification of specifications and designs. Use of assertions and proofs. Automated program and design transformation.

**Prerequisite:** ICS 202, ICS 253

## **SWE 326                      Software Testing and Quality Assurance                      (3-0-3)**

Concept of software quality, and software quality metrics. Software quality assurance planning & implementation. Quality process standards. Validation & verification. Reviews, walkthroughs, &

inspections. Mechanisms for validating software systems. Techniques for generating and validating test data. Students participate in a group project on software validation and verification.

**Prerequisite:** SWE 215, SWE 312

**SWE 344                                      Internet Protocols and Client-Server Programming                                      (2-3-3)**

Principles of inter-network architecture and communication protocols. Open systems and interoperability. Case studies of particular protocols from network layer and above. Socket programming. Remoting. Selected examples of networked client-server applications such as e-mail, news, file-transfer, HTTP. Client-Server Programming Project(s). Using APIs. Software tools and environments.

**Prerequisite:** ICS 202

**SWE 363                                      Web Engineering and Development                                      (3-0-3)**

Web Engineering fundamentals: requirements, analysis modeling, design modeling, testing. Internet basics for web applications. Technologies and tools for developing web applications: markup languages, styling, data description and transformation, client and server side programming. Web services. Advances in web engineering.

**Prerequisite:** Junior Standing

**SWE 387                                      Software Project Management                                      (3-0-3)**

Introduction project management concepts, tools, and techniques: integration management and project planning, scope management, scheduling, budget control, human resource management, communication management, risk analysis and management, project quality management, and procurement management.

**Prerequisite:** Junior Standing

**SWE 399                                      Summer Training                                      (0-0-0)**

A summer period of 8 weeks spent as a trainee in industry, business, or government agencies for the purpose of familiarizing the student with the real job world and enabling him to apply and relate his academic knowledge to a real work environment.

The student is required to participate in computer science related activities and use his time to get acquainted with the computer science related functions and resources used by his employing organization. Besides progress reports, the student is required to submit a final report and do a presentation on his experience and the knowledge he gained during his summer training program. The student receives a zero-credit Pass/Fail grade.

**Prerequisite:** SWE 363, ENGL 214, Department Approval

**SWE 416                                      Software Architecture                                      (3-0-3)**

Study the concepts, principles, methods, and best practices in software architecture. Different architectural styles, patterns and product lines are presented and compared. Methods to analyze, evaluate and document software architectures are also discussed. Students participate in a group project on software architecture design.

**Prerequisite:** SWE 316

**SWE 417                                      Software Engineering Project I                                      (1-6-3)**

This is the first part of a two-semester senior-year capstone project. Student teams employ knowledge gained from courses throughout the program such as development of requirements, design, implementation, and quality assurance to develop a software solution to a real-world problem from conception to completion. In this part students develop project plan, software requirement specification and software design document.



**Prerequisite:** SWE 316, SWE 387

**SWE 418                                      Software Engineering Project II                                      (0-6-2)**

This is the second part of a two-semester, senior-year capstone project. Student teams employ knowledge gained from courses throughout the program such as development of requirements, design, implementation, and quality assurance to develop a software solution to a real-world problem from conception to completion. In this part, students implement the design they produced in SWE 417, test their code, and evaluate their final product.

**Prerequisite:** SWE 326, SWE 417

**SWE 436                                      Object-Oriented Design Patterns                                      (3-0-3)**

A depth study of object-oriented design patterns. How design patterns solve design problems? How to select a design pattern? How to use a design pattern? Detailed study of creational patterns, structural patterns, and behavioral patterns. Case studies.

**Prerequisite:** SWE 316

**SWE 469                                      Software Metrics                                      (3-0-3)**

Overview of software metrics, basics of measurement theory, goal-based framework for software measurement, empirical investigation in software engineering. Measuring internal product attributes, measuring external product attributes, measuring cost and effort, measuring software reliability, software test metrics, and object-oriented metrics.

**Prerequisite:** SWE 316, STAT 319

**SWE 487                                      Software Processes and Process Improvements                                      (3-0-3)**

Software process models. Software process analysis. Life cycle process models and standards. Process implementation at various levels like organization, project, team, or individual. Measurement and analysis of software process. Process improvements.

**Prerequisite:** SWE 326

**SWE 490                                      Special Topics I                                      (3-0-3)**

In-depth study of a selected special topic relevant to software engineering

**Prerequisite:** Senior Standing

**SWE 491                                      Special Topics II                                      (3-0-3)**

In-depth study of a selected special topic relevant to software engineering

**Prerequisite:** Senior Standing

# **UNIVERSITY BOARD AND ADMINISTRATION**

## UNIVERSITY BOARD

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<b>Dr. Adel S. Al-Dosary</b>	Dean of College of Environmental Design
<b>Dr. Abdulaziz O. Al-Kaabi</b>	Dean of College of Petroleum Engineering & Geosciences
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<b>Dr. Salam A. Zummo</b>	Dean of Graduate Studies
<b>Dr. Nedal T. Ratrout</b>	Dean of Academic Development
<b>Dr. Saad M. Al-Shahrani</b>	Dean of Admissions & Registration
<b>Dr. Saeed M. Al-Amoudi</b>	Dean of Faculty & Personnel Affairs and Acting Secretary of the University Board
<b>Dr. Saleh A. Al-Baridi</b>	Dean of Library Affairs
<b>Dr. Dr. Nasser M. Al-Aqeeli</b>	Dean of Scientific Research
<b>Dr. Mesfer M. Al-Zahrani</b>	Dean of Student Affairs
<b>Dr. Omar S. Al-Amoudi</b>	Dean of Educational Services
<b>Dr. Abdulrahman A. Al-Arfaj</b>	Dean of Dammam Community College

## UNIVERSITY ADMINISTRATION

Rector & Chief Executive Officer	Dr. Khalid S. Al-Sultan, Ph.D. University of Michigan, Ann Arbor (1990)
Vice Rector for Academic Affairs	Dr. Mohammad S. Al-Homoud, Ph.D. Texas A&M (1994)
Vice Rector for Applied Research	Dr. Sahel N. Abduljawwad, Ph.D. University of Colorado, Boulder (1985)
General Supervisor, Services	Dr. Sami A. Khaiyat, Ph.D. Texas A&M (1994)
Supervisor, Dhahran Techno-Valley	Dr. Samir A. Al-Baiyat, Ph.D. University of Notre Dame (1986)
Dean, College of Engineering Sciences	Dr. Omar A. Al-Suwailem , Ph.D. University of Missouri, Columbia(1996)
Dean, College of Sciences	Dr. Suliman S. Al-Homidan, Ph.D. University of Dundee (1993)
Dean, College of Industrial Management	Dr. Mohammed F. Al-Zahrani, Ph.D. University of Oklahoma (2006)
Dean, College of Computer Sciences & Engineering	Dr. Adel F. Ahmed, Ph.D. University of Sydney (2008)
Dean, College of Environmental Design	Dr. Adel S. Aldosary University of Michigan, Ann Arbor (1991)
Dean, College of Petroleum Engineering & Geosciences	Dr. Abdulaziz O. Al-Kaabi Texas A&M
Dean, College of Applied & Supporting Studies	Dr. Ismail M. Budaiwi, Ph.D. Colorado University (1994)
Dean of Graduate Studies	Dr. Salam A. Zummo, Ph.D. University of Michigan, Ann Arbor (2003)
Dean of Academic Development	Dr. Nedat T. Ratrouf Michigan State University (1989)
Dean of Admissions & Registration	Dr. Omar A. Al-Suwailem , Ph.D. University of Missouri, Columbia(1996)
Dean of Faculty and Personnel Affairs	Dr. Saeed M. Alamoudi, Ph.D. University of Pittsburgh (1999)
Dean of Library Affairs	Dr. Saleh Al-Baridi Ph.D. Florida State University (1994)
Dean, Scientific Research	Dr. Nasser M. Al-Aqeeli, Ph.D. Mc Gill University (2000)
Dean of Student Affairs	Dr. Mesfer M. Al-Zahrani, Ph.D. Pennsylvania State University (1995)
Dean of Educational Services	Dr. Omar S. Al-Amoudi, Ph.D. KFUPM (1992)
Dean, Dammam Community College	Dr. Abdul Rahman A. Al-Arfaj, Ph.D. University of Washington (1985)

**UNIVERSITY FACULTY**

## **ORDER OF EACH ENTRY**

Name

Highest Earned Degree and Year of Graduation

The University Granting the Degree

Academic Rank

Department and Year of Appointment at KFUPM

Dr. Abbas, Nasir  
Ph.D. (2012)  
University of Amsterdam  
Assistant Professor  
Mathematics & Statistics Department (2014)

Dr. Abbasi, Saddam Akber  
Ph.D. (2013)  
University of Auckland  
Assistant Professor  
Mathematics & Statistics Department (2013)

Dr. Abdel-Aal, Radwan El-Said  
Ph.D. (1983)  
University of Strathclyde  
Professor  
Computer Engineering Department (1985)

Dr. Abd-El-Fattah, Ahmed Mohsen Sabry  
Ph.D. (2011)  
Kansas State University  
Assistant Professor  
Architecture Department (2012)

Dr. Abdelrahman, Wael Gamal Eldin Mohamed  
Ph.D. (1999)  
University of Cincinnati  
Assistant Professor  
Aerospace Engineering Department (2006)

Dr. Abdou, Adel Abdel- Moneim  
Ph.D. (1995)  
Concordia University  
Associate Professor  
Architecture Engineering Department (1996)

Dr. Abdulghani, Waleed Mohammed Rashad  
Ph.D. (2003)  
University of Manchester  
Assistant Professor  
Geosciences Department (1986)

Dr. Abduljawad, Sahel N.  
Ph.D. (1985)  
University of Colorado, Boulder  
Professor  
Civil Engineering Department (1978)

Dr. Abdul-Jauwad, Samir Hussain Ibrahim  
Ph.D. (1985)  
University of Sheffield  
Associate Professor  
Electrical Engineering Department (1974)

Mr. Abdullah, Mohammad Yunus  
Master (1984)  
University of Essex  
Lecturer  
Preparatory English Program (1993)

Dr. Abdullatif, Osman Mahmoud  
Ph.D. (1993)  
University of Khartoum  
Associate Professor  
Geosciences Department (2001)

Dr. Abdulraheem, Abdulazeez  
Ph.D. (1994)  
University of Oklahoma  
Associate Professor  
Petroleum Engineering Department (1994)



Dr. Abido, Mohamed Ali Yousif  
Ph.D. (1997)  
King Fahd University of Petroleum & Minerals  
Professor  
Electrical Engineering Department (1992)

Dr. Abo-Ghander, Nabeel Salem  
Ph.D. (2011)  
University of British Columbia  
Assistant Professor  
Chemical Engineering Department (2000)

Dr. Abokhodair, Abdul-Wahab Bin Abdulaziz Bin  
Ph.D. (1978)  
University of California Santa Cruz  
Associate Professor  
Geosciences Department (1972)

Dr. Abouheaf, Mohammed  
Ph.D. (2012)  
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Assistant Professor  
System Engineering Department (2013)

Dr. Abualhamayel, Habib Bin Ibrahim Bin Ahmed  
Ph.D. (1981)  
University of Colorado, Boulder  
Professor  
Mechanical Engineering Department (1973)

Dr. Al-Abdul Wahhab, Hamad I.  
Ph.D. (1985)  
Oregon State University  
Professor  
Civil Engineering Department (1979)

Dr. Abu-Al-Saud, Wajih Abdulelah

Ph.D. (2004)  
Georgia Institute of Technology  
Assistant Professor  
Electrical Engineering Department (1994)

Dr. Abu-Amara, Marwan Hassan  
Ph.D. (1995)  
Texas A&M University  
Associate Professor  
Computer Engineering Department (2003)

Dr. Abu-Dheir, Numan Mohammad Khalil Zuhdi  
Ph.D. (2005)  
University of Kentucky  
Assistant Professor  
Mechanical Engineering Department (2006)

Dr. Abuelmaatti, Muhammad Taher  
Ph.D. (1979)  
University of Bradford  
Professor  
Electrical Engineering Department (1991)

Mr. Abu-Hilal, Hamed  
Master (1987)  
Michigan State University  
Lecturer  
Physical Education Department (2000)

Dr. Abuihlail, Jawad Younes  
Ph.D. (2001)  
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Mr. Abujiya, Mu'azu Ramat  
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Lecturer  
Preparatory Math Program (2000)

Dr. Abu-Khamsin, Sidqi Ahmad M  
Ph.D. (1984)  
Stanford University  
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Petroleum Engineering Department (1975)

Dr. Abulkibash, Abdalla Mahmud Shihadeh  
Ph.D. (1979)  
University of Exeter  
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Chemistry Department (1980)

Dr. Abu-Sbeih, Mohamed Zuheir Ibrahim  
Ph.D. (1983)  
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Mr. AbuShosha, Mohammed Ahmed  
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Dr. Abussaud, Basim Ahmed Ali  
Ph.D. (2007)  
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Mr. Adejumo, Adewale Olumide  
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Mr. Adiche, Hakim Salah Mohamed  
Master (1997)  
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Dr. Afzal, Hafiz Muhammad  
Ph.D. (1999)  
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Islamic & Arabic Studies Department (1995)

Dr. Aghdam, Reza Fathollahzadeh  
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University of Technology, Sydney  
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Dr. Ahmad, Shamshad  
Ph.D. (1991)  
Indian Institute of Technology, Delhi India  
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Civil Engineering Department (2001)

Dr. Ahmad, Izhar Mohammad Gufran  
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Mr. Ahmad, Irfan  
Master (2008)  
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Dr. Ahmad, Irshad  
Ph.D. (2011)  
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Mr. Ahmed, Mustafa Faisal  
MBA (1997)  
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Dr. Ahmed, Chokri Salah Abdallah Belhaj  
Ph.D. (1996)  
University of Montreal  
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Electrical Engineering Department (1991)

Dr. Ahmed, Moataz Aly Kamaleldin  
Ph.D. (1997)  
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Mr. Ahmed, Akram Mohamed Musa  
Master (1989)  
Yarmouk University  
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Preparatory Math Program (1995)

Mr. Ahmed, Mohammad Bilal  
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Preparatory Science & Engineering Program (2011)

Dr. Ahmed, Adel Fadhl Noor  
Ph.D. (2008)  
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Mr. Ahmed, Syed Naveed  
Master (1999)  
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Ph.D. (1992)  
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Mr. Ahmed, Mohiuddin Nehaluddin  
Master (1984)  
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Dr. Aiban, Saad A.  
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Dr. Alabri, Khalid Hassan  
Ph.D. (2000)  
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Islamic & Arabic Studies Department (2004)

Dr. Al-Absi, Munir Ahmed Abdo  
Ph.D. (2001)  
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Associate Professor  
Electrical Engineering Department (2000)

Dr. Al-Adel, Fida Fouad  
Ph.D. (1981)  
University of Paris  
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Physics Department (1982)

Dr. Alahmadi, Saad Mohammed A.  
Ph.D. (2010)  
Carleton University  
Assistant Professor  
Electrical Engineering Department (2003)

Dr. Al-Ahmadi, Hasan M.  
Ph.D. (1990)  
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Associate Professor  
Civil Engineering Department (1982)

Dr. Al-Ahmadi, Mohammad Saad  
Ph.D. (2006)  
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Dr. Al-Ahmari, Abdallah Said Muhammad  
Ph.D. (2003)  
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Electrical Engineering Department (1991)

Mr. Alaimia, Mohamed Ridha  
Master (1989)  
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Preparatory Math Program (1999)

Dr. Al-Aithan, Thamer Abdulmohsen  
Ph.D. (1997)  
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Assistant Professor  
Physics Department (1985)

Dr. Al-Akhdar, Zaki Haidar H  
Ph.D. (1989)  
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Dr. Al-Ali, Habib Husain A  
Ph.D. (1988)  
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Dr. Al-Ameer, Abdlhameed Bin Abdullah  
Ph.D. (1992)  
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Dr. Al-Amer, Samir Hasan Husain  
Ph.D. (1999)  
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Assistant Professor  
System Engineering Department (1984)

Dr. Al-Amer, Adnan M  
Ph.D. (1983)  
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Chemical Engineering Department (1976)

Dr. Al-Amoudi, Omar S. B.  
Ph.D. (1992)  
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Dr. Al-Amoudi, Saeed Mohammed Saeed  
Ph.D. (1999)  
University of Pittsburgh  
Assistant Professor  
Physics Department (1991)

Dr. Alamri, Saeed Ali Mohammed  
Ph.D. (2005)  
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Assistant Professor  
Islamic & Arabic Studies Department (1997)

Dr. Al-Aqeeli, Nasir Mohammed  
Ph.D. (2000)  
Mcgill University  
Associate Professor  
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Dr. Al-Arfaj, Abdulrahman Ahmad Abdulrahman  
Ph.D. (1985)  
University of Washington  
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Chemistry Department (1978)

Dr. Al-Ashban, Aref Abdulla  
Ph.D. (1995)  
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Management & Marketing Department (1989)

Mr. Al-Asiri, Hassan Saeed  
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Dr. Allassaf, Abdulaziz Muhammad Jaser  
Ph.D. (2002)  
Northeastern University  
Assistant Professor  
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Dr. Al-Assaf, Abdulla Khalaf  
Ph.D. (1989)  
Halab University  
Assistant Professor  
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Dr. Alassar, Rajai Samih Mousa  
Ph.D. (1996)  
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Dr. Al-Athel, Khaled Saleh  
Ph.D. (2010)  
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Assistant Professor  
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Dr. Al-Attas, Omar G.  
Ph.D. (2012)  
University of Ottawa  
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Civil Engineering Department (2000)

Dr. Al-Attas, Husain Salem  
Ph.D. (2002)  
University of Pittsburgh  
Assistant Professor  
Mathematics & Statistics Department (1991)

Dr. Alawami, Louai Adnan  
Ph.D. (2013)  
Queen's University  
Lecturer  
Computer Engineering Department (2003)

Dr. Alawami, Ali Taleb  
Ph.D. (2010)  
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Dr. Al-Badour, Fadi  
Ph.D. (2012)  
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Dr. Al-Baghli, Nadhir Abbas H  
Ph.D. (2001)  
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Chemical Engineering Department (1991)

Dr. Al-Baiyat, Samir Alwan  
Ph.D. (1986)  
University of Notre Dame  
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Electrical Engineering Department (1977)

Dr. Al-Baridi, Saleh Abdulkarim Abdul-Aziz  
Ph.D. (1994)  
Florida State University  
Assistant Professor  
General Studies Department (1984)

Dr. Al-Barri, Thaeer  
Ph.D. (2007)  
Lund University  
Assistant Professor  
Chemistry Department (2014)

Dr. Al-Basheer, Watheq Ahmad Obidallah  
Ph.D. (2006)  
University of Tennessee  
Assistant Professor  
Physics Department (2012)

Mr. Al-Bashrawi, Mousa Ahmad Ali  
Bachelor (2009)  
King Fahd University of Petroleum & Minerals  
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Accounting & MIS Department (2009)

Mr. Al-Battal, Abdullah Faisal  
Master (2013)  
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Electrical Engineering Department (2010)

Dr. Al-Betar, Abdulrahman Faisal  
Ph.D. (2012)  
Memorial University, Canada  
Assistant Professor  
Chemistry Department (2012)

Dr. Albinali, Khaled Mohammed  
Ph.D. (2005)  
Kent State University  
Assistant Professor  
Finance & Economics Department (1996)

Dr. Albinmousa, Jafar Husain Ali  
Ph.D. (2011)  
University of Waterloo  
Assistant Professor  
Mechanical Engineering Department (2003)

Dr. Al-Dajani, Mansour Bin Abdulaziz Bin  
Ph.D. (2001)  
University of California Los Angeles  
Associate Professor  
System Engineering Department (1994)

Dr. Al-Dakhil-Allah, Ali Abdullah  
Ph.D. (1998)  
University of Manchester  
Assistant Professor  
Biology Department (1988)

Dr. Aldamer, Shafi Abdulrahman  
Ph.D. (2001)  
University of Durham  
Assistant Professor  
General Studies Department (2003)

Dr. Al-Darwish, Nasir Ali Nasir  
Ph.D. (1989)  
Oregon State University  
Associate Professor  
Information & Computer Science Department (1982)

Dr. Al-Dharrab, Suhail  
Ph.D. (2013)  
University of Waterloo  
Associate Professor  
Electrical Engineering Department (2005)

Dr. Aldheefallah, Mujahed Mohammed  
Ph.D. (2009)  
University of Calgary  
Assistant Professor  
System Engineering Department (1999)

Dr. Al-Dini, Salem Ahmad Salem  
Ph.D. (2005)  
Texas A&M University  
Assistant Professor  
Mechanical Engineering Department (1994)

Mr. Aldohan, Badr Hamad  
Bachelor (2001)  
King Fahd University of Petroleum & Minerals  
Lecturer  
Electrical Engineering Department (2001)

Dr. Al-Dosary, Adel Shaheen Yousef  
Ph.D. (1991)  
University of Michigan  
Professor  
City & Regional Planning Department (1983)

Dr. Al-Dulaijan, Saleh U.  
Ph.D. (1996)  
Pennsylvania State University  
Associate Professor  
Civil Engineering Department (1984)

Dr. Aldurgam, Mohammad Mansour Fadel  
Ph.D. (2009)  
King Fahd University of Petroleum & Minerals  
Assistant Professor  
System Engineering Department (2009)

Dr. Al-Duwaish, Hussain Naser .  
Ph.D. (1995)  
Colorado State University  
Associate Professor  
Electrical Engineering Department (1988)

Dr. Al-Dweik, Ahmad Yousef  
Ph.D. (2010)  
King Fahd University of Petroleum & Minerals  
Assistant Professor  
Mathematics & Statistics Department (2010)

Dr. Al-Elg, Ali Habibh. Hameed  
Ph.D. (1993)  
University of Mississippi  
Assistant Professor  
Finance & Economics Department (1982)

Dr. Alfagih, Ashraf Ehsan  
Ph.D. (2011)  
Queen'S University  
Assistant Professor  
Information & Computer Science Department (2000)

Dr. Al-Faraj, Taqi Nasr Turkey  
Ph.D. (1986)  
University of Texas, Austin  
Associate Professor  
Management & Marketing Department (1977)

Dr. Al-Farayedhi, Abdulghani Abdulla  
Ph.D. (1987)  
University of Colorado, Boulder  
Associate Professor  
Mechanical Engineering Department (1977)

Dr. Al-Fares, Hesham Kamal .  
Ph.D. (1991)  
Arizona State University  
Professor  
System Engineering Department (1984)



Mr. Al-Fifi, Salman Amsari H  
Master (2011)  
King Fahd University of Petroleum & Minerals  
Lecturer  
Aerospace Engineering Department (2004)

Dr. Alfuraidan, Monther Rashed Saleh  
Ph.D. (2004)  
Michigan State University  
Associate Professor  
Mathematics & Statistics Department (1995)

Dr. Al-Gadhib, Ali H.  
Ph.D. (1989)  
North Carolina State University  
Associate Professor  
Civil Engineering Department (1980)

Dr. Al-Gahtani, Ahmad S.  
Ph.D. (1986)  
University of Iowa  
Associate Professor  
Civil Engineering Department (1986)

Dr. Al-Gahtani, Husain J.  
Ph.D. (1992)  
Michigan State University  
Professor  
Civil Engineering Department (1986)

Dr. Al-Gahtani, Ibrahim Mohammad Shaiea  
Ph.D. (1987)  
University of Wisconsin, Milwaukee  
Assistant Professor  
Finance & Economics Department (1979)

Dr. Al-Garni, Ahmed Zafer Ali  
Ph.D. (1991)  
University of Maryland  
Professor  
Aerospace Engineering Department (1984)

Dr. Al-Garni, Said Ali  
Ph.D. (2012)  
University of Carleton  
Assistant Professor  
Mathematics & Statistics Department (1998)

Dr. Alghadhiban, Samir Nasser  
Ph.D. (2005)  
Virginia Polytechnic Institute & State University  
Assistant Professor  
Electrical Engineering Department (1997)

Dr. Al-Ghahtani, Mesfer Ali Mohammed  
Ph.D. (2001)  
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Professor  
Islamic & Arabic Studies Department (1996)

Dr. Alghamdi, Mohammad Khalaf  
Ph.D. (2012)  
Mcgill University  
Assistant Professor  
Electrical Engineering Department (2001)

Dr. Alghamdi, Saeid A.  
Ph.D. (1988)  
Arizona State University  
Assistant Professor  
Civil Engineering Department (1982)

Dr. Al-Ghamdi, Salem Matar Saeed  
Ph.D. (1994)  
Virginia Polytechnic Institute & State University  
Professor  
Management & Marketing Department (1982)

Dr. Al-Ghamdi, Abdul-Rahim Saeed  
Ph.D. (1992)  
University of Illinois, Urbana-Champaign  
Assistant Professor  
System Engineering Department (1981)

Mr. Al-Ghazi, Anas Al-Sayed  
Bachelor (2005)  
King Fahd University of Petroleum & Minerals  
Lecturer  
System Engineering Department (2005)

Dr. Al-Habboubi, Mohammad Husain Amran  
Ph.D. (1987)  
Oregon State University  
Professor  
System Engineering Department (1978)

Dr. Al-Hadhrani, Luai Muhammad  
Ph.D. (2002)  
Texas A&M University  
Associate Professor  
Mechanical Engineering Department (1994)

Dr. Al-Hadidi, Laith Awni Abdul-Fattah  
Ph.D. (2011)  
King Fahd University of Petroleum & Minerals  
Assistant Professor  
Construction Engineering Management (2013)

Dr. Alhajyaseen, Wael  
Ph.D. (1995)  
Nagoya University, Japan  
Assistant Professor  
Civil Engineering Department (2013)

Dr. Al-Hammad, Abdalmohsen Abdalla  
Ph.D. (1984)  
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Professor  
Architecture Engineering Department (1978)

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# Undergraduate BULLETIN

Design By: Naveed A. Shah  
Printed By: KFUPM Press