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

Undergraduate Bulletin
2019

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Dhahran 31261, Saudi Arabia

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.

This Bulletin was prepared during the 2018/2019 academic year and published in September 2019. The contents were compiled from various inputs received from the academic departments and administrative offices throughout the University.

The Bulletin provides information about all academic programs. It also gives information on academic regulations, admission criteria and selected activities and services. It is hoped that the Bulletin will serve as a useful guide to faculty members, students and staff whenever questions arise regarding academic matters such as University rules, curricula of programs, and courses and their prerequisites.

Dr. Ahmed Salah Nada
Editor, KFUPM Undergraduate Bulletin
September 01, 2019

ACKNOWLEDGEMENTS

The editor is extremely grateful for the generous support provided by the University Vice Rector for Academic Affairs, Dr. Mesfer M. Al-Zahrani. Special thanks go to all my colleagues in the office of the Vice Rector for Academic Affairs. I would also like to thank Dr. Adel A. Abdou for his valuable comments. This assignment could not have been accomplished without the cooperation received from the University Deans and Chairmen, the Registrar, and all Departments involved.

FOREWORD

The revised Undergraduate Bulletin shows the commitment of King Fahd University of Petroleum & Minerals (KFUPM) to regularly update its academic programs to respond to global changes and react to the needs of the Kingdom of Saudi Arabia. The Bulletin contains detailed information of the current academic programs. It includes the degree plans, degree requirements, course descriptions and graduation requirements. It also outlines the policies, procedures, and student services available at the University at the time of publishing.

The Bulletin also imparts the compliance of all undergraduate academic programs to the requirements of national and international accrediting institutions ensuring continuous improvement of academic quality at the time of its publication.

Our academic programs are developed and updated to be proactive in preparing future generations of leaders. We make certain that students leave KFUPM with all of the necessary knowledge, skills, attitudes, and values that will enable them to be successful leaders and global citizens.

Through the various units and grants available at KFUPM, including Colleges, Centers of Excellence, and Research Groups, KFUPM continues to support and involve faculty members and students in research activities. The University's commitment to community service is maintained through a variety of formal and informal programs, with the additional challenge of instilling a culture of community service in its students.

I take this opportunity to extend my thanks and appreciation for the efforts of all those involved in the successful launching of this Bulletin. My special thanks are due to the Rector of the University for his leadership and continuous support of all academic activities, and to all University Deans, department Chairmen, faculty, support units, and individuals who contributed to the development of this Bulletin.

Dr. Mesfer Mohammad Al-Zahrani

Vice Rector for Academic Affairs

September 01, 2019

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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 10,870 students during the 2018-2019 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 2018/2019, 37,936 degrees have been awarded including 4,934 Master's and 427 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 Burayadah 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 & COMMUNICATIONS TECHNOLOGY CENTER

The Information & Communications Technology Center (ICTC) 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 ICTC 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 ICTC:

ICTC 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-elated courses and tutorials.

Organization

The ICTC 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 ICTC 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 ICTC, 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 ICTC departments through the best practice models in IT.

The University Intranet

The KFUPM ICTC 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 ICTC 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 ICTC, 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 ICTC 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 ICTC, thereby ensuring high-quality IT services to the University community. The ICTC 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 polices. 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 he 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 as 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 repute 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 inquires 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 come to the Deanship from its various departments in addition to bylaws and regulations.

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 finicial 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

The Academic Year is:	Two regular semesters and a summer semester, if any.
The Academic Semester is:	A term of no less than (15) weeks of instruction not including the registration and final examination periods.
The Summer Semester is:	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.
The Academic Level:	Indicates the study level in accordance with the specifications of each approved degree plan.
The Degree Plan is:	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.
A Course is:	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).
The Credit Hour is:	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.
Academic Probation is:	A notification given to a student with a cumulative GPA below the minimum acceptable limit as explained in these regulations.

The Class Work Score is: 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.

The Final Examination is: An examination in the course, given once at the end of every semester.

The Final Examination Score is: The score attained by the student in each course in the final examination.

The Final Score is: The total of the class work score plus the final examination score calculated for each course out of a total grade of 100.

The Course Grade is: A percentage, or alphabetical letter, assigned to a student, indicating the final grade he received in a course.

Incomplete Grade is: 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".

In Progress Grade is: A provisional grade assigned to each course which requires more than one semester to complete. The letter grade "IP" is assigned in this case.

Semester GPA is: 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).

Cumulative GPA is: 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).

Graduation Ranking is: The assessment of the student's scholastic achievement during his study at the University.

Course Load is 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

The Grading System applicable at KFUPM	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.
Transcript	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.
Major GPA	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.
The Credit-Hour for the Laboratory or Field Sessions	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.
The Admission & Academic Standing Committee	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.
Promotion from Prep-Year Courses	This is based upon successfully passing all or some of the Prep-Year courses in accordance with the rules set by the University.
The Cooperative Program	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.
Summer Training	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.

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. However, this condition will be relaxed 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.

3. 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.

<u>Implementation Rules of Article Twenty-Five</u>

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 a DN 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 DN 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 DN grade. In this case, the instructor gives the student a make-up exam;
   (b) that the student deserves the DN 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 another 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

College of General Studies
- Preparatory Year Program
- Department of Islamic and Arabic Studies
- Physical Education Department
- Department of Global and Social Studies
- English Language Department

College of Applied Engineering
- Applied Aerospace Engineering
- Applied Chemical Engineering
- Applied Civil and Environmental Engineering
- Applied Electrical Engineering
- Applied Mechanical Engineering

College of Engineering
- Aerospace Engineering
- Chemical Engineering
- Civil and Environmental Engineering
- Electrical Engineering
- Mechanical Engineering

College of Computer Sciences and Engineering
- Computer Engineering
- Information and Computer Science
  Computer Science
  Software Engineering
- Systems Engineering
  Industrial and Systems Engineering
  Control and Instrumentation Systems Engineering

College of Environmental Design
- Architectural Engineering
- Architecture
- City and Regional Planning
- Construction Engineering and Management

KFUPM Business School
- Accounting and Finance
  Accounting
  Finance
- Information Systems & Operations Management
  Management Information Systems
- Management and Marketing
  Management
  Marketing

College of Petroleum Engineering & Geosciences
- Geosciences
  Geology
  Geophysics
- Petroleum Engineering
- Center for Integrative Petroleum Research

College of Sciences
- Chemistry
  Chemistry
  Industrial Chemistry (frozen)
- Life Sciences
- Mathematics and Statistics
  Mathematics
  Statistics
  Actuarial Sciences and Financial Mathematics
- Physics

COLLEGE OF GENERAL STUDIES

Dean: Dr. Hattan Tawfiq

PROGRAMS

PREPARATORY YEAR

DEPARTMENTS

ISLAMIC AND ARABIC STUDIES
PHYSICAL EDUCATION
GLOBAL AND SOCIAL STUDIES
ENGLISH LANGUAGE

The College of General Studies (CGS) 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 CGS with the community through services and research of mutual interest.

Goals

CGS 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 one program: the Preparatory Year Program (PYP); and four supporting academic departments: the Islamic and Arabic Studies Department; the Physical Education Department; the Department of Global and Social Studies; 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.

Islamic & Arabic Studies Department

The department offers courses in Islamic ideology, professional ethics and human rights in Islam, Writing for Professional Needs, 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.

Department of Global and Social Studies

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	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**
Total credit hours required in Preparatory Program: 31									

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

Preparatory English Program (PEP)

Director: Barrett F. Brookshire (A)

Faculty

Abdullah
Amison
Appling
Armstrong
Baker
Brigham
Brooks
Brookshire
Brown
Burridge
Carey
Clermont
Combes
Debenham
Fernelius
Fletcher
Fogarty
Foord
Garlington
Gaylard
Gowlett
Graham
Gray
Green
Hands
Hennessey
Hillmer
Hind
House
Hudson
Johnston
Jones
Kearney
Knight
Knott
Kriel
Lake
Lavelle
Lewis
MacDonald
Mann
Marsh
McCarthy
McKay
Moore, D.B.
Moore, H.M.
Mountjoy
Owen
Oxley
Paddock
Pearson
Poores
Powell
Robben
Rycroft
Silke
Sliwa
Smith
Snow
Snyman
Turbett
Watson
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	Arafeh	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. Rezqallah Malkawi (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 (Life Skills), and PYP 004 (Preparatory Engineering Technology). Half of the newly admitted students take PYP 001and 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.

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 General Studies. 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 Consequences" (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), "Writing for Professional Needs" (IAS 201), and "Oral 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-Nabawiyyah" (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: "Reading and 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
Total			**30**

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 Global and Social Studies

Chairman: Dr. Shafi Aldamer

Faculty

Albaridi	Bendania	Saeed
Aldamer	Alowidha	Schefinger
Almadkhali	Jiang	Sondaal
Almatrodi	Khogali	Thompson
Almogren	Magliveras	
Alqurtuby	Moftah	

The Department of Global and Social Studies 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 Global and Social 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), 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: Dr. Malcolm Bancroft (A)

Faculty

Anyan	Gibson	Lawrie
Berry	Graham	Marquis
Billam	Hamilton	Nagy
Blazenko	Hartley	Nelson
Congreve	Horn	Nicholas
Dale	Ismail	Pearson
Daly	Jameson	Pollard
Donovan	King	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 ENGL102 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 21st century.

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. Ali Al-Shaikhi

DEPARTMENTS

APPLIED AEROSPACE ENGINEERING
APPLIED CHEMICAL ENGINEERING
APPLIED CIVIL AND ENVRONMENTAL 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 21st 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.

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 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. Ayman M. Abdallah

Faculty

Abdallah	Al-Garni	Ahmed
Abdelrahman	Ghazy	
Al-Fifi	Ghazzawi	

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 air transportation, civil aviation, industry, and economy; second, its relevance to defence issues including Air Force and Air Defence.

The Applied Aerospace Engineering (AAE) Program is designed to cover all fundamental aspects. 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, Astronautics and current trending topics like Unmanned Aerial Systems (UAS). Moreover, the curriculum is also augmented by elective courses in various branches of Aerospace Engineering. A student can take one course from Aerospace Engineering, one from math/basic sciences 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 senior design courses, 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.

The aviation market in the middle east, a main industry attraction for AE graduate students, has consistently outperformed most of the regional markets in the past decade since the establishment of the AAE BS Program. Between 2012 and 2032 growth in air passenger and cargo traffic in the region is expected to outperform all other regions in the world. Growth is also driven by establishment of new aerospace engineering companies and government organizations that cater to both civil and defence related sectors in the Kingdom. Also, the AE department aspires to contribute in one of the aims of Kingdom’s Vision 2030, which is to involve industry experts and national academic institutions in exchanging knowledge and technology to build national expertise in the fields of manufacturing, maintenance, repair, research and development of aerospace defence industry.

Vision

The Aerospace Department at KFUPM aims at being a distinguished department known for its world-class competitive graduates, cutting edge research, leadership in aerospace engineering education, and professional society-related services.

Mission

The mission of the AE department is:

- to graduate leaders who are knowledgeable and equipped with the required professional skills to solve standing and emerging challenges.
- to provide excellent environment for education to support active learning and critical thinking.
- to provide a leading-edge research in collaboration with academic and industrial stakeholders.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **“Applied Aerospace Engineering”** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Applied Aerospace Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Graduates will excel in their professional career to meet the expectations of employers of aerospace engineers.
2. Qualified graduates will be able to pursue advanced Aerospace Engineering degrees in excellent world universities if they so desire.
3. Graduates will assume leadership roles in their profession and in their communities.

- **Student Outcomes (SOs)**

The ***Applied Aerospace Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. communicate effectively with a range of audiences.

4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements for the Bachelor of Science (BS) Degree in Applied Aerospace Engineering

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

(a) General Education Requirements (64 credit hours) **Credit Hours**

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
		61

(b) Core Requirements (49 credit hours)

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
Aerospace Engineering Labs	AE 420, 421	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
Flight Propulsion	AE 422	3
Flight Dynamics	AE 426	3
Aerospace System Design	AE 427	3
		45

(c) Electives (12 credit hours)

AE Electives	Two AE xxx Course	6
Electives (One Technical Elective and One Science Elective. TE can be taken from any other department after the approval of AE Department)	Two XX xxx Courses	6
General Studies	Two GS xxx Courses	6
		18

(d) Cooperative Work (9 credit hours)

Each Coop student must participate in a 28-week program of industrial experience and submit a report.

Cooperative Work	AE 351	9
		9

The total number of credit hours required is	**133**

Applied 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	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**
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 Consequences	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	Writing for Professional Needs	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
ME 311	Fluid Mechanics	3	0	3	AE 328	Flight Structures I	3	0	3
XX xxx	Technical Elective	3	0	3	AE 333	Aerodynamics I	3	0	3
XX xxx	Science Elective	3	0	3	AE 355	Exp. & Comp. Methods for AE	1	0	1
GS xxx	General Studies I	3	0	3	AE 420	AE Lab I	0	3	1
					IAS 301	Oral Communication Skills	2	0	2
					GS xxx	General Studies II	3	0	3
		16	**3**	**17**			**16**	**9**	**19**
Summer Session					AE 350	Begin Cooperative Work	**0**	**0**	**0**
Fourth Year (Senior)									
AE 351	Cooperative Work	0	0	9	AE 421	AE 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 Tech. Elective I	3	0	3
					AE xxx	AE Tech. Elective II	3	0	3
					IAS 322	Human Rights in Islam	2	0	2
		0	**0**	**9**			**17**	**3**	**18**
Total credit hours required in Degree Program : 133									

Department of Applied Chemical Engineering

Chairman: Dr. Mamdouh Al-Harthi

Faculty

Abo-Ghander
Abussaud
Al-Asiri
Al-Baghli
Al-Harthi
Al-Juhani
Al-Jundi
Al-Mubaiyedh
Al-Mutairi
Al-Saifi
Al-Shammari
Al-Yousef
Ba-Aqil
Ba-Shammakh
Mahgoub
M.Mazhar
Razzak
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 Department of choice and will be recognized as one of the top research and graduate chemical engineering departments in the Kingdom and abroad.

Mission

The mission of the Department of Chemical Engineering at King Fahd University of Petroleum & Minerals is 'to contribute to the thriving economy and vibrant society by offering an innovative, challenging and flexible educational programs'. Chemical Engineering programs are designed to provide high level academic and professional skills by promoting lifetime learning, planning, communication, problem solving and leadership.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Applied Chemical Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Applied Chemical Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Achieve a successful career in the oil, gas, petrochemical, desalination, energy and other process industries.
2. Integrate their academic preparation with chemical engineering practice, innovation and technology development.
3. Pursue a graduate degree in chemical engineering or other related fields.
4. Take leadership roles in industry, business, and governmental agencies.

- **Student Outcomes (SOs)**

The ***Applied Chemical Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. communicate effectively with a range of audiences.
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Programs Strategy

The strategy of the Department of Applied 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 Bachelor of Science (BS) Degree in Applied Chemical Engineering

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

(a) General Education Requirements (62 credit hours) **Credit Hours**

Sciences	PHYS 101, 102, CHEM 101, 102	16
Mathematics and Statistics	MATH 101, 102, 201, 202, 371, STAT 319	20
Communication Skills	ENGL 101, 102, 214, IAS 101, 201, 301	15
Engineering Skills	ICS 103	3
Islamic and Arabic Studies	IAS 111, 212, 322	6
Physical Education	PE 101, 102	2
		62

(b) Advanced Chemical Sciences Requirements (17 credit hours)

Chemistry	CHEM 201, 311, 321	11
Material Science	ME 205	3
Biology	BIOL 233	3
		17

(c) Core Requirements (36 credit hours)

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
		36

(d) Electives (9 credit hours)

CHE Electives	CHE 4xx	3
Technical Electives	XE xxx	3
General Studies	GS xxx	3
		9

(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
		9

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	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**
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 Consequences	2	0	2	ME 205	Materials Science	2	3	3
					IAS 201	Writing for Professional Needs	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 321	Instrumental Analysis for Engineers	2	4	3
CHEM 311	Physical Chemistry II	3	4	4	STAT 319	Probability and Stat. for Eng. and Scientists	2	3	3
MATH 371	Introduction to Numerical Computing	3	0	3	IAS 301	Language Comm. Skills	2	0	2
IAS 212	Professional Ethics	2	0	2	XE xxx	Technical Elective	3	0	3
					GS xxx	GS Elective	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 401	Process Dynamics and Control	3	0	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 495	Integrated Design Course	1	6	3
					CHE 4xx	CHE 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. Salah Al-Dulaijan

Faculty

Abduljauwad	Al-Malack	Assi
Adekunle	Al-Ofi	Baig
Ahmad	Al-Osta	Bouchama
Al-Abdul Wahhab	Al-Qahtani, H.	Chowdhury
Al-Ahmadi	Al-Sghan	Essa
Al-Amoudi	Al-Shayea	Khalid
Al-Dulaijan	Al-Sughaiyer	Mukhtar
Al-Gadhib	Al-Suwaiyan	Ratrout
Al-Gahtani, A.	Al-Zahrani, Mesfer	Sharif
Alghamdi	Al-Zahrani, Muhammad	Vohra

Introduction

The Applied Civil Engineering (ACE) program 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 provides basic knowledge in sciences, mathematics, and engineering in the first two years. During the third year, the student is introduced to different fields in civil engineering with the emphasis on applications and design. After the completion of his third year, the student undertakes COOP training in industry. Appropriate electives are also offered to further enhance 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 Applied Civil Engineering undergraduate curriculum.

Vision

To provide students with proper learning infrastructure and research environments to develop their potential with technical knowledge and professional skills. For this ultimate educational objective, all underpinnings of the department (including academic and professional partnerships with academic and industrial stakeholders) have been forged to ensure maintaining recognizable leading-stands in education, research, and public professional-services.

Mission

The department (CEE-KFUPM) seeks to provide distinctive infrastructure and environment for education, research and public services synergistically supportive to active learning, creative thinking, developing professional skills and self-development such that CEE-KFUPM graduates would be qualified for being leaders equipped with potential-skills and capabilities to provide intelligent solutions for standing and emerging professional challenges.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Applied Civil Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Applied Civil Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Establish themselves as leading practicing civil engineering professionals, and demonstrate distinct abilities as responsible members of professional multi-disciplinary teams;
2. Pursue career developmental activities for up-to-date professionally-technical knowledge and skills; and
3. Conduct impactful basic and applied research activities to develop efficient solutions.

- **Student Outcomes (SOs)**

The ***Applied Civil Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. communicate effectively with a range of audiences.
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements for the Bachelor of Science (BS) Degree in Applied Civil Engineering

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

(a) General Education Requirements (57 credit hours)

		Credit Hours
English	ENGL 101, 102, 214	9
Computer Skill	ICS 103	3
Interdisciplinary Basic Course	ME 201	3
Mathematics	MATH 101, 102, 201, 208	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
		57

(b) Core Requirements (48 credit hours)

Computer Graphics	CE 216	2
Surveying	CE 262	3
Mechanics and Structures	CE 201, 203, 305, 315	12
Materials	CE 204, 206	4
Geotechnical	CE 354, 356	4
Transportation	CE 341, 343	4
Fluid Mechanics and Environmental Engineering	CE 230, 330, 335, 375	10
Numerical and Statistical Methods in CE	CE 318	3
Construction Management and Economy	CE 422	3
Senior Design Project	CE 411	3
		48

(c) Electives (21 credit hours)

CE Electives	Two CE xxx Courses	6
CE Design Electives	Two CE xxx Courses	6
Additional Science Elective	GEOL 101 or BIOL 233	3
General Studies	Two GS xxx Courses	6
		21

(d) Cooperative Work (6 credit hours)

A minimum of 28-week program to gain experience; submit and present a report.

Cooperative Work	CE 351	6
		6

The total number of credit hours required is **132**

Applied Civil 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	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**
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	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	ICS 103	Computer Programming in C	2	3	3
IAS 111	Belief and its Consequences	2	0	2	CHEM 111	Basics of Environmental Chemistry	2	0	2
		15	**9**	**18**			**16**	**6**	**18**
Second Year (Sophomore)									
PE 102	Health and Physical Educ. II	0	2	1	IAS 201	Writing for Professional Needs	2	0	2
CE 201	Statics	3	0	3	ME 201	Dynamics	3	0	3
MATH 201	Calculus III	3	0	3	CE 203	Structural Mechanics I	3	0	3
ENGL 214	Academic & Professional Comm.	3	0	3	CE 204	Civil Eng. Materials	3	0	3
CE 216	Computer Graphics	1	3	2	CE 206	Civil Eng. Materials Lab	0	3	1
CE 262	Surveying	2	3	3	MATH 208	Intro. to Differential Eq. & Linear Algebra	3	0	3
IAS 212	Professional Ethics	2	0	2	CE 230	Eng. Fluid Mechanics	3	0	3
		14	**8**	**17**			**17**	**3**	**18**
Third Year (Junior)									
CE 305	Structural Analysis I	3	0	3	IAS 301	Oral Communication Skills	2	0	2
IAS 322	Human Rights in Islam	2	0	2	CE 315	Reinforced Concrete I	2	3	3
CE 318	Numerical & Statistical Methods in CE	2	3	3	CE 335	Eng. Hydrology	2	3	3
CE 341	Transportation Eng.	3	0	3	CE 330	Environmental Eng. Principles	3	0	3
CE 343	Transportation Eng. Lab	0	3	1	CE 375	Environmental Chemistry Lab	0	3	1
CE 354	Intro. to Geotechnical Eng.	3	0	3	CE xxx	CE Design Elective I	3	0	3
CE 356	Geotechnical Eng. Lab	0	3	1	GS xxx	GS Elective I	3	0	3
XXX xxx	Science Elective	2	3	3					
		15	**12**	**19**			**15**	**9**	**18**
Summer Session					CE 350	Begin Cooperative Work	**0**	**0**	**0**
Fourth Year (Senior)									
CE 351	Cooperative Work	0	0	6	GS xxx	GS Elective II	3	0	3
					CE xxx	CE Elective I	3	0	3
					CE xxx	CE Elective II	3	0	3
					CE xxx	CE Design Elective II	3	0	3
					CE 411	Senior Design Project	1	6	3
					CE 422	Construction Management and Economy	3	0	3
		0	**0**	**6**			**16**	**6**	**18**
Total credit hours required in Degree Program : 132									

Department of Applied Electrical Engineering

Chairman: Dr. Abdallah Al-Ahmari

Faculty

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

Mission

- Imparting profound knowledge in the areas of electrical engineering.
- Enriching graduates with technical and soft skills to take up leading role in the society.
- Producing high quality research with focus on energy-related challenges.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **“Applied Electrical Engineering”** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Applied Electrical Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

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 (SOs)**

The ***Applied Electrical Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirement for the Bachelor of Science (BS) Degree in Applied Electrical Engineering

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

(a) General Education Requirements (58 credit hours)		**Credit Hours**
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
		58

(b) Core Requirements (51 credit hours)		
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
		51

(c) Electives (16 credit hours)		
Electrical Engineering Electives	Two EE 4xx courses	7
Non-EE Technical Elective from the colleges (Engineering, Computer Sciences and Eng., Sciences, Environmental Design, and Petroleum Eng. & Geosciences)	XXX 2xx	3
General Studies	Two GS xxx Courses	6
		16

(d) Cooperative Work (9 credit hours)		
Cooperative Work	EE 351	9
		9

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	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**
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 Consequences	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	Non-EE Technical Elective	3	0	3	IAS 201	Writing for Professional Needs	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	Oral Communication 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	Bahaidarah	Mokheimer
Abualhamayel	Baig	Muhammad
Abu-Dheir	Bashmal	Munteshari
Ahmed	Bazoune	Nouari
Akhtar	Ben-Mansour, R	Qureshi
Al-Aqeeli	Bin-Mansoor, S	Patel
Al-Athel	Furquan	Raza
Albinmousa	Gasem	Sahin
Al-Hadhrami	Habib	Said
Al-Merbati	Hassan, F	Sarhan
Al-Nassar	Hawwa	Shaukat
Al-Qahtani, H	Jaber	Shuja
Al-Qahtani, M	Khalifa	Sorour
Al-Quaity	Khater	Sunar
Al-Qutub	Khulief	Toor
Alsaeed	Leseman	Yaqub
Al-Sayoud	Mahmood	Yilbas
Al-Sharafi	Mahmoud, M	Younas
Anis	Mekid	Zahoor
Antar	Merah	Zubair
Badour	Mezghani	

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 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.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Applied Mechanical Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Applied Mechanical Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Knowledge and competencies to pursue a successful career in mechanical engineering, other related fields, or engage in entrepreneurship.
2. Continuation of their lifelong learning and professional development through self-study, continuing education, graduate studies, or professional certification.
3. Lead or actively participate in efforts to address social, technical and business challenges of the 21st century and in line with the Kingdom's Vision 2030.

- **Student Outcomes (SOs)**

The ***Applied Mechanical Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. communicate effectively with a range of audiences.

4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements for the Bachelor of Science (BS) Degree in Applied Mechanical Engineering

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

(a) General Education Requirements (67 credit hours) — **Credit Hours**

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, 333	17
Physical Education	PE 101, 102	2
Sciences	CHEM 101, PHYS 101, 102	12
		67

(b) Core Requirements (49 credit hours)

Mechanical Engineering Drawing & Graphics	ME 210	3
Intro. to Mechanical Engineering Design	ME 218	2
Dynamics, Mechanics of Machines, and System Dynamics	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
		49

(c) Electives (9 credit hours)

Mechanical Engineering Elective	ME 4xx	3
General Studies	Two GS xxx Courses	6
		9

(d) Cooperative Work (9 credit hours)

Cooperative Work	ME 351	9
		9

The total number of credit hours required is **134**

Applied 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	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**
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 Consequences	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	Writing for Professional Needs	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 333	Methods of Applied Math I	3	0	3
EE 306	Electromechanical Devices	2	3	3	GS xxx	GS Elective I	3	0	3
IAS 301	Oral Communication 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

Dean: Dr. Ali Al-Shaikhi

DEPARTMENTS

AEROSPACE ENGINEERING
CHEMICAL ENGINEERING
CIVIL AND ENVRONMENTAL ENGINEERING
ELECTRICAL ENGINEERING
MECHANICAL 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 are designed to meet the challenges of the 21^{st} 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 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 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.

Curricular Requirements

The general 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 Sciences: The curriculum of each major in 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 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 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. Ayman M. Abdallah

Faculty

Abdallah	Al-Garni	Ahmed
Abdelrahman	Ghazy	
Al-Fifi	Ghazzawi	

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 air transportation, civil aviation, industry, and economy; second, its relevance to defence issues including Air Force and Air Defence.

The Aerospace Engineering (AE) Program is designed to cover all fundamental aspects. 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, Astronautics and current trending topics like Unmanned Aerial Systems (UAS). Moreover, the curriculum is also augmented by several elective courses in various branches of Aerospace Engineering. A student can take two courses from Aerospace Engineering, two from other engineering/sciences/management 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.

The aviation market in the middle east, a main industry attraction for AE graduate students, has consistently outperformed most of the regional markets in the past decade since the establishment of the AE BS Program. Between 2012 and 2032 growth in air passenger and cargo traffic in the region is expected to outperform all other regions in the world. Growth is also driven by establishment of new aerospace engineering companies and government organizations that cater to both civil and defence related sectors in the Kingdom. Also, the AE department aspires to contribute in one of the aims of Kingdom’s Vision 2030, which is to involve industry experts and national academic institutions in exchanging knowledge and technology to build national expertise in the fields of manufacturing, maintenance, repair, research and development of aerospace defence industry.

Vision

The Aerospace Department at KFUPM aims at being a distinguished department known for its world-class competitive graduates, cutting edge research, leadership in aerospace engineering education, and professional society-related services.

Mission

The mission of the AE department is:

- to graduate leaders who are knowledgeable and equipped with the required professional skills to solve standing and emerging challenges.
- to provide excellent environment for education to support active learning and critical thinking.
- to provide a leading-edge research in collaboration with academic and industrial stakeholders.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Aerospace Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Aerospace Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Graduates will excel in their professional career to meet the expectations of employers of aerospace engineers.
2. Qualified graduates will be able to pursue advanced Aerospace Engineering degrees in excellent world universities if they so desire.
3. Graduates will assume leadership roles in their profession and in their communities.

- **Student Outcomes (SOs)**

The ***Aerospace Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. communicate effectively with a range of audiences.

4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements for the Bachelor of Science (BS) Degree in Aerospace Engineering

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

(a) General Education Requirements (67 credit hours) — **Credit Hours**

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, 333, 371	20
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
		67

(b) Core Requirements (49 credit hours)

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
Aerospace Engineering Labs	AE 420, 421	2
Senior Design Project	AE 411, 412	3
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
Flight Propulsion	AE 422	3
Flight Dynamics	AE 426	3
Aerospace System Design	AE 427	3
		48

(c) Electives (18 credit hours)

AE Electives	Two AE xxx Courses	6
Electives (Technical Electives can be taken from any other department after the approval of AE Department)	Two XE xxx Courses	6
General Studies	Two GS xxx Courses	6
		18

(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
		0

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	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**
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 Consequences	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	Writing for Professional Needs	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
MATH 333	Methods of Applied Math I	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
MATH 371	Intro. to Numerical Computing	3	0	3	AE 355	Exp. & Comp. Methods for AE	0	3	1
GS xxx	GS Elective I	3	0	3	IAS 301	Oral Communication 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	2	0	2
AE 420	AE Lab I	0	3	1	AE 421	AE Lab II	0	3	1
AE 426	Flight Dynamics I	3	0	3	AE 422	Flight Propulsion I	3	0	3
AE xxx	AE Tech. 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 Tech. Elective II	3	0	3
XE xxx	Tech. Elective I	3	0	3	XE xxx	Tech. 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. Mamdouh A. Al-Harthi

Faculty

Abo-Ghander	Al-Mubaiyedh	Mahgoub
Abussaud	Al-Mutairi	M.Mazhar
Al-Asiri	Al-Saifi	Razzak
Al-Baghli	Al-Shammari	Shawabkeh
Al-Harthi	Al-Yousef	Shehzad
Al-Juhani	Ba-Aqil	
Al-Jundi	Ba-Shammakh	

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 Department of choice and will be recognized as one of the top research and graduate chemical engineering departments in the Kingdom and abroad.

Mission

The mission of the Department of Chemical Engineering at King Fahd University of Petroleum & Minerals is ‘to contribute to the thriving economy and vibrant society by offering an innovative, challenging and flexible educational programs’. Chemical Engineering programs are designed to provide high level academic and professional skills by promoting lifetime learning, planning, communication, problem solving and leadership.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Chemical Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Chemical Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Achieve a successful career in the oil, gas, petrochemical, desalination, energy and other process industries.
2. Integrate their academic preparation with chemical engineering practice, innovation and technology development.
3. Pursue a graduate degree in chemical engineering or other related fields.
4. Take leadership roles in industry, business, and governmental agencies.

- **Student Outcomes (SOs)**

The ***Chemical Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. communicate effectively with a range of audiences.
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

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 Bachelor of Science (BS) Degree in Chemical Engineering

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

(a) General Education Requirements (62 credit hours) | **Credit Hours**

Sciences	PHYS 101, 102, CHEM 101, 102	16
Mathematics and Statistics	MATH 101, 102, 201, 202, 371 STAT 319	20
Communication Skills	ENGL 101, 102, 214, IAS 101, 201, 301	15
Engineering Skills	ICS 103	3
Islamic and Arabic Studies	IAS 111, 212, 322	6
Physical Education	PE 101, 102	2
		62

(b) Advanced Chemical Sciences Requirements (17 credit hours)

Chemistry	CHEM 201, 311, 321	11
Material Science	ME 205	3
Biology	BIOL 233	3
		17

(c) Core Requirements (36 credit hours)

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
		36

(d) Electives (18 credit hours)

CHE Electives	Two CHE 4xx Courses	6
Technical Electives	Two XE xxx Courses	6
General Studies	Two GS xxx Courses	6
		18

(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
		0

The total number of credit hours required is **133**

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	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**
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 Consequences	2	0	2	ME 205	Materials Science	2	3	3
					IAS 201	Writing for Professional Needs	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 321	Instrumental Analysis for Engineers	2	4	3
CHEM 311	Physical Chemistry II	3	4	4	STAT 319	Probability and Stat. for Eng. and Scientists	2	3	3
MATH 371	Introduction to Numerical Computing	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. Salah Al-Dulaijan

Faculty

Abduljauwad	Al-Malack	Assi
Adekunle	Al-Ofi	Baig
Ahmad	Al-Osta	Bouchama
Al-Abdul Wahhab	Al-Qahtani, H.	Chowdhury
Al-Ahmadi	Al-Sghan	Essa
Al-Amoudi	Al-Shayea	Khalid
Al-Dulaijan	Al-Sughaiyer	Mukhtar
Al-Gadhib	Al-Suwaiyan	Ratrout
Al-Gahtani, A.	Al-Zahrani, Mesfer	Sharif
Alghamdi	Al-Zahrani, Muhammad	Vohra

Introduction

The Civil Engineering (CE) program 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 provides basic knowledge in sciences, mathematics, and engineering in the first two years. During the third year, the student is introduced to different fields in civil engineering with the emphasis on applications and design. After the completion of his third year, the student undertakes an 8-week summer training program in industry. Appropriate electives are also offered to further enhance 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.

Vision

To provide students with proper learning infrastructure and research environments to develop their potential with technical knowledge and professional skills. For this ultimate educational objective, all underpinnings of the department (including academic and professional partnerships with academic and industrial stakeholders) have been forged to ensure maintaining recognizable leading-stands in education, research, and public professional-services.

Mission

The department (CEE-KFUPM) seeks to provide distinctive infrastructure and environment for education, research and public services synergistically supportive to active learning, creative thinking, developing professional skills and self-development such that CEE-KFUPM graduates would be qualified for being leaders equipped with potential-skills and capabilities to provide intelligent solutions for standing and emerging professional challenges.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Civil Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Civil Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Establish themselves as leading practicing civil engineering professionals, and demonstrate distinct abilities as responsible members of professional multi-disciplinary teams;
2. Pursue career developmental activities for up-to-date professionally-technical knowledge and skills; and
3. Conduct impactful basic and applied research activities to develop efficient solutions.

- **Student Outcomes (SOs)**

The ***Civil Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. communicate effectively with a range of audiences.
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements for the Bachelor of Science (BS) Degree in Civil Engineering

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

(a) General Education Requirements (57 credit hours)

		Credit Hours
English	ENGL 101, 102, 214	9
Computer Skill	ICS 103	3
Interdisciplinary Basic Course	ME 201	3
Mathematics	MATH 101, 102, 201, 208	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
		57

(b) Core Requirements (48 credit hours)

Computer Graphics	CE 216	2
Surveying	CE 262	3
Mechanics and Structures	CE 201, 203, 305, 315	12
Materials	CE 204, 206	4
Geotechnical	CE 354, 356	4
Transportation	CE 341, 343	4
Fluid Mechanics and Environmental Engineering	CE 230, 330, 335, 375	10
Numerical and Statistical Methods in CE	CE 318	3
Construction Management and Economy	CE 422	3
Senior Design Project	CE 411	3
		48

(c) Electives (27 credit hours)

CE Electives	Three CE xxx Courses	9
CE Design Electives	Two CE xxx Courses	6
Additional Science Elective	GEOL 101 or BIOL 233	3
Technical Elective (from approved list)	XE xxx	3
General Studies	Two GS xxx Courses	6
		27

(d) Summer Training (0 credit hours)

A minimum of 8-week program to gain experience; submit and present a report.

Summer Training	CE 399	0
		0

The total number of credit hours required is **132**

Civil 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	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**
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	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	ICS 103	Computer Programming in C	2	3	3
IAS 111	Belief and its Consequences	2	0	2	CHEM 111	Basics of Environmental Chemistry	2	0	2
		15	**9**	**18**			**16**	**6**	**18**
Second Year (Sophomore)									
PE 102	Health and Physical Educ. II	0	2	1	ME 201	Dynamics	3	0	3
CE 201	Statics	3	0	3	CE 203	Structural Mechanics I	3	0	3
MATH 201	Calculus III	3	0	3	CE 204	Civil Eng. Materials	3	0	3
ENGL 214	Academic & Professional Comm.	3	0	3	CE 206	Civil Eng. Materials Lab	0	3	1
CE 216	Computer Graphics	1	3	2	MATH 208	Intro. to Differential Eq. & Linear Algebra	3	0	3
CE 262	Surveying	2	3	3	IAS 212	Professional Ethics	2	0	2
XXX xxx	Science Elective	2	3	3	CE 230	Eng. Fluid Mechanics	3	0	3
		14	**11**	**18**			**17**	**3**	**18**
Third Year (Junior)									
IAS 201	Writing for Professional Needs	2	0	2	IAS 301	Oral Communication Skills	2	0	2
GS xxx	GS Elective I	3	0	3	CE 330	Environmental Eng. Principles	3	0	3
CE 305	Structural Analysis I	3	0	3	CE 375	Environmental Chemistry Lab	0	3	1
CE 318	Numerical & Statistical Methods in CE	2	3	3	CE 335	Eng. Hydrology	2	3	3
CE 341	Transportation Eng.	3	0	3	CE 354	Intro. to Geotechnical Eng.	3	0	3
CE 343	Transportation Eng. Lab	0	3	1	CE 356	Geotechnical Eng. Lab	0	3	1
					CE xxx	CE Elective I	3	0	3
		13	**6**	**15**			**13**	**9**	**16**
Summer Session					CE 399	Summer Training	**0**	**0**	**0**
Fourth Year (Senior)									
CE 315	Reinforced Concrete I	2	3	3	IAS 322	Human Rights in Islam	2	0	2
GS xxx	GS Elective II	3	0	3	CE 411	Senior Design Project	1	6	3
CE xxx	CE Elective II	3	0	3	CE xxx	CE Elective III	3	0	3
CE xxx	CE Design Elective I	3	0	3	CE xxx	CE Design Elective II	3	0	3
CE 422	Construction Management and Economy	3	0	3	XE xxx	Technical Elective	3	0	3
		14	**3**	**15**			**12**	**6**	**14**
Total credit hours required in Degree Program : 132									

Department of Electrical Engineering

Chairman: Dr. Abdallah Al-Ahmari

Faculty

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

Mission

- Imparting profound knowledge in the areas of electrical engineering.
- Enriching graduates with technical and soft skills to take up leading role in the society.
- Producing high quality research with focus on energy-related challenges.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Electrical Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Electrical Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

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 (SOs)**

The ***Electrical Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. An ability to communicate effectively with a range of audiences.

4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements for the Bachelor of Science (BS) Degree in Electrical Engineering

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

(a) General Education Requirements (58 credit hours)		**Credit Hours**
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
		58

(b) Core Requirements (51 credit hours)		
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
		51

(c) Electives (25 credit hours)		
Electrical Engineering Electives	Four EE 4xx Courses	13
Non-EE Technical Elective from the colleges (Engineering, Computer Sciences and Eng., Sciences, Environmental Design, and Petroleum Eng. & Geosciences)	XXX 2xx	3
Technical Elective	XE xxx	3
General Studies	Two GS xxx Courses	6
		25

(d) Summer Training (0 credit hours)		
Summer Training	EE 399	0
		0

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	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**
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 Consequences	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	Non-EE Technical Elective	3	0	3	IAS 201	Writing for Professional Needs	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	Oral Communication 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	Bahaidarah	Mokheimer
Abualhamayel	Baig	Muhammad
Abu-Dheir	Bashmal	Munteshari
Ahmed	Bazoune	Nouari
Akhtar	Ben-Mansour, R	Qureshi
Al-Aqeeli	Bin-Mansoor, S	Patel
Al-Athel	Furquan	Raza
Albinmousa	Gasem	Sahin
Al-Hadhrami	Habib	Said
Al-Merbati	Hassan, F	Sarhan
Al-Nassar	Hawwa	Shaukat
Al-Qahtani, H	Jaber	Shuja
Al-Qahtani, M	Khalifa	Sorour
Al-Quaity	Khater	Sunar
Al-Qutub	Khulief	Toor
Alsaeed	Leseman	Yaqub
Al-Sayoud	Mahmood	Yilbas
Al-Sharafi	Mahmoud, M	Younas
Anis	Mekid	Zahoor
Antar	Merah	Zubair
Badour	Mezghani	

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 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.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Mechanical Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Mechanical Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Knowledge and competencies to pursue a successful career in mechanical engineering, other related fields, or engage in entrepreneurship.
2. Continuation of their lifelong learning and professional development through self-study, continuing education, graduate studies, or professional certification.
3. Lead or actively participate in efforts to address social, technical and business challenges of the 21st century and in line with the Kingdom's Vision 2030.

- **Student Outcomes (SOs)**

The ***Mechanical Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. communicate effectively with a range of audiences.

4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements for the Bachelor of Science (BS) Degree in Mechanical Engineering

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

(a) General Education Requirements (67 credit hours) | **Credit Hours**

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, 333	17
Physical Education	PE 101, 102	2
Sciences	CHEM 101, PHYS 101, 102	12
		67

(b) Core Requirements (49 credit hours)

Mechanical Engineering Drawing & Graphics	ME 210	3
Intro. to Mechanical Engineering Design	ME 218	2
Dynamics, Mechanics of Machines, and System Dynamics	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
		49

(c) Electives (18 credit hours)

Technical Elective	Two XE xxx courses	6
Mechanical Engineering Elective I	ME 4xx	3
Mechanical Engineering Elective II	ME 4xx	3
General Studies	Two GS xxx Courses	6
		18

(d) Summer Training (0 credit hours)

Summer Training	ME 399	0
		0

The total number of credit hours required is **134**

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	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**
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 Consequences	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	Writing for Professional Needs	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 333	Methods of Applied Math I	3	0	3
EE 306	Electromechanical Devices	2	3	3	IAS 301	Oral Communication 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

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. Ahmed Almulhem

Faculty

Abu-Amara	Barnawi	Mudawar
Adiche	Baroudi	Osais
Ahmed	Chenaoua	Raad
Al-Awami	El-Maleh	Sait
AlKharobi	El-Rabaa	Selmi
Al-Madani	Felemban	Sheltami
AlMulhem	Mahmoud, A	Tabbakh
Al-Suwaiyan	Mahmoud, M	Ul-Hasan

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: The mission of the computer engineering program at KFUPM is to develop and train the human intellect needed for meeting the continued technological advances in the discipline of computer engineering and IT-related areas. This includes graduating well-trained computer engineers to participate in the industrial development currently taking place in the Kingdom of Saudi Arabia.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **“Computer Engineering”** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Computer Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Established themselves as successful professional computer engineers with demonstrated leadership capabilities.
2. Demonstrated an ability to pursue a successful professional career.
3. Enrolled and succeeded in graduate and professional studies/programs if they chose to do so.

- **Student Outcomes (SOs)**

The ***Computer Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. communicate effectively with a range of audiences.
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements for the Bachelor of Science (BS) Degree in Computer Engineering

Option I: With Summer Training

Every student majoring in Computer Engineering (Summer Training Option) must complete the following curriculum:

(a) General Education Requirements (52 credit hours)		**Credit Hours**
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, 208	14
Physical Education	PE 101, 102	2
Physics	PHYS 101, 102	8
		52

(b) Core Requirements (53 credit hours)		
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
		53

(c) Electives (27 credit hours)		
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
		27

(d) Summer Training (0 credit hours)		
Summer Training	COE 399	0
		0

The total number of credit hours required is **132**

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	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**
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 Consequences	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	Writing for Professional Needs	2	0	2					
		14	**9**	**17**			**13**	**9**	**16**
Third Year (Junior)									
MATH 208	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	Oral Communication 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 Bachelor of Science (BS) Degree in Computer Engineering

Option II: With Cooperative Work

Every student majoring in Computer Engineering (Cooperative Work Option) must complete the following curriculum:

(a) General Education Requirements (52 credit hours)		**Credit Hours**
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, 208	14
Physical Education	PE 101, 102	2
Physics	PHYS 101, 102	8
		52

(b) Core Requirements (57 credit hours)		
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
		57

(c) Electives (15 credit hours)		
COE Depth Elective	COE 405 or CE 444	3
COE Electives	Two COE 4xx Courses	6
General Elective	Two GS xxx Courses	6
		15

(d) Cooperative Work (9 credit hours)		
Cooperative Work	COE 351	9
		9

The total number of credit hours required is **133**

Computer 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	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**
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 Consequences	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	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	Writing for Professional Needs	2	0	2					
		14	**9**	**17**			**16**	**9**	**19**
Third Year (Junior)									
MATH 208	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	Oral Communication 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
		17	**6**	**19**			**15**	**9**	**18**
Summer Session					COE 350	Begin Cooperative Work	**0**	**0**	**0**
Fourth Year (Senior)									
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
		0	**0**	**9**			**13**	**9**	**16**
Total credit hours required in Degree Program : 133									

Department of Information and Computer Science

Chairman: Dr. Hamoud Aljamaan

FACULTY

Ahmad	Alvi	Hassine
Ahmed, F	Arafat	Mahmood
Ahmed, M	Aslam	Hossam
Abdallah	Azzedin	Niazi
Al-Jamaan	El-Alfy	Ramadan
Al-Jasser	El-Bassuny	Yazdani
Al-Khatib	Ghouti	Zhioua
Al-Khoraidly	Garout	Mirzal
Al-Mohammadi	Hassan, Y	Salahadin
Al-Muhtaseb	Hassan, M	Luqman
Al-Shayeb	Al-Turki	AlOthman
Alutaibi		

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.

Bachelor of Science (BS) IN COMPUTER SCIENCE

The Bachelor of Science (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.

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 Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Computer Science"** is accredited by the **Computing Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Computer Science*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Be successful in performing the duties of a computing-related position;
2. Be successful in completing an advanced degree program;
3. Work as individuals with minimum guidance and as leaders or members in a team;
4. Follow appropriate practices within a professional, legal, and ethical framework;
5. Maintain currency through self-learning or other professional development.

- **Student Outcomes (SOs)**

The ***Computer Science*** **(BS)** students **by the time of gradation will have the ability to:**

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

The CS Program

The department is offering the computer science program with two options:

Option I: Bachelor of Science (BS) in Computer Science with summer training.
Option II: Bachelor of Science (BS) in Computer Science with Coop.

Requirements for the Bachelor of Science (BS) Degree in Computer Science

Option I: With Summer Training

Every student majoring in Computer Science (Summer Training Option) must complete the following curriculum:

(a) General Education Requirements (52 credit hours)		**Credit Hours**
Basic Science	CHEM 101, PHYS 101, 102	12
Mathematics and Statistics	MATH 101, 102, 201, 208, 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
		52

(b) Core Requirements (55 credit hours)		
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
		55

(c) Electives (24 credit hours)		
ICS Electives	Four ICS/SWE xxx Courses	12
Technical Electives	Four XE xxx Courses	12
		24

(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
		0

The total number of credit hours required is **131**

Computer Science 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	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**
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 Consequences	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 208	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	Writing for Professional Needs	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	Oral Communication 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 Bachelor of Science (BS) Degree in Computer Science

Option II: With Cooperative Work

Every student majoring in Computer Science (Cooperative Work Option) must complete the following curriculum:

(a) General Education Requirements (52 credit hours)		**Credit Hours**
Basic Science	CHEM 101, PHYS 101, 102	12
Mathematics and Statistics	MATH 101, 102, 201, 208, 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
		52

(b) Core Requirements (52 credit hours)		
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
		52

(c) Electives (18 credit hours)		
ICS Electives	Four ICS xxx Courses	12
Technical Electives	Two XE xxx Courses	6
		18

(d) Cooperative Work (9 credit hours)

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
		9

The total number of credit hours required is **131**

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	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**
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 Consequences	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 208	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	Writing for Professional Needs	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	Oral Communication 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									

Bachelor of Science (BS) 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.

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.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Software Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Software Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Be successful in performing the duties of a software engineering related position.
2. Be successful in completing an advanced degree program.
3. Work as individuals with minimum guidance and as leaders or members in teams.
4. Follow appropriate practices within a professional, legal, and ethical framework.
5. Maintain currency through self-learning or other professional development.

- **Student Outcomes (SOs)**

The ***Software Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. communicate effectively with a range of audiences.
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements for the Bachelor of Science (BS) Degree in Software Engineering

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

(a) General Education Requirements (52 credit hours) **Credit Hours**

Basic Science	CHEM 101 (4), PHYS 101 (4), PHYS 102 (4)	12
Mathematics and Statistics	MATH 101 (4), MATH 102 (4) , MATH 201 (3), STAT 319 (3)	14
English	ENGL 101 (3), ENGL 102 (3), ENGL 214 (3)	9
Physical Education	PE 101 (1), PE 102 (1)	2
Islamic and Arabic Studies	IAS 101 (2), IAS 111 (2), IAS 201 (2), IAS 212 (2), IAS 301 (2), IAS 322 (2)	12
Systems Engineering	ISE 307 (3)	3
		52

(b) Core Requirements (65 credit hours)

SWE	SWE 205 (3), SWE 215 (3), SWE 312 (3), SWE 316 (3), SWE 326 (3), SWE 363 (3), SWE 387 (3), SWE 417 (3), SWE 418 (2)	26
ICS	ICS 102 (3), ICS 201 (4), ICS 202 (4), ICS 233 (4), ICS 253 (3), ICS 254 (3), ICS 324 (4), ICS 343 (4), ICS 353 (3), ICS 431 (4)	36
COE	COE 202 (3)	3
		65

(c) Electives (15 credit hours)

SWE/ICS Electives	Three SWE/ICS xxx Courses	9
Technical Electives	Two XE xxx Courses	6
		15

(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
		0

The total number of credit hours required is **132**

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	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**
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 Consequences	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	Writing for Professional Needs	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	Oral Communication 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

Al-Turki	Al-Ghazi	Al-Amer
Duffuaa	Abdelaal	Alyazidi
Selim	Attia	Al-Dhaifullah
Al-Hanbli	Alsawafy	Pirim
Al-Durgam	Hassan	Al-Habboubi
Moghathawi	Al-Sunni	Osman
Darghouth	Mahmoud	Nahas
Kara	Al-Saif	Al-Shareef
Kolus	Elferik	Hamdan
Mujahid	Mysorewala	Vaqar

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 industrial & systems engineering and control & instrumentation systems engineering

Global : To become a well-recognized worldwide center of excellence in education and research in the areas of industrial & systems engineering and control & instrumentation systems engineering

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.

Bachelor of Science (BS) 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.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Industrial and Systems Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Industrial and Systems Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Successful professionals in industrial and systems engineering and related areas.
2. Leaders in their organizations.
3. Pursuers of new knowledge to adapt to every changing environment.

- **Student Outcomes (SOs)**

The ***Industrial and Systems Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. communicate effectively with a range of audiences.

4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

The main study areas involved in ISE program 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.

Requirements for the Bachelor of Science (BS) 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:

(a) General Education Requirements (49 credit hours)

		Credit Hours
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
English Language	ENGL 101, 102, 214	9
Mathematics	MATH 101, 102, 201, 208	14
Sciences	CHEM 101, PHYS 101, 102	12
Physical Education	PE 101, 102	2
		49

(b) General Engineering Fundamentals (24 credit hours)

Engineering Graphics	CE 101	2
Computer Programming in C	ICS 103	3
Electrical Circuits	EE 204	3
Probability and Statistics	ISE 205	3
Material Science	ME 216, 217	4
Numerical Methods	CISE 301	3
Linear Control Systems	CISE 305	3
Engineering Economic Analysis	ISE 307	3
		24

(c) Core Requirements (35 credit hours)

Optimization Methods	ISE 321	3
Operations Research	ISE 303	3
Information Systems for ISE	ISE 365	3
Quality Control and Industrial Statistics	ISE 320	3
Manufacturing Technology	ME 322, 323	4
Work and Process Improvements	ISE 324	2
Engineering Statistics	ISE 315	3
Seminar	ISE 499	0
Industrial Engineering Design	ISE 391	2
Production Systems	ISE 402	3
Stochastic Systems Simulation	ISE 405	3
Facility Layout and Location	ISE 422	3
Senior Design Project	ISE 482	3
		35

(d) Electives (24 for Summer Training and 18 for Cooperative Work)

Summer Training Option	Four ISE 4xx courses	12
	Two XXX xxx technical elective courses	6
Cooperative Work Option	Three ISE 4xx courses	9
	One XXX xxx technical elective courses	3
General Studies	Two GS xxx courses	6
		24 or 18

(e) Summer Training or Cooperative Work (0 or 6 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	6
		0 or 6

The total number of credit hours required is **132**

Industrial and Systems 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	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**
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	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 Consequences	2	0	2
PE 101	Health and Physical Educ. I	0	2	1	CE 101	Eng. Graphics	1	3	2
		15	**9**	**18**			**15**	**9**	**18**
Second Year (Sophomore)									
MATH 201	Calculus III	3	0	3	MATH 208	Intro. to Differential Eq. & Linear Algebra	3	0	3
ME 216	Materials Science and Engineering	3	0	3	ISE 315	Eng. Statistics	3	0	3
ME 217	Materials Lab	0	3	1	ME 322	Manufacturing Processes	3	0	3
EE 204	Fundamentals of Electrical Circuits	2	3	3	ME 323	Manufacturing Lab	0	3	1
ISE 205	Eng. Probability and Statistics	3	0	3	CISE 301	Numerical Methods	3	0	3
IAS 201	Writing for Professional Needs	2	0	2	ISE 365	Information Systems for ISE	2	3	3
ENGL 214	Academic &Professional Comm.	3	0	3	IAS 212	Professional Ethics	2	0	2
		16	**6**	**18**			**16**	**6**	**18**
Third Year (Junior)									
ISE 303	Operations Research I	3	0	3	ISE 321	Optimization Methods	3	0	3
ISE 320	Quality Control and Industrial Statistics	3	0	3	ISE 307	Eng. Economic Analysis	3	0	3
IAS 301	Oral Communication Skills	2	0	2	ISE 391	Industrial Eng. Design	1	3	2
ISE 324	Work and Process Improvements	2	0	2	ISE 405	Stochastic Systems Simulation	2	3	3
CISE 305	Linear Control Systems	3	0	3	IAS 322	Human Rights in Islam	2	0	2
ISE 499	Seminars	1	0	0	GS xxx	GS Elective I	3	0	3
PE 102	Health and Physical Educ. II	0	2	1					
		14	**2**	**14**			**14**	**6**	**16**
Summer Session					ISE 399	Summer Training	**0**	**0**	**0**
Fourth Year (Senior)									
ISE 4xx	ISE Elective I	-	-	3	ISE 4xx	ISE Elective II	3	0	3
XXX xxx	Technical Elective I	-	-	3	ISE 422	Facility Layout and Location	3	0	3
ISE 402	Production Systems and Inventory Control	3	0	3	ISE 4xx	ISE Elective III	-	-	3
GS xxx	GS Elective II	3	0	3	ISE 4xx	ISE Elective IV	-	-	3
ISE 482	Senior Design Project	1	6	3	XXX xxx	Technical Elective II	-	-	3
		7	**6**	**15**			**6**	**0**	**15**
Total credit hours required in Degree Program : 132									

Industrial and Systems Engineering Curriculum – Cooperative Work Option

OURSE	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	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**
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	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 Consequences	2	0	2
PE 101	Health and Physical Educ. I	0	2	1	CE 101	Eng. Graphics	1	3	2
		15	**9**	**18**			**15**	**9**	**18**
Second Year (Sophomore)									
MATH 201	Calculus III	3	0	3	MATH 208	Intro. to Differential Eq. & Linear Algebra	3	0	3
ME 216	Materials Science and Engineering	3	0	3	ISE 315	Eng. Statistics	3	0	3
ME 217	Materials Lab	0	3	1	ME 322	Manufacturing Processes	3	0	3
EE 204	Fundamentals of Electrical Circuits	2	3	3	ME 323	Manufacturing Lab	0	3	1
ISE 205	Eng. Probability and Statistics	3	0	3	CISE 301	Numerical Methods	3	0	3
IAS 201	Writing for Professional Needs	2	0	2	ISE 365	Information Systems for ISE	2	3	3
ENGL 214	Academic &Professional Comm.	3	0	3	IAS 212	Professional Ethics	2	0	2
		16	**6**	**18**			**16**	**6**	**18**
Third Year (Junior)									
ISE 303	Operations Research I	3	0	3	ISE 324	Work and Process Improvements	2	0	2
ISE 320	Quality Control and Industrial Statistics	3	0	3	ISE 321	Optimization Methods	3	0	3
GS xxx	GS Elective I	3	0	3	ISE 307	Eng. Economic Analysis	3	0	3
IAS 301	Oral Communication Skills	2	0	2	ISE 391	Industrial Eng. Design	1	3	2
ISE 405	Stochastic Systems Simulation	2	3	3	ISE 402	Production Systems and Inventory Control	3	0	3
CISE 305	Linear Control Systems	3	0	3	IAS 322	Human Rights in Islam	2	0	2
ISE 499	Seminars	1	0	0	GS xxx	GS Elective II	3	0	3
PE 102	Health and Physical Educ. II	0	2	1					
		17	**5**	**18**			**17**	**3**	**18**
Summer Session					ISE 350	Begin Cooperative Work	**0**	**0**	**0**
Fourth Year (Senior)									
ISE 351	Cooperative Work	0	0	6	ISE 4xx	ISE Elective I	3	0	3
					ISE 422	Facility Layout and Location	3	0	3
					ISE 4xx	ISE Elective II	-	-	3
					ISE 4xx	ISE Elective III	-	-	3
					XXX xxx	Technical Elective	-	-	3
					ISE 482	Senior Design Project	1	6	3
		0	**0**	**6**			**7**	**6**	**18**
Total credit hours required in Degree Program : 132									

Bachelor of Science (BS) 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.

- **Program Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Control and Instrumentation Systems Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Control and Instrumentation Systems Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. Prepare graduates to be successful professionals in the control and instrumentation systems engineering and related areas.
2. Prepare graduates to be leaders in their organizations.
3. Prepare graduates to be pursuers of new knowledge to adapt to every changing environment.

- **Student Outcomes (SOs)**

The ***Control and Instrumentation Systems Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. communicate effectively with a range of audiences.
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements for the Bachelor of Science (BS) 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:

(a) General Education Requirements **Credit Hours**
(52 for Summer Training and 49 for Cooperative Work)

Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
English Language	ENGL 101, 102, 214	9
Mathematics	MATH 101, 102, 201, 208	14
Sciences	CHEM 101, PHYS 101, 102	12
Physical Education	PE 101, 102	2
Principles of Management (***only for summer training option***)	MGT 301	3
		52 or 49

(b) General Engineering Fundamentals (26 credit hours)

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
		26

(c) Core Requirements (40 credit hours)

Introduction to CISE	CISE 201	1
Design of Digital Systems	CISE 204	3
Introduction to Information Technology	CISE 209	2
Linear Control Systems	CISE 305, 306	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
		40

(d) Electives (14 for Summer Training and 8 for Cooperative Work)

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
		14 or 8

(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
		0 or 9

The total number of credit hours required is **132**

Control and Instrumentation Systems 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	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**
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	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 Consequences	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)									
MATH 201	Calculus III	3	0	3	MATH 208	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	Writing for Professional Needs	2	0	2					
		14	**3**	**15**			**14**	**6**	**16**
Third Year (Junior)									
CISE 305	Linear Control Systems	3	0	3	CISE 312	Instrumentation Eng.	2	3	3
CISE 306	Linear Control Systems Lab	0	3	1	CISE 316	Control Systems Design	2	3	3
CISE 313	Automation Devices and Electronics	2	3	3	CISE 318	Computer Control Systems	2	3	3
CISE 315	Signals and Systems	3	0	3	CISE 4xx	CISE Elective I	-	-	3
CISE 301	Numerical Methods	3	0	3	ISE 402	Production Systems and Inventory Control	3	0	3
IAS 301	Oral Communication Skills	2	0	2	IAS 212	Professional Ethics	2	0	2
XXX xxx	Free Elective I	-	-	3					
		13	**6**	**18**			**11**	**9**	**17**
Summer Session					CISE 399	Summer Training	**0**	**0**	**0**
Fourth Year (Senior)									
CISE 490	Senior Design Project	0	9	3	CISE 412	Mechatronics	2	3	3
CISE 4xx	CISE Elective II	-	-	3	CISE 414	Embedded Control Systems	2	3	3
CISE 4xx	CISE Elective III	-	-	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	-	-	2					
		6	**9**	**17**			**11**	**9**	**14**
Total credit hours required in Degree Program : 132									

Control and Instrumentation Systems 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	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**
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	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 Consequences	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)									
MATH 201	Calculus III	3	0	3	MATH 208	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 301	Oral Communication Skills	2	0	2
IAS 201	Writing for Professional Needs	2	0	2					
IAS 212	Professional Ethics	2	0	2					
		16	**3**	**17**			**16**	**6**	**18**
Third Year (Junior)									
CISE 305	Linear Control Systems	3	0	3	CISE 312	Instrumentation Eng.	2	3	3
CISE 306	Linear Control Systems Lab	0	3	1	CISE 316	Control Systems Design	2	3	3
CISE 313	Automation Devices and Electronics	2	3	3	CISE 318	Computer Control Systems	2	3	3
CISE 315	Signals and Systems	3	0	3	CISE 4xx	CISE Elective I	-	-	3
CISE 301	Numerical Methods	3	0	3	ISE 402	Production Systems and Inventory Control	3	0	3
IAS 322	Human Rights in Islam	2	0	2	CISE 390	Seminars	0	0	0
ISE 307	Eng. Economic Analysis	3	0	3	CISE 490	Senior Design Project	0	9	3
		16	**6**	**18**			**9**	**18**	**18**
Summer Session					CISE 350	Begin Cooperative Work	**0**	**0**	**0**
Fourth Year (Senior)									
CISE 351	Cooperative Work	0	0	9	CISE 412	Mechatronics	2	3	3
					CISE 414	Embedded Control Systems	2	3	3
					CISE 418	Industrial Process Control	3	0	3
					CISE 438	Instrumentation for Process Control	2	3	3
					CISE 4xx	CISE Elective II	-	-	3
					XXX xxx	Free Elective	-	-	2
		0	**0**	**9**			**9**	**9**	**17**
Total credit hours required in Degree Program : 132									

COLLEGE OF ENVIRONMENTAL DESIGN

Dean: Dr. Ismail Budaiwi

DEPARTMENTS

ARCHITECTURAL ENGINEERING
ARCHITECTURE
CITY AND REGIONAL PLANNING
CONSTRUCTION ENGINEERING AND MANAGEMENT

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 proram 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 and Regional 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 Bachelor of Science (BS) 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	Asif	Makawi
Ahmed	Budaiwi	Mohammed
Al-Hammad	Hassanain	Ouis
Al-Homoud	Kim	Qannan

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.

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:
Building Structural Systems

1. Building Structural Systems
2. Building Environmental Control Systems
   (*i.e. Building Mechanical Systems*, *Electrical and Lighting Systems*)
3. Construction and Maintenance Management (i.e. *Construction/Const Mgmt*)

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 135 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 58 credit hours as general education requirements, 71 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 Bachelor of Science (BS) 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 build 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 Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Architectural Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Architectural Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

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.

- **Student Outcomes (SOs)**

The ***Architectural Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. communicate effectively with a range of audiences.

4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements for the Bachelor of Science (BS) Degree in Architectural Engineering
Option I: With Summer Training

Every student majoring in Architectural Engineering (Summer Training Option) must complete the following curriculum:

(a) General Education Requirements (57 credit hours)		**Credit Hours**
Communication Skills	ENGL 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
History of Architecture I	ARC 121	3
Islamic Studies	IAS 111, 212, 322	6
Mathematics and Statistics	MATH 101, 102, 201, 202, 371, STAT 319	20
Natural Sciences	PHYS 101, 102, CHEM 101	12
Physical Education	PE 101, 102	2
		58

(b) Core Requirements (71 credit hours)		
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, 262, 354, 356, ME 203, EE 204	16
Graphics & Architectural Design	ARE 101, 202, 301	8
Senior Project	ARE 400	3
Structural Engineering	CE 201, 203, 305, 315	12
		71

(c) Electives (6 credit hours)		
Any two courses of:	ARE 440, 442, 445, 446, 450, 452, 455, 456, 457, 490, 491, CE 408, 415	6
		6

(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
		0

The total number of credit hours required is **135**

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	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**
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 Consequences	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 121	History of Architecture I	3	0	3	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 262	Surveying	2	3	3					
		17	**9**	**20**			**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 371	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	Writing for Professional Needs	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	Oral Communication Skills	2	0	2	CE 354	Intro. to Geotechnical Eng.	3	0	3
IAS 322	Human Rights in Islam	2	0	2	CE 356	Geotechnical Eng. Lab.	0	3	1
		8	**12**	**12**			**12**	**3**	**13**
Total credit hours required in Degree Program : 135									

Requirements for the Bachelor of Science (BS) Degree in Architectural Engineering
Option II: With Cooperative Work

Every student majoring in Architectural Engineering (Cooperative Work Option) must complete the following curriculum:

(a) General Education Requirements (57 credit hours)

		Credit Hours
Communication Skills	ENGL 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
History of Architecture I	ARC 121	3
Islamic Studies	IAS 111, 212, 322	6
Mathematics and Statistics	MATH 101, 102, 201, 202, 371, STAT 319	20
Natural Sciences	PHYS 101, 102, CHEM 101	12
Physical Education	PE 101, 102	2
		58

(b) Core Requirements (68 credit hours)

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, 262, 354, 356, ME 203, EE 204	16
Graphics & Architectural Design	ARE 101, 202, 301	8
Structural Engineering	CE 201, 203, 305, 315	12
		68

(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
		9

The total number of credit hours required is **135**

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	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**
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 Consequences	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 121	History of Architecture I	3	0	3	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 262	Surveying	2	3	3					
		17	**9**	**20**			**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 371	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	Writing for Professional Needs	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 354	Intro. to Geotechnical Eng.	3	0	3
					CE 356	Geotechnical Eng. Lab.	0	3	1
					IAS 301	Oral Communication 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 : 135									

Department of Architecture

Chairman: Dr. Ismail Budaiwi (A)

Faculty

Abd El Fattah	Al-Mahdy	Ashmeel
Al-Abbad	Al-Najjar	Ashour
Al-Khabbaz	Al-Nazhah	Babsail
Al-Kharoubi	Al-Qawasmi	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 Bachelor of Science (BS) Degree in Architecture

Every student majoring in Architecture must complete the following curriculum:

(a) General Education Requirements (30 credit hours)		Credit Hours
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
English	ENG 101, 102, 214	9
Physics	PHYS 133	4
Mathematics	MATH 106	3
Physical Education	PE 101, 102	2
		30

(b) Core Requirements (108 credit hours)		
Design Studios & Projects	ARC 102, 103, 204, 205, 306, 307, 401, 405, 409	41
Architectural and Digital Communication	ARC 113, 114, 213, 214	12
Structure in Architecture	ARC 231, 232	6
Architecture of Saudi Arabia	ARC 228	2
History and Theory of Architecture	ARC 121, 122, 226, 227	11
Working Drawings	ARC 345	3
Landscape Design	ARC 354	3
Human Factors in Architecture	ARC 355	3
Principles of Sustainable Design	ARC 356	3
Urban Design	ARC 357	3
Real Estate and Housing Development	ARC 358	3
Professional Practice	ARC 491	3
Building Materials and Construction	ARE 211, 212	6
Mechanical Systems, Acoustics, Illumination	ARE 322, 328	6
Construction Management	ARE 413	3
		108

(c) Electives (14 credit hours)		
ARC Electives	Three ARC xxx Courses	8
General Studies Elective	GS xxx	3
Free Elective	XXX xxx	3
		14

(d) Summer Training (2 credit hour)		
Summer Training	ARC 399	2
		2

The total number of credit hours required is **154**

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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
ARC 102	Design Studio I	0	6	3	ARC 103	Design Studio II	0	6	3
ARC 113	Architectural Communication I	0	6	3	ARC 114	Architectural Communication II	0	6	3
ARC 121	History of Architecture I	3	0	3	ARC 122	History of Architecture II	3	0	3
ENGL 101	Intro. to Academic Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3
PHYS 133	Principles of Physics	3	3	4	MATH 106	Applied Calculus	3	0	3
IAS 101	Practical Grammar	2	0	2	IAS 111	Belief and its Consequences	2	0	2
PE 101	Health and Physics Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1
		11	**17**	**19**			**11**	**14**	**18**
Second Year (Sophomore)									
ARC 204	Architectural Design Studio III	0	10	5	ARC 205	Architectural Design Studio IV	0	10	5
ARC 213	Digital Communication I	0	6	3	ARC 214	Digital Communication II	0	6	3
ARC 226	Theory of Architecture I	2	0	2	ARC 227	Theory of Architecture II	3	0	3
ARC 231	Structure in Architecture I	3	0	3	ARC 232	Structure in Architecture II	3	0	3
ARE 211	Building Materials	2	3	3	ARC 228	Architecture of Saudi Arabia	2	0	2
IAS 212	Professional Ethics	2	0	2	ARE 212	Construction Systems	3	0	3
		9	**19**	**18**			**11**	**16**	**19**
Summer Session I					ENGL 214	Acad. & Professional Comm.	**3**	**0**	**3**
					GS xxx	GS Elective	**3**	**0**	**3**
					IAS 201	Writing for Professional Needs	**2**	**0**	**2**
Third Year (Junior)									
ARC 306	Architectural Design Studio V	0	10	5	ARC 307	Architectural Design Studio VI	0	10	5
ARC 354	Landscape Design	2	2	3	ARC 345	Working Drawings	0	6	3
ARC 355	Human Factors in Architecture	3	0	3	ARC 356	Principles of Sustainable Design	3	0	3
ARE 322	Building Mechanical Systems	2	3	3	ARC 357	Urban Design	3	0	3
ARC xxx	ARC Elective I	3	0	3	ARE 328	Architectural Acoustics & Illumination	3	0	3
IAS 301	Oral Communication Skills	2	0	2					
		12	**15**	**19**			**9**	**16**	**17**
Summer Session II					ARC 399	Summer Training	**0**	**0**	**2**
Fourth Year (Senior)									
ARC 401	Senior Project Preparation and Program.	3	0	3	ARC 409	Arch. Design Studio VIII: Senior Project	0	12	6
ARC 405	Architectural Design Studio VII	0	12	6	ARC 491	Professional Practice	3	0	3
ARC 358	Real Estate and Housing Development	3	0	3	ARC xxx	ARC Elective III	3	0	3
ARE 413	Construction Management	3	0	3	XXX xxx	Free Elective	3	0	3
ARC xxx	ARC Elective II	2	0	2	IAS 322	Human Rights in Islam	2	0	2
		11	**12**	**17**			**11**	**12**	**17**
Total credit hours required in Degree Program : 154									

Department of City and Regional Planning

Chairman: Dr. Baqer Al-Ramadan (A)

Faculty

Aldosary	Alshuwaikhat	Nahiduzzaman
Al-Naser	Gim	Tauhidur Rahman
Al-Ramadan	Kadrin	

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 126 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 Bachelor of Science (BS) Degree in City Planning
Option I: With Summer Training

Every student majoring in City Planning (Summer Training 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 105, 106	6
Natural Sciences	PHYS 133	4
Physical Education	PE 101, 102	2
		38

(b) Core Requirements (74 credit hours)		
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 262, CP 303	6
		74

(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 level or above courses from any other department	6
IAS Elective	IAS 4xx	2
		14

(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
		0

The total number of credit hours required is **126**

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	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**
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 105	Finite Mathematics	3	0	3	MATH 106	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 Consequences	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 262	Surveying	2	3	3	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					
		16	**3**	**17**			**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	Writing for Professional Needs	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	Oral Communication Skills	2	0	2					
		13	**9**	**16**			**10**	**9**	**13**
Total credit hours required in Degree Program : 126									

Requirements for the Bachelor of Science (BS) Degree in City Planning
Option II: With Cooperative Work

Every student majoring in City 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 105, 106	6
Natural Sciences	PHYS 133	4
Physical Education	PE 101, 102	2
		38

(b) Core Requirements (65 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 262, CP 303	6
		65

(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
		14

(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
		9

The total number of credit hours required is **126**

City Planning 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	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**
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 105	Finite Mathematics	3	0	3	MATH 106	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 Consequences	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 262	Surveying	2	3	3	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					
		16	**3**	**17**			**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	Writing for Professional Needs	2	0	2	XXX xxx	Free Elective I	3	0	3
		12	**12**	**16**			**14**	**12**	**18**
Summer Session					CP 350	Begin Cooperative Work	**0**	**0**	**0**
Fourth Year (Senior)									
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	Oral Communication Skills	2	0	2
					IAS 4xx	IAS Elective	2	0	2
		0	**0**	**9**			**17**	**0**	**17**
Total credit hours required in Degree Program : 126									

KFUPM BUSINESS SCHOOL

Dean: Dr. Hesham Merdad

DEPARTMENTS

ACCOUNTING AND FINANCE
INFORMATION SYSTEMS AND OPERATIONS MANAGEMENT
MANAGEMENT AND MARKETING

Established in 1975, the KFUPM Business School (KBS) offers undergraduate and graduate degree programs. It offers five undergraduate programs leading to the baccalaureate degrees in Accounting, Finance, Management Information Systems, Management, and Marketing. KBS 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. KBS 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 top five business schools in Asia

Mission

We graduate students with relevant knowledge, skills, and leadership potential that make them the most sought after by employers in the region. We produce high quality research that is highly regarded by business scholars. We engage the community in valuable and enriching services.

Learning Goals

In addition to the learning goals specific to each major, all KBS 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 KFUPM Business School, 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 & Finance

Chairman: Dr. Hesham Merdad

Faculty

Abdelhalim	Al-Sahlawi, A	Islam
Ahmed, N.	Al-Sahlawi, M	Khan
Akimaya	Al-Shammasi	Kurdi
Albinaly	Al-Subaie	Li
Al-Elg	Al-Yousef	Madani
Al-Harbi	Al-Zahrani	Merdad
Al-Hazmi	Chen	Miah
Al-Hejji	Dong	Taha
Al-Mansour	Hossain	Uthman

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
College General Education Learning Goals/Objectives	
1. Communication Abilities 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.
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	1. Students will be able to work effectively in group settings.
	2. Students will be able to lead group work.
3. Reflective Thinking Skills Ability to apply logic and exercise sound judgment in making decisions	Students will be able to show good judgment in making choices and decisions.
4. Analytic/Quantitative Skills 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.
5. Ethical Understanding 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.
6. Use of Information Technology 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.
7. Leadership 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.
8. Multicultural and diversity understanding 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.
9. Management-Specific Knowledge 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.
Finance Major Learning Goals/Objectives	
10. Discipline-Specific Knowledge 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 Bachelor of Science (BS) Degree in Accounting

Every student majoring in Accounting must complete the following curriculum:

(a) General Education Requirements (38 credit hours)

		Credit Hours
Communication Skills	ENG 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 105, 106	6
Physical Education	PE 101, 102	2
Science or Engineering Elective	XXX xxx	3
General Studies	Two GS xxx Courses	6
		38

(b) Core Requirements in Business Administration (59 credit hours)

Accounting	ACCT 110, 210	6
Business Communications	MGT 210	3
Economics	ECON 101, 102, 306	9
Management	MGT 301, 311, 449	9
Management Information Systems	MIS 101, 215	5
Marketing	MKT 250	3
Finance	FIN 250	3
Operations Management	OM 210, 311	6
Statistics	STAT 211, 212	6
Research Methods	MGT 355	3
Business Electives	Two XXX xxx courses	6
		59

(c) Accounting Major Requirements (24 credit hours)

Accounting Information Systems	ACCT 300	3
Intermediate Accounting I	ACCT 301	3
Intermediate Accounting II	ACCT 302	3
Auditing	ACCT 311	3
Advanced Accounting	ACCT 403	3
Cost Accounting	ACCT 410	3
ACCT Electives	ACCT xxx	6
		24

(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
		6

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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
MATH 105	Finite Mathematics	3	0	3	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 106	Applied Calculus	3	0	3
MIS 101	Business Computing	1	2	2	IAS 111	Belief and its Consequences	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
		15	**2**	**16**			**17**	**2**	**18**
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	Writing for Professional Needs	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 306	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 311	Business Analytics	3	0	3	ACCT 410	Cost Accounting	3	0	3
GS xxx	GS Elective II	3	0	3	IAS 301	Oral Communication Skills	2	0	2
IAS 322	Human Rights in Islam	2	0	2	MGT 311	Legal Environment	3	0	3
MGT 301	Principles of Management	3	0	3	MGT 355	Business Research Methods	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 xxx	ACCT Elective I	3	0	3
					ACCT xxx	ACCT Elective II	3	0	3
					XXX xxx	Business Elective I	3	0	3
					MGT 449	Strategic Management	3	0	3
					XXX xxx	Business Elective II	3	0	3
		0	**0**	**6**			**18**	**0**	**18**
Total credit hours required in Degree Program : 127									

Requirements for the Bachelor of Science (BS) Degree in Finance

Every student majoring in Finance must complete the following curriculum:

(a) General Education Requirements (38 credit hours)		**Credit Hours**
Communication Skills	ENG 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 105, 106	6
Physical Education	PE 101, 102	2
Science or Engineering Elective	XXX xxx	3
General Studies	Two GS xxx Courses	6
		38

(b) Core Requirements in Business Administration (59 credit hours)		
Accounting	ACCT 110, 210	6
Business Communications	MGT 210	3
Economics	ECON 101, 102, 306	9
Management	MGT 301, 311, 449	9
Management Information Systems	MIS 101, 215	5
Marketing	MKT 250	3
Finance	FIN 250	3
Operations Management	OM 210, 311	6
Statistics	STAT 211, 212	6
Research Methods	MGT 355	3
Business Electives	Two XXX xxx courses	6
		59

(c) Finance Major Requirements (24 credit hours)		
Intermediate Accounting I	ACCT 301	3
Corporate Finance	FIN 315	3
Investments	FIN 320	3
Financial Modeling	FIN 425	3
Financial Policy	FIN 450	3
FIN Elective	Two FIN xxx Courses	6
ECON Elective	ECON xxx	3
		24

(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
		6

The total number of credit hours required is **127**

Finance 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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
ECON 101	Principles of Economics I	3	0	3	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 111	Belief and it Consequences	2	0	2	MIS 215	Principles of MIS	3	0	3
ACCT 110	Intro. to Financial Accounting	3	0	3	MATH 106	Applied Calculus	3	0	3
MATH 105	Finite Mathematics	3	0	3	IAS 101	Practical Grammar	2	0	2
MIS 101	Business Computing	1	2	2	ACCT 210	Intro. to Managerial Accounting	3	0	3
PE 101	Health and Physical Educ. I	0	2	1					
		15	**4**	**17**			**17**	**0**	**17**
Second Year (Sophomore)									
ACCT 301	Intermediate Accounting I	3	0	3	IAS 212	Professional Ethics	2	0	2
ENGL 214	Academic & Professional Comm.	3	0	3	PE 102	Health and Physical Educ. II	0	2	1
IAS 201	Writing for Professional Needs	2	0	2	MGT 210	Business Comm.	3	0	3
XXX xxx	Science or Eng. Elective	3	0	3	FIN 315	Corporate Finance	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	OM 210	Operations Management	3	0	3
					MKT 250	Principles of Marketing	3	0	3
		17	**2**	**17**			**17**	**2**	**18**
Third Year (Junior)									
ECON xxx	ECON Elective	3	0	3	MGT 311	Legal Environment	3	0	3
ECON 306	Economy of Saudi Arabia	3	0	3	GS xxx	GS Elective I	3	0	3
OM 311	Business Analytics	3	0	3	FIN xxx	FIN Elective I	3	0	3
MGT 355	Business Research Methods	3	0	3	FIN 425	Financial Modeling	3	0	3
FIN 320	Investments	3	0	3	MGT 301	Principles of Management	3	0	3
IAS 322	Human Rights in Islam	2	0	2	IAS 301	Oral Communication Skills	2	0	2
		17	**0**	**17**			**17**	**0**	**17**
Summer Session					FIN 350	Begin Cooperative Work	**0**	**0**	**0**
Fourth Year (Senior)									
FIN 351	Cooperative Work	0	0	6	XXX xxx	Business Elective I	3	0	3
					FIN xxx	FIN Elective II	3	0	3
					FIN 450	Financial Policy	3	0	3
					GS xxx	GS Elective II	3	0	3
					XXX xxx	Business Elective II	3	0	3
					MGT 449	Strategic Management	3	0	3
		0	**0**	**6**			**18**	**0**	**18**
Total credit hours required in Degree Program : 127									

Department of Information Systems & Operations Management

Chairman: Dr. Mohammed Al-Khars

Faculty

Abdallah	Al-Faraj	Al-Ojairi
Ahmad, A.	Al-Jabri	Al-Wahaishi
Ahmed, M.	Al-Khaldi	Nehari-Talet
Al-Ahmadi	Al-Khars	Qahwash
Al-Bashrawi	Al-Nasser	Yu

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.

<table>
<tr><th>Learning goal</th><th>Learning objective</th></tr>
<tr><td colspan="2">College General Education Learning Goals and Objectives</td></tr>
<tr><td rowspan="2">1. Communication Abilities
Ability to communicate business ideas effectively both orally and in writing</td><td>1. Students will be able to write reports that (a) are grammatically correct and (b) incorporate logical, complete, and articulate thoughts</td></tr>
<tr><td>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.</td></tr>
<tr><td rowspan="2">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</td><td>1. Students will be able to work effectively in group settings.</td></tr>
<tr><td>2. Students will be able to lead group work.</td></tr>
<tr><td>3. Reflective Thinking Skills
Ability to apply logic and exercise sound judgment in making decisions</td><td>Students will be able to show good judgment in making choices and decisions</td></tr>
<tr><td rowspan="3">4. Analytic/Quantitative Skills
Ability to understand, analyze and use quantitative data to make business decisions and/or solve business problems</td><td>1. Students will be able to identify quantitative characteristics of business problems.</td></tr>
<tr><td>2. Students will be able to examine and interpret numeric business data.</td></tr>
<tr><td>3. Students will be able to analyze numeric business data to derive conclusions.</td></tr>
<tr><td rowspan="2">5. Ethical Understanding
Ability to recognize, understand and evaluate ethical issues in business</td><td>1. Students will be able to recognize and understand ethical issues in business situations.</td></tr>
<tr><td>2. Students will be able to evaluate ethical issues</td></tr>
</table>

situations	presented to them and to make responsible choices and/or decisions.
6. Use of Information Technology 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.
7. Leadership 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.
8. Multicultural and diversity understanding 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.
College Management-Specific Learning Goals and Objectives	
9. General Business Knowledge 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
Accounting Specific Learning Goals and Objectives	
10. Accounting Knowledge 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.
11. Application of Accounting knowledge 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 frameworks and techniques to planning, decision-

	making and financial control. 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.

Requirements for the Bachelor of Science (BS) Degree in Management Information Systems

Every student majoring in MIS must complete the following curriculum:

(a) General Education Requirements (38 credit hours)

		Credit Hours
Communication Skills	ENG 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 105, 106	6
Physical Education	PE 101, 102	2
Science or Engineering Elective	XXX xxx	3
General Studies	Two GS xxx Courses	6
		38

(b) Core Requirements in Business Administration (59 credit hours)

Accounting	ACCT 110, 210	6
Business Communications	MGT 210	3
Economics	ECON 101, 102, 306	9
Management	MGT 301, 311, 449	9
Management Information Systems	MIS 101, 215	5
Marketing	MKT 250	3
Finance	FIN 250	3
Operations Management	OM 210, 311	6
Statistics	STAT 211, 212	6
Research Methods	MGT 355	3
Business Electives	Two XXX xxx courses	6
		59

(c) MIS Major Requirements (24 credit hours)

Introduction to Computing I	ICS 102	3
Fundamentals of Computer Comm.	COE 353	3
Systems Analysis & Design	MIS 301	3
Business Data Management	MIS 311	3
IS Project Management	MIS 405	3
Management Support Systems	MIS 410	3
MIS Electives	Two MIS xxx Courses	6
		24

(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
		6

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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
IAS 101	Practical Grammar	2	0	2	IAS 111	Belief and its Consequences	2	0	2
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1
MATH 105	Finite Mathematics	3	0	3	MATH 106	Applied Calculus	3	0	3
ECON 101	Principles of Economics I	3	0	3	ACCT 210	Intro. to Managerial Accounting	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	ENGL 102	Intro. to Report Writing	3	0	3
MIS 101	Business Computing	1	2	2	ICS 102	Intro. to Computing I	2	3	3
		15	**4**	**17**			**16**	**5**	**18**
Second Year (Sophomore)									
IAS 201	Writing for Professional Needs	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	MIS 301	Systems Analysis & Design	2	2	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**			**16**	**2**	**17**
Third Year (Junior)									
IAS 322	Human Rights in Islam	2	0	2	MIS 351	Cooperative Work	0	0	6
COE 353	Fundamentals of Computer Comm.	3	0	3					
MGT 301	Principles of Management	3	0	3					
ECON 306	Economy of Saudi Arabia	3	0	3					
MIS 311	Business Data Management	2	2	3					
MGT 355	Business Research Methods	3	0	3					
		16	**2**	**17**			**0**	**0**	**6**
Summer Session					MIS 352	End Cooperative Work	**0**	**0**	**0**
Fourth Year (Senior)									
XXX xxx	Business Elective I	3	0	3	MGT 449	Strategic Management	3	0	3
GS xxx	GS Elective I	3	0	3	GS xxx	GS Elective II	3	0	3
MIS 405	IS Project Management	2	2	3	MIS 410	Management Support Systems	2	2	3
MGT 311	Legal Environment	3	0	3	XXX xxx	Business Elective II	3	0	3
OM 311	Business Analytics	3	0	3	IAS 301	Oral Communication Skills	2	0	2
MIS xxx	MIS Elective I	3	0	3	MIS xxx	MIS Elective II	3	0	3
		17	**2**	**18**			**16**	**2**	**17**
Total credit hours required in Degree Program : 127									

Department of Management & Marketing

Chairman: Dr. Aymen A. Kayal

Faculty

Al-Ashban	Al-Shuridah	Kazmi
Al-Ghamdi	Al-Wuhaibi	Kayal
Al-Kahtani	Al-Zamel	Makkawi
Almashayekhi	Frimpong	Mansour
Al-Meer	Heineck	Mat-zin
Al-Shammari	Hu	Sohail
Al-Shebil	Joyner	Umar

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
College General Education Learning Goals/Objectives	
1. Communication Abilities 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.
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	1. Students will be able to work effectively in group settings.
	2. Students will be able to lead group work.
3. Reflective Thinking Skills Ability to apply logic and exercise sound judgment in making decisions	Students will be able to show good judgment in making choices and decisions.
4. Analytic/Quantitative Skills 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.
5. Ethical Understanding 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.
6. Use of Information Technology 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.
7. Leadership 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.
8. Multicultural and diversity understanding 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.
College Management-Specific Learning Goals and Objectives	
9. Management-Specific Knowledge 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.
Management Major Learning Goals/Objectives	
10. Discipline-Specific Knowledge 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
11. Application of Discipline-Specific Knowledge	1. Students will be able to apply the management process of planning, organizing, leading, and controlling.

Ability to apply management area concepts, principles and theories appropriately	2. Students will be able to draw appropriate implementation plans for the strategies. 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.

Requirements for the Bachelor of Science (BS) Degree in Management

Every student majoring in Management must complete the following curriculum:

(a) General Education Requirements (38 credit hours)		Credit Hours
Communication Skills	ENG 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 105, 106	6
Physical Education	PE 101, 102	2
Science or Engineering Elective	XXX xxx	3
General Studies	Two GS xxx Courses	6
		38

(b) Core Requirements in Business Administration (59 credit hours)		
Accounting	ACCT 110, 210	6
Business Communications	MGT 210	3
Economics	ECON 101, 102, 306	9
Management	MGT 301, 311, 449	9
Management Information Systems	MIS 101, 215	5
Marketing	MKT 250	3
Finance	FIN 250	3
Operations Management	OM 210, 311	6
Statistics	STAT 211, 212	6
Research Methods	MGT 355	3
Business Electives	Two XXX xxx courses	6
		59

(c) Management Major Requirements (24 credit hours)		
Organization Behavior	MGT 310	3
Organizational Leadership	MGT 430	3
International Business	MGT 440	3
Management of Innovation and Change	MGT 450	3
Human Resources Management	HRM 301	3
MGT Electives	Three MGT xxx Courses	9
		24

(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
		6

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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
ECON 101	Principles of Economics I	3	0	3	MIS 101	Business Computing	1	2	2
ENGL 101	Intro. to Academic Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3
MATH 105	Finite Mathematics	3	0	3	ACCT 210	Introduction to Managerial Accounting	3	0	3
IAS 101	Practical Grammar	2	0	2	ECON 102	Principles of Economics II	3	0	3
XXX xxx	Science or Eng. Elective	3	0	3	MATH 106	Applied Calculus	3	0	3
ACCT 110	Introduction to Financial Accounting	3	0	3	IAS 111	Belief and its Consequences	2	0	2
PE 101	Health and Physical Educ. I	0	2	1	PE 102	Health and Physical Educ. II	0	2	1
		17	**2**	**18**			**15**	**4**	**17**
Second Year (Sophomore)									
FIN 250	Financial Management	3	0	3	MGT 210	Business Comm.	3	0	3
STAT 211	Statistics for Business I	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
IAS 201	Writing for Professional Needs	2	0	2	MKT 250	Principles of Marketing	3	0	3
MIS 215	Principles of MIS	3	0	3	IAS 212	Professional Ethics	2	0	2
MGT 301	Principles of Management	3	0	3	ECON 306	Economy of Saudi Arabia	3	0	3
		17	**0**	**17**			**17**	**0**	**17**
Third Year (Junior)									
HRM 301	Human Resources Management	3	0	3	MGT xxx	MGT Elective I	3	0	3
IAS 322	Human Rights in Islam	2	0	2	MGT 355	Business Research Methods	3	0	3
MGT 310	Organization Behavior	3	0	3	GS xxx	GS Elective I	3	0	3
MGT 311	Legal Environment	3	0	3	MGT xxx	MGT Elective II	3	0	3
OM 311	Business Analytics	3	0	3	XXX xxx	Business Elective I	3	0	3
MGT 430	Organizational Leadership	3	0	3	IAS 301	Oral Communication Skills	2	0	2
		17	**0**	**17**			**17**	**0**	**17**
Summer Session					MGT 350	Begin Cooperative Work	**0**	**0**	**0**
Fourth Year (Senior)									
MGT 351	Cooperative Work	0	0	6	XXX xxx	Business Elective II	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
					MGT xxx	MGT Elective III	3	0	3
					GS xxx	GS Elective II	3	0	3
		0	**0**	**6**			**18**	**0**	**18**
Total credit hours required in Degree Program : 127									

Requirements for the Bachelor of Science (BS) Degree in Marketing

Every student majoring in Marketing must complete the following curriculum:

(a) General Education Requirements (38 credit hours)		**Credit Hours**
Communication Skills	ENG 214, IAS 101, 201, 301	9
English	ENGL 101, 102	6
Islamic Studies	IAS 111, 212, 322	6
Mathematics	MATH 105, 106	6
Physical Education	PE 101, 102	2
Science or Engineering Elective	XXX xxx	3
General Studies	Two GS xxx Courses	6
		38

(b) Core Requirements in Business Administration (59 credit hours)		
Accounting	ACCT 110, 210	6
Business Communications	MGT 210	3
Economics	ECON 101, 102, 306	9
Management	MGT 301, 311, 449	9
Management Information Systems	MIS 101, 215	5
Marketing	MKT 250	3
Finance	FIN 250	3
Operations Management	OM 210, 311	6
Statistics	STAT 211, 212	6
Research Methods	MGT 355	3
Business Electives	Two XXX xxx courses	6
		59

(c) Marketing Major Requirements (24 credit hours)		
Marketing Research	MKT 345	3
Product & Brand Management	MKT 360	3
Integrated Marketing Communications	MKT 370	3
Consumer Behavior	MKT 410	3
Strategic Marketing	MKT 450	3
Digital Marketing	MKT 485	3
MKT Electives	Two MKT xxx courses	6
		24

(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
		6

The total number of credit hours required is **127**

Marketing 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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
ECON 101	Principles of Economics I	3	0	3	ACCT 210	Intro. to Managerial Accounting	3	0	3
ENGL 101	Intro. to Academic Discourse	3	0	3	ECON 102	Principles of Economics II	3	0	3
IAS 111	Belief and its Consequences	2	0	2	ENGL 102	Intro. to Report Writing	3	0	3
MATH 105	Finite Mathematics	3	0	3	IAS 101	Practical Grammar	2	0	2
MIS 101	Business Computing	1	2	2	MATH 106	Applied Calculus	3	0	3
PE 101	Health and Physical Educ. I	0	2	1	MIS 215	Principles of MIS	3	0	3
ACCT 110	Intro. to Financial Accounting	3	0	3	PE 102	Health and Physical Educ. II	0	2	1
		15	**4**	**17**			**17**	**2**	**18**
Second Year (Sophomore)									
XXX xxx	Science or Eng. Elective	3	0	3	IAS 212	Professional Ethics	2	0	2
ENGL 214	Academic and Professional Comm.	3	0	3	MGT 210	Business Comm.	3	0	3
GS xxx	GS Elective I	3	0	3	MGT 301	Principles of Management	3	0	3
IAS 201	Writing for Professional Needs	2	0	2	MKT 250	Principles of Marketing	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	OM 210	Operations Management	3	0	3
		17	**0**	**17**			**17**	**0**	**17**
Third Year (Junior)									
ECON 306	Economy of Saudi Arabia	3	0	3	MGT 311	Legal Environment	3	0	3
IAS 322	Human Rights in Islam	2	0	2	MKT 345	Marketing Research	3	0	3
GS xxx	GS Elective II	3	0	3	MKT 370	Integrated Marketing Comm.	3	0	3
MGT 355	Business Research Methods	3	0	3	MKT 410	Consumer Behavior	3	0	3
MKT 360	Product & Brand Management	3	0	3	OM 311	Business Analytics	3	0	3
MKT 485	Digital Marketing	3	0	3	XXX xxx	Business Elective I	3	0	3
		17	**0**	**17**			**18**	**0**	**18**
Summer Session					MKT 350	Begin Cooperative Work	**0**	**0**	**0**
Fourth Year (Senior)									
MKT 351	Cooperative Work	0	0	6	XXX xxx	Business Elective II	3	0	3
					IAS 301	Oral Communication Skills	2	0	2
					MGT 449	Strategic Management	3	0	3
					MKT xxx	MKT Elective I	3	0	3
					MKT 450	Strategic Marketing	3	0	3
					MKT xxx	MKT Elective II	3	0	3
		0	**0**	**6**			**17**	**0**	**17**
Total credit hours required in Degree Program : 127									

COLLEGE OF PETROLEUM ENGINEERING & GEOSCIENCES

Dean: Dr. Abdulaziz Al-Kaabi

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 Geosciences, and the Center for Integrative Petroleum Research. 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.

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. Abdullatif Al-Shuhail

Faculty

Abdulghani	Alshuhail	Kaminski
Abdullatif	Al-Shuhail	Korvin
Abokhodair	Dogan	Makkawi
Al-Lehyani	Hariri	Qurban
Alramadan	Hughes	Tawabini
Al-Shaibani	Kaka	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 Bachelor of Science (BS) Degree in Geology

Every student majoring in Geology must complete the following curriculum:

(a) General Education Requirements (47 credit hours)		**Credit Hours**
Chemistry	CHEM 101, 102	8
English	ENGL 101, 102, 214	9
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Mathematics	MATH 101, 102	8
Physical Education	PE 101, 102	2
Physics	PHYS 101, 102	8
		47

(b) Core Requirements (41 credit hours)		
Principles of Geology	GEOL 101	3
Introduction to the Petroleum Industry	PETE 101	2
Essentials of Geophysics	GEOP 102	2
Integrated Design I	CPG 498	1
Integrated Design II	CPG 499	2
Earth History and Paleontology	GEOL 213	3
Mineralogy and Optical Mineralogy	GEOL 217	3
Petrology	GEOL 220	3
Sedimentology and Stratigraphy	GEOL 270	3
Structural Geology	GEOL 305	3
Petroleum Geology	GEOL 315	3
Regional Geology	GEOL 318	3
Computational Methods in Geology	GEOL 354	3
Geology Seminar	GEOL 409	1
Subsurface Geology	GEOL 465	3
Seismic Data Interpretation	GEOP 416	3
		41

(c) Electives (30 credit hours)		
CPG Electives	Four XXX xxx Courses	12
MATH Elective	MATH/STAT/ICS xxx	3
Laboratory Science Elective	BIOL/CHEM/PHYS xxx	3
Free Electives	Two XXX xxx Courses	6
General Studies	Two GS xxx Courses	6
		30

(d) Summer Sessions (8 credit hours)

Each student must complete the following courses during three summer sessions.

Summer Camp	CPG 199	1
Summer Training	GEOL 399	1
Field Geology	GEOL 430	6
		8

The total number of credit hours required is **126**

Geology 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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
GEOL 101	Principles of Geology	2	3	3	GEOP 102	Essentials of Geophysics	2	0	2
PETE 101	Intro. to Petroleum Industry	2	0	2	ENGL 102	Intro. to Report Writing	3	0	3
MATH 101	Calculus I	4	0	4	CHEM 101	General Chemistry I	3	4	4
PE 101	Health and Physical Educ. I	0	2	1	MATH 102	Calculus II	4	0	4
ENGL 101	Intro. to Academic Discourse	3	0	3	PHYS 102	General Physics II	3	3	4
PHYS 101	General Physics I	3	3	4	PE 102	Health and Physical Educ. II	0	2	1
		14	**8**	**17**			**15**	**9**	**18**
Summer Session I					CPG 199	Summer Camp	**0**	**0**	**1**
Second Year (Sophomore)									
GEOL 213	Earth History and Paleontology	2	3	3	GEOL 220	Petrology	2	3	3
GEOL 217	Mineralogy and Optical Mineralogy	2	3	3	GEOL 270	Sedimentology and Stratigraphy	2	3	3
CHEM 102	General Chemistry II	3	4	4	XXX xxx	MATH/STAT/ICS Elective	3	0	3
IAS 101	Practical Grammar	2	0	2	IAS 111	Belief and its Consequences	2	0	2
GS xxx	GS Elective I	3	0	3	ENGL 214	Academic & Professional Comm.	3	0	3
		12	**10**	**15**			**12**	**6**	**14**
Summer Session II					GEOL 399	Summer Training	**0**	**0**	**1**
Third Year (Junior)									
GEOL 305	Structural Geology	2	3	3	GEOL 315	Petroleum Geology	3	0	3
GEOL 354	Computational Methods in Geology	2	3	3	GEOL 318	Regional Geology	3	0	3
XXX xxx	CPG Elective I	3	0	3	XXX xxx	CPG Elective II	3	0	3
XXX xxx	BIOL/CHEM/PHYS Elective	2	3	3	IAS 212	Professional Ethics	2	0	2
IAS 201	Writing for Professional Needs	2	0	2	XXX xxx	Free Elective I	3	0	3
		11	**9**	**14**			**14**	**0**	**14**
Summer Session III					GEOL 430	Field Geology	**0**	**18**	**6**
Fourth Year (Senior)									
CPG 498	Integrated Design I	0	3	1	CPG 499	Integrated Design II	0	6	2
GEOL 409	Geology Seminar	1	0	1	XXX xxx	CPG Elective IV	3	0	3
GEOL 465	Subsurface Geology	3	0	3	IAS 322	Human Rights in Islam	2	0	2
XXX xxx	CPG Elective III	3	0	3	XXX xxx	Free Elective II	3	0	3
GEOP 416	Seismic Data Interpretation	3	0	3	GS xxx	GS Elective II	3	0	3
IAS 301	Oral Communication Skills	2	0	2					
		12	**3**	**13**			**11**	**6**	**13**
Total credit hours required in Degree Program : 126									

Requirements for the Bachelor of Science (BS) Degree in Geophysics

Every student majoring in Geophysics must complete the following curriculum:

(a) General Education Requirements (56 credit hours) — **Credit Hours**

Chemistry	CHEM 101	4
Information and Computer Science	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	14
Physical Education	PE 101, 102	2
Physics	PHYS 101, 102, 204, 205	12
		56

(b) Core Requirements (42 credit hours)

Principles of Geology	GEOL 101	3
Introduction to the Petroleum Industry	PETE 101	2
Essentials of Geophysics	GEOP 102	2
Integrated Design I	CPG 498	1
Integrated Design II	CPG 499	2
Introduction to Seismology	GEOP 204	3
Computational Geophysics	GEOP 205	3
Introduction to Seismic Exploration	GEOP 215	3
Gravity and Magnetics Exploration	GEOP 304	3
Seismic Data Processing	GEOP 320	3
Electrical and Electromagnetic Exploration	GEOP 353	3
Seminar	GEOP 405	1
Structural Geology	GEOL 305	3
Integrated Petroleum Geology	GEOL 345	4
Methods of Theoretical Physics	PHYS 210	3
Electricity and Magnetism I	PHYS 305	3
		42

(c) Electives (24 credit hours)

Geophysics Electives	GEOP 3xx, GEOP 4xx	6
Petroleum Engineering Elective	PETE 3xx	3
CPG Elective	XXX xxx	3
Math Elective	MATH xxx	3
General Studies Electives	Two GS xxx Courses	6
Free Elective	XXX xxx	3
		24

(d) Summer Sessions (6 credit hours)

Each student must complete the following courses during three summer sessions.

Summer Camp	CPG 199	1
Summer Training	GEOP 399	1
Geophysics Field Camp	GEOP 490	4
		6

The total number of credit hours required is **128**

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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
GEOL 101	Principles of Geology	2	3	3	GEOP 102	Essentials of Geophysics	2	0	2
PETE 101	Intro. to Petroleum Industry	2	0	2	ENGL 102	Intro. to Report Writing	3	0	3
MATH 101	Calculus I	4	0	4	CHEM 101	General Chemistry I	3	4	4
PE 101	Health and Physical Educ. I	0	2	1	MATH 102	Calculus II	4	0	4
ENGL 101	Intro. to Academic Discourse	3	0	3	PHYS 102	General Physics II	3	3	4
PHYS 101	General Physics I	3	3	4	PE 102	Health and Physical Educ. II	0	2	1
		14	**8**	**17**			**15**	**9**	**18**
Summer Session I					CPG 199	Summer Camp	**0**	**0**	**1**
Second Year (Sophomore)									
GEOP 215	Intro. to Seismic Exploration	3	0	3	GEOP 204	Intro. to Seismology	3	0	3
ICS 103	Computer Programming in C	2	3	3	GEOP 205	Computational Geophysics	3	0	3
MATH 201	Calculus III	3	0	3	PHYS 210	Methods of Theoretical Physics	3	0	3
PHYS 204	General Physics III	3	0	3	MATH 202	Elements of Differential Eq.	3	0	3
PHYS 205	General Physics III Lab	0	3	1	ENGL 214	Academic & Professional Comm.	3	0	3
IAS 101	Practical Grammar	2	0	2	IAS 111	Belief and its Consequences	2	0	2
		13	**6**	**15**			**17**	**0**	**17**
Summer Session II					GEOP 399	Summer Training	**0**	**0**	**1**
Third Year (Junior)									
GEOL 305	Structural Geology	2	3	3	GEOP 304	Gravity and Magnetic Exploration	3	0	3
GEOL 345	Integrated Petroleum Geology	3	3	4	GEOP 320	Seismic Data Processing	2	3	3
PHYS 305	Electricity and Magnetism I	3	0	3	GEOP 353	Electrical and Electromagnetic Exploration	3	0	3
MATH xxx	Math Elective	3	0	3	IAS 212	Professional Ethics	2	0	2
IAS 201	Writing for Professional Needs	2	0	2	GS xxx	GS Elective I	3	0	3
		13	**6**	**15**			**13**	**3**	**14**
Summer Session III					GEOP 490	Geophysics Field Camp	**0**	**9**	**4**
Fourth Year (Senior)									
CPG 498	Integrated Design I	0	3	1	CPG 499	Integrated Design II	0	6	2
GEOP 3xx	GEOP Elective I	3	0	3	GEOP 405	Seminar	1	0	1
PETE 3xx	PETE Elective	3	0	3	GEOP 4xx	GEOP Elective II	3	0	3
XXX xxx	CPG Elective	3	0	3	IAS 322	Human Rights in Islam	2	0	2
GS xxx	GS Elective II	3	0	3	IAS 301	Oral Communication Skills	2	0	2
					XXX xxx	Free Elective	3	0	3
		12	**3**	**13**			**11**	**6**	**13**
Total credit hours required in Degree Program : 128									

Department of Petroleum Engineering

Chairman: Dr. Dhafer Al-Shehri

Faculty

Abdulraheem
Abu-Khamsin
Al-Afnan
Al-Arifi
Al-Jawad
Al-Majed
Al-Ramadan
Awotunde
Azad
Elkatatny
Gajbhiye
Glatz
Haq
Ibrahim
Liao
Mahmoud
Patil
Sultan
Weijermars

Introduction

Petroleum engineering involves 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 over time. 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 geology, geophysics, and computer technologies 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 student with the necessary background in physics, chemistry, geology, mathematics, and engineering subjects such as fluid mechanics, thermodynamics, strength of materials and electric circuits. The curriculum introduces the students to basic petroleum engineering subjects too. The third and the 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 maximum recovery in the most economical manner. This involves the utilization of basic and advanced sciences and computer technology.

The role of 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 extract hydrocarbons and to treat the produced fluids to convert to 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 make it an institution that is 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 Accreditation**

The undergraduate program **Bachelor of Science (BS)** in **"Petroleum Engineering"** is accredited by the **Engineering Accreditation Commission** of **ABET** (https://www.abet.org).

- **Program Educational Objectives (PEOs)**

The undergraduate program of **Bachelor of Science (BS)** in ***Petroleum Engineering*** is designed to graduate students **who are expected to attain (within a few years) of graduation the following PEOs:**

1. established careers in petroleum engineering and related geosciences that enable them to compete in the global energy industry,
2. demonstrated professional and technical development through self-learning and formal training, and
3. shown adherence to professional ethics, compliance with HSE guidelines and practice of social responsibility.

- **Student Outcomes (SOs)**

The ***Petroleum Engineering*** **(BS)** students **by the time of gradation will have the ability to:**

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. communicate effectively with a range of audiences.

4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. acquire and apply new knowledge as needed, using appropriate learning strategies.

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 Bachelor of Science (BS) Degree in Petroleum Engineering

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

(a) General Education Requirements (61 credit hours) — **Credit Hours**

Chemistry	CHEM 101	4
Physics	PHYS 101, 102	8
Mathematics	MATH 101, 102, 201, 202, 371	17
Engineering	CE 202, CHE 204	6
Islamic and Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Computer Programming	ICS 103	3
English	ENGL 101, 102, 214	9
Physical Education	PE 101, 102	2
		61

(b) Core Requirements (54 credit hours)

Principles of Geology	GEOL 101	3
Introduction to the Petroleum Industry	PETE 101	2
Essentials of Geophysics	GEOP 102	2
Integrated Design I	CPG 498	1
Integrated Design II	CPG 499	2
Phase Behavior	PETE 202	3
Rock and Fluid Properties	PETE 206	4
Reservoir Engineering	PETE 301	3
Well Completion	PETE 302	3
Well Testing	PETE 306	3
Drilling Engineering	PETE 311	4
Well Logging	PETE 313	3
Reservoir Description	PETE 315	4
Reservoir Simulation	PETE 402	3
Petroleum Production Engineering	PETE 403	3
Petroleum Economics	PETE 407	3
Seminar	PETE 408	1
Geology	GEOL 305, 345	7
		54

(c) Electives (18 credit hours)

PETE Electives	Two PETE 4xx Courses	6
GEOP Elective	GEOP xxx	3
Technical Elective	XE xxx	3
General Studies	Two GS xxx Courses	6
		18

(d) Summer Sessions (2 credit hours)

Each student must complete the following courses during two summer sessions.

Summer Camp	CPG 199	1
Summer Training	PETE 399	1
		2

The total number of credit hours required is **135**

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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
GEOL 101	Principles of Geology	2	3	3	GEOP 102	Essentials of Geophysics	2	0	2
PETE 101	Intro. to Petroleum Industry	2	0	2	CHEM 101	General Chemistry I	3	4	4
MATH 101	Calculus I	4	0	4	PHYS 102	General Physics II	3	3	4
PE 101	Health and Physical Educ. I	0	2	1	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
PHYS 101	General Physics I	3	3	4	PE 102	Health and Physical Education II	0	2	1
		14	**8**	**17**			**15**	**9**	**18**
Summer Session I					CPG 199	Summer Camp	**0**	**0**	**1**
Second Year (Sophomore)									
PETE 202	Phase Behavior	3	0	3	PETE 206	Rock and Fluid Properties	3	3	4
CE 202	Statics & Strength of Materials	3	0	3	CHE 204	Transport Phenomena I	3	0	3
ICS 103	Computer Programming in C	2	3	3	ENGL 214	Academic & Professional Comm.	3	0	3
MATH 201	Calculus III	3	0	3	MATH 202	Elements of Differential Eq.	3	0	3
GS xxx	GS Elective I	3	0	3	GS xxx	GS Elective II	3	0	3
IAS 101	Practical Grammar	2	0	2	IAS 111	Belief and its Consequences	2	0	2
		16	**3**	**17**			**17**	**3**	**18**
Third Year (Junior)									
PETE 301	Reservoir Eng.	3	0	3	PETE 302	Well Completion	3	0	3
PETE 311	Drilling Eng.	3	3	4	PETE 306	Well Testing	3	0	3
PETE 313	Well Logging	3	0	3	PETE 315	Reservoir Description	3	3	4
GEOL 305	Structural Geology	2	3	3	GEOL 345	Integrated Petroleum Geology	3	3	4
IAS 201	Writing for Professional Needs	2	0	2	MATH 371	Intro. to Numerical Computing	3	0	3
IAS 212	Professional Ethics	2	0	2					
		15	**6**	**17**			**15**	**6**	**17**
Summer Session II					PETE 399	Summer Training	**0**	**0**	**1**
Fourth Year (Senior)									
CPG 498	Integrated Design I	0	3	1	CPG 499	Integrated Design II	0	6	2
PETE 402	Reservoir Simulation	2	3	3	PETE 403	Petroleum Production Eng.	3	0	3
PETE 407	Petroleum Economics	3	0	3	PETE 408	Seminar	0	2	1
PETE 4xx	PETE Elective I	3	0	3	PETE 4xx	PETE Elective II	3	0	3
GEOP xxx	GEOP Elective	3	0	3	IAS 322	Human Rights in Islam	2	0	2
IAS 301	Oral Communication Skills	2	0	2	XE xxx	Technical Elective	3	0	3
		13	**6**	**15**			**11**	**8**	**14**
Total credit hours required in Degree Program : 135									

COLLEGE OF SCIENCES

Dean: Dr. Abdulaziz Alsaadi

DEPARTMENTS

CHEMISTRY
LIFE 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 Chemistry, Life 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 life sciences 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 life sciences will offer undergraduate biology courses required by several engineering department.

Department of Chemistry

Chairman: Dr. Khalid R. Alhooshani

Faculty

Abulkibash	Badawi	Maung
Al-Arfaj	Chanbasha	Mazumder
Al-Barri	El-Ali	Morsy
Al-Betar	Fettouhi	Muallem
Al-Harbi	Forner	Musa
Alhooshani	Hamdan	Oweimreen
Al-Saadi	Imam	Saleh
Al-Suwaiyan	Isab	Siddiqui
Al-Thagfi	Kawde	Ullah
Asrof	Khaled	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

The Chemistry Department at KFUPM aspires to excel in chemical education, research and services.

Mission

The Chemistry Department is committed to prepare competitive and professional graduates within an innovative and intellectually stimulating environment, support other academic programs at KFUPM by offering quality chemistry learning experiences, conduct basic and applied research of national and international impact, build proactive partnerships with industry and offer effective training and educational and technical services to the society.

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.

BS PROGRAM IN CHEMISTRY

MISSION STATEMENT

The B.S. program in chemistry prepares students for successful careers in private or government sectors or for pursuing graduate studies in chemistry. The program provides quality theoretical and practical learning experiences in various areas of chemistry enriched with diverse research opportunities.

PROGRAM STRATEGIC GOALS

The approved major goals of the Chemistry Program are:

1. Improve the quality of the Chemistry program.
2. Promote the research awareness and experience at the undergraduate level.
3. Increase student enrolment in the Chemistry program.
4. Ensure quality assurance in teaching and learning at the undergraduate level.
5. Develop and implement a community engagement plan.

PROGRAM EDUCATIONAL OBJECTIVES

The chemistry program aims at preparing graduates who will be:

1) leading professionals in private or government sectors,
2) able to pursue higher studies,
3) practicing safety measures,
4) life-long learners with strong interpersonal skills, and
5) responsible, ethically driven, and productive members of the society,
6) able to promote creativity and analytical thinking conducive for novel discoveries and invention of processes and methods in chemical sciences.

Program Learning Outcomes

Expected Program Learning Outcomes
On successful completion of this program, graduates will be able to:

Knowledge

a) Demonstrate a thorough knowledge of the fundamental theories and principles of analytical, organic, inorganic and physical chemistry.
b) Attain expertise in the main procedures, tools and techniques used by chemists.
c) Recognize the applications of mathematics and physics to chemical sciences.
d) Demonstrate knowledge of social responsibility and ethical principles.

Cognitive Skills

e) Demonstrate competence in the application of the principles and problem solving in analytical, organic, inorganic and physical chemistry.
f) Carry out chemical experiments, analyze and report the results correctly.
g) Competently identify gaps in knowledge regarding chemical sciences.
h) Handle chemicals following safety procedures and regulations.
i) Recognize job responsibilities of a chemist in the field and apply professional skills in an industrial setting.

Interpersonal Skills & Responsibility

j) Work effectively as a member of a team.
k) Demonstrate adequate life-long learning skills.

Communication, Information Technology, Numerical

l) Communicate effectively both orally and in writing.
m) Use effectively computer applications and information technology tools related to chemistry.

Psychomotor

n) Assemble and properly use chemistry experimental setups.
o) Correctly perform quantitative measurements requiring accurate and precise manipulations.

Requirements for the Bachelor of Science (BS) Degree in Chemistry

Every student majoring in Chemistry must complete the following curriculum:

(a) General Education Requirements (53 credit hours)		**Credit Hours**
Communication Skills	ENGL 214, IAS 101, 201, 301	9
Computer Programming	ICS 103	3
English	ENGL 101, 102	6
General Studies	Two GS xxx Courses	6
Islamic and Arabic Studies	IAS 111, 212, 322, 4xx	8
Mathematics	MATH 101, 102, 201	11
Physical Education	PE 101, 102	2
Physics	PHYS 101, 102	8
		53

(b) Core Requirements (46 credit hours)		
General Chemistry	CHEM 101, 102	8
Analytical Chemistry	CHEM 221, 324, 426	7
Biochemistry	CHEM 363	3
Inorganic Chemistry	CHEM 236, 336	6
Organic Chemistry	CHEM 201, 204, 305	9
Physical Chemistry	CHEM 212, 311	8
Research Skills	CHEM 388, 479, 488	5
		46

(c) Electives (21 credit hours)		
Chemistry Electives A course containing a lab is strongly recommended	Three CHEM xxx Courses	9
Technical Electives Not from GS or IAS, Minimum 6 credit hours of Non-CHEM courses	Three XXX xxx Courses	9
Math Elective MATH 202, 208, 225 or STAT 319	MATH xxx or STAT xxx	3
		21

(d) Summer Training (2 credit hours)

Each student must spend two months in a chemical laboratory (analytical laboratory, hospital, clinic, etc.) or a period of two months of industrial employment in appropriate industries or firms. Summer training could also be conducted in a university or a research institution/center.

Summer Training	CHEM 399	2
		2

The total number of credit hours required is **122**

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	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**
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
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	IAS 101	Practical Grammar	2	0	2
		13	**9**	**16**			**15**	**7**	**17**
Second Year (Sophomore)									
CHEM 201	Organic Chemistry I	3	4	4	CHEM 204	Organic Chemistry II	3	0	3
CHEM 221	Analytical Chemistry	2	4	3	CHEM 212	Physical Chemistry I	3	4	4
ICS 103	Computer Programming in C	2	3	3	CHEM 236	Inorganic Chemistry I	3	4	4
IAS 111	Belief and its Consequences	2	0	2	IAS 201	Writing for Professional Needs	2	0	2
MATH 201	Calculus III	3	0	3	ENGL 214	Academic & Professional Comm.	3	0	3
PE 102	Health and Physical Educ. II	0	2	1					
		12	**13**	**16**			**14**	**8**	**16**
Third Year (Junior)									
CHEM 305	Organic Synthesis and Characterization Lab	0	8	2	CHEM 324	Advanced Instrumental Chemical Analysis	2	4	3
CHEM 311	Physical Chemistry II	3	4	4	CHEM 363	Biochemistry	3	0	3
CHEM 336	Inorganic Chemistry II	2	0	2	CHEM 388	Chemistry Research I	0	8	2
XXX xxx	Math/STAT Elective*	3	0	3	CHEM xxx	Chemistry Elective I	3	0	3
IAS 212	Professional Ethics	2	0	2	IAS 301	Oral Communication Skills	2	0	2
GS xxx	GS Elective I	3	0	3					
		13	**12**	**16**			**10**	**12**	**13**
Summer Session					CHEM 399	Summer Training	**0**	**0**	**2**
Fourth Year (Senior)									
CHEM 426	Advanced Instrumental Analysis Lab.	0	4	1	CHEM 479	Chemistry Seminar	1	0	1
CHEM 488	Chemistry Research II	0	8	2	CHEM xxx	Chemistry Elective III	3	0	3
CHEM xxx	Chemistry Elective II	3	0	3	XXX xxx	Technical Elective II	3	0	3
XXX xxx	Technical Elective I	3	0	3	XXX xxx	Technical Elective III	3	0	3
GS xxx	GS Elective II	3	0	3	IAS 4xx	IAS Elective	2	0	2
IAS 322	Human Rights in Islam	2	0	2					
		11	**12**	**14**			**12**	**0**	**12**
Total credit hours required in Degree Program : 122									

* MATH 202, 208, 225 or STAT 319

FROZEN

Requirements for the Bachelor of Science (BS) Degree in Industrial Chemistry

Every student majoring in Industrial Chemistry must complete the following curriculum:

(a) General Education Requirement (55 credit hours)		**Credit Hours**
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
		55

(b) Core Requirements (59 credit hours)

Industrial Chemistry (19 credit hours)		
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
		19

Pure Chemistry (40 credit hours)		
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
		40

(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
		8

(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
		2

The total number of credit hours required is **124**

Industrial 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	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**
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 Consequences	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					
		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
PE 102	Health and Physical Educ. II	0	2	1	MATH 202	Elements of Differential Eq.	3	0	3
		11	**6**	**13**			**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 355	Industrial Catalysis	3	0	3
IAS 322	Human Rights in Islam	2	0	2	IAS 201	Writing for Professional Needs	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
		14	**13**	**17**			**12**	**8**	**14**
Summer Session					CHEM 399	Summer Training	**0**	**0**	**2**
Fourth Year (Senior)									
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	Oral Communication 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
		13	**4**	**14**			**9**	**12**	**12**
Total credit hours required in Degree Program : 124									

Department of Mathematics and Statistics

Chairman: Dr. Husain Al-Attas

Faculty

Abbas
Abuihlail
AbuShoshah
Abu-Sbeih
Ahmad
Alanezy
Alassaf
Alassar
Al-Attas
Alfuraidan
Al-Garni
Al-Homidan
Alhumidi
Al-Khulaifi
Al-Kurdi
Al-Momani
Al-Mutawa
Al-Rasasi
Al-Sabah
Al-Sawi
Alshahrani
Al-Shammari
Al-Smail
Al-Smail
Anabosi
Belhaiza
Bokhari, A
Bonfoh
Chanane
Duman
Echi
Elgindy
Elmughrabi
Fairag
Fukhar-ud-din
Furati
Joo
Kabbaj
Kadri
Kafini
Khalfallah
Khan, A
Kroumi
Khan, S
Laradji
Malik, M
Messaoudi
Mezerdi
Mimouni
Mustapha
Omar
Riaz
Saleh, K
Saleh, M
Shehadeh
Smii
Tatar, A
Tatar, N
Tawfiq
Trabelsi
Yousuf

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 Bachelor of Science (BS) Degree in Mathematics

Every student majoring in Mathematics must complete the following curriculum:

(a) General Education Requirements (61 credit hours)		Credit Hours
English	ENGL 101, 102	6
Communication Skills	ENGL 214, IAS 101, 201, 301	9
Computing	ICS 101 or ICS 102 or ICS 103	3
Mathematics	MATH 101, 102, 201, 202	14
Natural Sciences	CHEM 101, PHYS 101, 102	12
Natural Sciences Elective	BIOL/CHEM/GEOL/GEOP/PHYS xxx	3
Islamic Studies	IAS 111, 212, 322	6
General Studies	Two GS xxx Courses	6
Physical Education	PE 101, 102	2
		61

(b) Mathematics Core Requirements (34 credit hours)		
Introduction to Sets and Structures	MATH 210	3
Introduction to Linear Algebra	MATH 225	3
Modern Algebra I	MATH 323	3
Methods of Applied Mathematics I	MATH 333	3
Advanced Calculus I	MATH 341	3
Introduction to Numerical Computing	MATH 371	3
Advanced Calculus II	MATH 441	3
Introduction to Complex Variables	MATH 445	3
Introduction to Topology	MATH 453	3
Seminar in Mathematics	MATH 490	1
Introduction to Statistics	STAT 201	3
One Course from	{MATH 451, STAT 301}	3
		34

(c) Electives (24 credit hours)		
Electives from Mathematics and Statistics Department: Four 3-credit hour courses of which at least 6 credit-hours from one of the groups:	*Pure Math:* MATH 310, 325, 353, 423, 424, 427, 433, 434, 435, 437, 451, 463, 467 *Applied Math and Numerical Analysis:* MATH 433, 434, 435, 437, 471, 472, 474, 475 *Actuarial Science and Statistics:* AS 201, 380, 481, STAT 301, 302, 310, 325, 365, 415, 416, 430, 435, 440, 460	12
Free Electives: Four 3-credit hour courses satisfying the conditions: i) At least two courses numbered 300 or above ii) At least 6 credit hours outside the Department of Math and Stat	Four XXX xxx Courses	12
		24

(d) Summer Training (2 credit hours)		
Summer Training	MATH 399	2
		2

The total number of credit hours required is **121**

Mathematics 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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
CHEM 101	General Chemistry I	3	4	4	XXX xxx	Science Elective	x	x	3
ENGL 101	Intro. to Academic Discourse	3	0	3	PHYS 102	General Physics II	3	3	4
ICS 10x	Computer Programming/Computing	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 Consequences	2	0	2
PHYS 101	General Physics I	3	3	4	PE 102	Health and Physical Educ. II	0	2	1
		15	**12**	**19**			**12+**	**5+**	**17**
Second Year (Sophomore)									
ENGL 214	Academic & Professional Comm.	3	0	3	GS xxx	GS Elective I	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 210	Intro. to Sets and Structures	3	0	3	MATH 225	Intro. to Linear Algebra	3	0	3
STAT 201	Intro. to Statistics	2	2	3	MATH 323	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	Writing for Professional Needs	2	0	2
MATH 333	Methods of Applied Math I	3	0	3	MATH 441	Advanced Calculus II	3	0	3
MATH 341	Advanced Calculus I	3	0	3	XXX xxx	MATH 451 or STAT 301*	3	0	3
MATH 371	Intro. to Numerical Computing	3	0	3	MATH xxx	MATH Elective I	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	Oral Communication Skills	2	0	2	GS xxx	GS Elective II	3	0	3
MATH 445	Intro. to Complex Variables	3	0	3	MATH 453	Intro. to Topology	3	0	3
MATH xxx	MATH Elective II	3	0	3	MATH 490	Seminar in Math	1	0	1
MATH xxx	MATH Elective III	3	0	3	MATH xxx	MATH Elective IV	3	0	3
XXX xxx	Free Elective III	3	0	3	XXX xxx	Free Elective IV	3	0	3
		14	**0**	**14**			**13**	**0**	**13**
Total credit hours required in Degree Program : 121									

* Math 451: Differential Geometry, STAT 301: Intro. to Probability Theory

BS 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 Bachelor of Science (BS) Degree in Statistics

Every student majoring in Statistics must complete the following curriculum:

(a) General Education Requirements (64 credit hours)		Credit Hours
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
		64

(b) Core Requirement (26 credit hours)		
Introduction to Linear Algebra	MATH 225	3
Introduction to Numerical Computing	MATH 371	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
		26

(c) Electives (30 credit hours)		
Four courses of:	STAT 320, 325, 355, 361, 375, 415, 435, 440, 460, 461, 475, 499	12
Four courses from one of the groups:	*Group I:* ICS 201, 202, 252, 334, MIS 301, 340, 401, 410, 425	12
	Group II: ACCT 201, 202, ECON 202, FIN 301, 302, MGT 210, 301, MKT 301, 345	
	Group III: From any department with the approval of the advisor	
One Extra Technical Elective	XXX xxx	3
General Studies	GS xxx	3
		30

(d) Summer Training (2 credit hours)

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
		2

The total number of credit hours required is **122**

Statistics 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	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**
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
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 Consequences	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**			**15**	**12**	**19**
Second Year (Sophomore)									
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 225	Intro. to Linear Algebra	3	0	3
STAT 201	Intro. to Statistics	2	2	3	XXX xxx	Technical Elective I	3	0	3
		13	**2**	**14**			**13**	**2**	**14**
Third Year (Junior)									
IAS 322	Human Rights in Islam	2	0	2	IAS 201	Writing for Professional Needs	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 371	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
		14	**0**	**14**			**14**	**0**	**14**
Summer Session					STAT 399	Summer Training	**0**	**0**	**2**
Fourth Year (Senior)									
IAS 301	Oral Communication 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
		14	**0**	**14**			**12**	**3**	**13**
Total credit hours required in Degree Program : 122									

BS Degree in Actuarial Sciences and Financial Mathematics

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 Bachelor of Science (BS) Degree in Actuarial Sciences and Financial Mathematics

Every student majoring in Actuarial Sciences must complete the following curriculum:

(a) General Education Requirements (49 credit hours)

		Credit Hours
English	ENGL 101, 102, 214	9
Computing	ICS 103	3
Mathematics	MATH 101, 102, 201	11
Economy	ECON 101, 102	6
Islamic & Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Accounting	ACCT 110, 210	6
Physical Education	PE 101, 102	2
		49

(b) Actuarial Sciences Core Requirements (56 credit hours)

Financial Mathematics	AS 201	3
Actuarial Science Problem Lab	AS 289, 389	2
Quantitative Financial Models for Actuaries	AS 250	3
Actuarial Contingencies	AS 380, 481	7
Numerical Methods for Actuaries	AS 322	3
Actuarial Risk Theory and Credibility	AS 484	4
Risk Modeling	AS 450	3
Financial Management	FIN 250	3
Investments	FIN 320	3
Islamic Finance	FIN 440	3
Introduction to Differential Equations & Linear Algebra	MATH 208	3
Statistical Methods for Actuaries	STAT 214	4
Introduction to Probability Theory	STAT 301	3
Statistical Inference	STAT 302	3
Regression Analysis	STAT 310	3
Stochastic Processes for Actuaries	STAT 416	3
Time Series	STAT 460	3
		56

(c) Electives (15 credit hours)

Technical Elective	One Course from STAT/MATH/ICS/ISE xxx, FIN 3xx, FIN 4xx	3
AS Elective	Two Courses from AS 460, 470, 476, 490, 491, STAT 436	6
General Studies	Two GS xxx Courses	6
		15

(d) Cooperative Work (9 credit hours)

Cooperative Work	AS 351	6
		6

The total number of credit hours required is **126**

Actuarial Sciences and Financial Mathematics 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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
ECON 101	Principles of Economics I	3	0	3	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
ICS 103	Computer Programming in C	2	3	3	ACCT 110	Intro. to Financial Accounting	3	0	3
IAS 101	Practical Grammar	2	0	2	IAS 111	Belief and its Consequences	2	0	2
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
		14	**5**	**16**			**15**	**2**	**16**
Second Year (Sophomore)									
ACCT 210	Intro. to Managerial Accounting	3	0	3	FIN 250	Financial Management	3	0	3
AS 201	Financial Math	3	0	3	AS 289	Actuarial Science Problem Lab I	0	2	1
ENGL 214	Academic & Professional Comm.	3	0	3	AS 250	Quant. Financial Models for Actuaries	2	2	3
IAS 201	Writing for Professional Needs	2	0	2	IAS 212	Professional Ethics	2	0	2
MATH 201	Calculus III	3	0	3	MATH 208	Intro. to Differential Eq. & Linear Algebra	3	0	3
STAT 214	Statistical Methods for Actuaries	3	2	4	GS xxx	GS Elective I	3	0	3
					STAT 301	Intro. to Probability Theory	3	0	3
		17	**2**	**18**			**16**	**4**	**18**
Third Year (Junior)									
FIN 320	Investments	3	0	3	AS 351	Cooperative Work	0	0	6
AS 389	Actuarial Science Problem Lab II	0	2	1					
AS 380	Actuarial Contingencies I	2	2	3					
AS 322	Numerical Methods for Actuaries	2	2	3					
IAS 301	Oral Communication Skills	2	0	2					
STAT 302	Statistical Inference	3	0	3					
STAT 310	Regression Analysis	3	0	3					
		15	**6**	**18**			**0**	**0**	**6**
Summer Session					AS 352	End Cooperative Work	**0**	**0**	**0**
Fourth Year (Senior)									
FIN 440	Islamic Finance	3	0	3	XXX xxx	Technical Elective	3	0	3
AS 484	Actuarial Risk Theory & Credibility	3	2	4	AS xxx	AS Elective II	3	0	3
AS xxx	AS Elective I	3	0	3	GS xxx	GS Elective II	3	0	3
AS 450	Risk Modeling	2	2	3	AS 481	Actuarial Contingencies II	3	2	4
IAS 322	Human Rights in Islamic	2	0	2	STAT 460	Time Series	3	0	3
STAT 416	Stochastic Processes for Actuaries	3	0	3					
		16	**4**	**18**			**15**	**2**	**16**
Total credit hours required in Degree Program : 126									

Department of Physics

Chairman: Dr. Abdulaziz Al-Aswad

Faculty

Al-Abdullah
Al-Aithan
Alam
Al-Amri
Al-Amoudi
Al-Aswad
Al-Basheer
Al-Jalal
Al-Kuhaili
Al-Luhaibi
Al-Marzoug
Al-Matouq
Al-Sadah
Al-Sunaidi
Al-Zahrani
Bahlouli
Dastageer
Dwaikat
El-Said
Gasmi
Ghannam
Gondal
Haider
Harrabi
Khateeb-Ur-Rehman
Khiari
Kunwar
Maalej
Mekki, A
Mekki, M
Naqvi
Ndiaye
Raashid
Rao
Salem
Yamani
Ziq

Introduction

The Department of Physics at King Fahd University of Petroleum and Minerals is one of the distinguished departments in teaching, research, and community services. The department obtained accreditation from the National Center for Academic Accreditation and Assessment (NCAAA) in 2014. The faculty of the department includes over thirty members who are PhD holders from prestigious international universities. The department undertakes research in a variety of Physics subjects and houses research groups that carry out research in Atomic/Molecular/Optical physics, Condensed Matter physics, and Nuclear Physics. The department offers a B.S. degree for undergraduate students as well as M.S. and PhD degrees for graduate students.

Physics deals with the study of natural phenomena originating from matter, motion, and energy. It therefore represents 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.

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 providing high quality fundamental education in physics in accordance with international standards in order to prepare creative young scientists with strong analytical, experimental, and communication skills.

Program Educational Objectives

- Prepare graduates capable of pursuing graduate studies in physics and related fields
- Prepare graduates for a successful career in industry and research laboratories
- Provide graduates with broad knowledge that allows them to be self-learners

Student Learning Outcomes

On successful completion of this program, graduates will be able to:

- Recognize the laws of classical physics at the basic and intermediate levels
- Recognize the laws of quantum physics at the basic and intermediate levels
- Recognize the laws of at least one major specialty area of physics at the basic and intermediate levels
- Solve problems in classical physics at the basic and intermediate levels
- Solve problems in quantum physics at the basic and intermediate levels
- Solve problems in at least one major specialty area of physics at the basic and intermediate levels
- Analyze and interpret experimental data as well as write concise reports
- Be a good, and ethically responsible, team player

- Use mathematical skills to solve problems in physics at the basic and intermediate levels
- Use computing tools to solve problems in physics at the basic and intermediate levels
- Search for and utilize information on topics in physics from a variety of sources
- Communicate physics concepts verbally, graphically, and in writing
- Setup and conduct experiments in order to study physical phenomena

Requirements for the B. S. Degree in Physics

The Department expects every student majoring in Physics to acquire a basic knowledge of

- Classical mechanics
- Electromagnetism, wave, and optical phenomena
- Quantum mechanics and its applications to simple physical systems
- Kinetic theory, thermodynamics, and statistical mechanics
- Experimental physics

The required courses are designed in such a way to ensure that every student graduating in physics has proficiency in all of the above areas of physics. The introductory sequence of general Physics 101, 102, 204 covers the entire subject matter of physics at an elementary level. Classical mechanics is dealt with in Physics 300 at the intermediate level. Physics 305 and 306 give the required knowledge and competency in classical electrodynamics and wave optics phenomena. Quantum mechanics and its applications is dealt with first in Physics 213 at an elementary level, followed by Physics 310, and Physics 410 at a more advanced level. Physics 430 examines the statistical and thermal descriptions of many particle systems. Students have many opportunities to learn experimental techniques in Physics 205, 309, and 403. Methods of theoretical physics are introduced in Physics 210 while electronics is dealt with in Physics 308. Students are also trained in Research skills in Physics 497.

Requirements for the Bachelor of Science (BS) Degree in Physics

Each student majoring in Physics must complete the following curriculum:

(a) General Education Requirements (52 credit hours) — **Credit Hours**

Chemistry	CHEM 101	4
Computer Programming	ICS 103	3
English	ENGL 101, 102, 214	9
Islamic & Arabic Studies	IAS 101, 111, 201, 212, 301, 322	12
Mathematics	MATH 101, 102, 201, 202	14
Physics	PHYS 101, 102	8
Physical Education	PE 101, 102	2
		52

(b) Core Courses (42 credit hours)

Modern Physics	PHYS 213	3
General Physics III	PHYS 204, 205	4
Methods of Theoretical Physics	PHYS 210	3
Classical Mechanics I	PHYS 300	4
Experimental Physics	PHYS 309, 403	4
Electricity & Magnetism	PHYS 305, 306	6
Quantum Mechanics	PHYS 310, 410	6
Electronics	PHYS 308	4
Physics Seminar	PHYS 499	1
Undergraduate Research	PHYS 497	3
Thermal & Statistical Physics	PHYS 430	4
		42

(c) Electives (30 credit hours)

Physics Electives	Two PHYS xxx, Two PHYS 4xx	12
Math Elective	MATH xxx (Not Math 333 or MATH 302)	3
Technical Electives	Three XXX xxx courses	9
General Studies	Two GS xxx Courses	6
		30

(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. The student may also do his summer training by doing research and other academic activities.

Summer Training	PHYS 399	2
		2

The total number of credit hours required is **126**

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	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**
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
CHEM 101	General Chemistry I	3	4	4	ICS 103	Computer Programming in C	2	3	3
ENGL 101	Intro. to Acad. Discourse	3	0	3	ENGL 102	Intro. to Report Writing	3	0	3
IAS 111	Belief and its Consequences	2	0	2	PE 102	Health and Physical Educ. II	0	2	1
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					
		15	**9**	**18**			**12**	**8**	**15**
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	PHYS 213	Modern Physics	3	0	3
PHYS 204	General Physics III	3	0	3	PHYS 210	Methods of Theoretical Physics	3	0	3
PHYS 205	General Physics III Lab	0	3	1	XXX xxx	Technical Elective II	3	0	3
XXX xxx	Technical Elective I	3	0	3					
		14	**3**	**15**			**14**	**0**	**14**
Third Year (Junior)									
IAS 201	Writing for Professional Needs	2	0	2	IAS 322	Human Rights in Islam	2	0	2
MATH xxx	MATH Elective	3	0	3	GS xxx	GS Elective I	3	0	3
PHYS 300	Classical Mechanics I	4	0	4	PHYS 309	Experimental Physics	1	3	2
PHYS 308	Electronics	3	3	4	PHYS 306	Electricity and Magnetism II	3	0	3
PHYS 305	Electricity and Magnetism I	3	0	3	PHYS 310	Quantum Mechanics and Applications I	3	0	3
					PHYS xxx	PHYS Elective I	3	0	3
		15	**3**	**16**			**15**	**3**	**16**
Summer Session					PHYS 399	Summer Training	**0**	**0**	**2**
Fourth Year (Senior)									
IAS 301	Oral Communication Skills	2	0	2	GS xxx	GS Elective II	3	0	3
PHYS 410	Quantum Mechanics and Applications II	3	0	3	PHYS xxx	PHYS Elective III	3	0	3
PHYS 403	Senior Physics Lab	0	6	2	PHYS 4xx	PHYS Elective IV	3	0	3
PHYS 499	Physics Seminar	1	0	1	PHYS 430	Thermal and Statistical Physics	4	0	4
PHYS 4xx	PHYS Elective II	3	0	3	XXX xxx	Technical Elective III	3	0	3
PHYS 497	Undergraduate Research I	0	0	3					
		9	**6**	**14**			**16**	**0**	**16**
Total credit hours required in the Degree Program: 126									

ACADEMIC COURSES

KFUPM COURSE ABBREVIATIONS

ACCT	Accounting	GEOP	Geophysics
AE	Aerospace Engineering	GS	Global and Social Studies
ARC	Architecture	HRM	Human Resources Management
ARE	Architectural Engineering	IAS	Islamic and Arabic Studies
AS	Actuarial Sciences	ICS	Information and Computer Science
BIOL	Biology	ISE	Industrial and Systems Engineering
CE	Civil Engineering	MATH	Mathematics
CHE	Chemical Engineering	ME	Mechanical Engineering
CHEM	Chemistry	MGT	Management
CISE	Control and Instrumentation Systems Engineering	MIS	Management Information Systems
COE	Computer Engineering	MKT	Marketing
CP	City Planning	OM	Operations Management
CPG	College of Petroleum Engineering	PE	Physical Education
ECON	Economics	PETE	Petroleum Engineering
EE	Electrical Engineering	PHYS	Physics
ENGL	English	PYP	Preparatory Year Program
ENTR	Entrepreneurship	STAT	Statistics
FIN	Finance	SWE	Software Engineering
GEOL	Geology		

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, 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)
Provides an introduction to financial accounting, with emphasis on the content, interpretation, and uses of accounting reports according to the International Financial Reporting Standards (IFRS). Develops students' skills underlying the preparation and analysis of financial statements of a business enterprise. Discusses accounting principles as they relate to the recognition of revenues and expenses, and the valuation of assets and liabilities. Ethics in accounting is incorporated in the presentation of financial statements.

ACCT 210 Introduction to Managerial Accounting (3-0-3)
Continuation of ACCT 110 with a focus on uses of accounting information for managerial decision making to aid planning and control activities of managers in business enterprises. Topics include 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)
Provides a broad perspective on concepts and applications of Accounting Information Systems (AIS) which record, control, report transactions, and enhance decision making in organizations. Highlights the concepts and applications related to internal control in manual and computerized accounting systems. Introduces the understanding of Enterprise Resource Planning (ERP) software as it applies to modern AIS at an enterprise level. Topics include: Transaction processing and ERP, databases, control and AIS (COSO, COBIT, and ERM frameworks), systems reliability, auditing computer-based AIS, and control applications in Accounting cycles. Provides hands-on experience with Database Management Systems (DBMS), Spreadsheet programs, Systems documentation tools and ERP software. Cases, class discussion, field trips and group projects emphasize independent thinking, group processes, and communication.
Prerequisite: ACCT 210

ACCT 301 Intermediate Accounting I (3-0-3)
Emphasizes objectives of financial statements, and their preparation. In-depth study of accounting principles with concentration on the valuation techniques and procedures underlying the financial statements. Features several 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. The course also refers to International Accounting Standards (IFRS) and standards issued by the Saudi Organization for Certified Public Accountants (SOCPA).
Prerequisite: ACCT 210

ACCT 302 Intermediate Accounting II (3-0-3)
Engages students in the study of stockholders' equity including issuance and reacquisition of capital stock, dividends and retained earnings. Topics of coverage also include accounting for short-term and long-term investments in securities, revenue recognition and long-term contracts, study of cash flows, capital leases, and

interpretation and analysis of financial statements. Involves use of cases and study of ethics in accounting. And computer applications in financial accounting. The course also refers to International Accounting Standards (IFRS) and standards issued by the Saudi Organization for Certified Public Accountants (SOCPA).
Prerequisite: ACCT 301

ACCT 305 Accounting for Governmental and Non-Profit Entities (3-0-3)
Examines accounting concepts and techniques for governmental operations including fund accounting. Topics of coverage also includes financial reporting and disclosure problems of governmental and non-profit organizations, and 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)
Teaches 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 are also included in the course coverage.

ACCT 311 Auditing (3-0-3)
Discusses generally accepted auditing standards (GAAS) and procedures used by the external auditor. Topics include professional ethics, professional responsibility, and legal liability of the external auditor. Audit concepts such as auditor's independence, fair presentation, and due professional care are emphasized. 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. The course will also refer to International Auditing Standards (IAS) and standards issued by the Saudi Organization for Certified Public Accountants (SOCPA).
Prerequisite: ACCT 300

ACCT 314 Computer Control and Audit (3-0-3)
Focuses on auditing of computer-based information systems. Topics include audit environment and information systems controls, theory of internal control and the application of audit procedures in a computerized environment, and techniques for evaluating applications, data integrity, general operations, security, systems software and maintenance. Provides hands-on use of Computer Assisted Tools & Techniques (CATT) software application.
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)
Twenty-eight weeks of practical training in Accounting 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 addressing a business problem related to his coop experience under the supervision of a faculty member in accordance with university regulations.
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)
Examines some of the more complex albeit common contemporary financial accounting and reporting issues as part of a post-intermediate financial accounting course. The primary topics include accounting for business combinations, investments in common stocks, consolidated financial statements, joint ventures, foreign currency transactions, and accounting for derivatives. The course also alludes to international accounting standards (IFRS) and standards issued by the Saudi Organization for Certified Public Accountants (SOCPA). The subject is designed to provide students, who are majoring in accountancy, with professional, theoretical and practical knowledge that is needed by accountants in understanding and discharging their responsibilities as professional accountants. This includes the legal, professional and ethical requirements.
Prerequisite: ACCT 302

ACCT 406 Internal Auditing (3-0-3)
Focuses on 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. Topics of coverage also includes 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.
Prerequisites: ACCT 210

ACCT 407 Financial Statement Analysis (3-0-3)
Develops basic skills required for a 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, and credit analysis. The course also covers the study of the potential effects of International Financial Reporting Standards (IFRS) financial statement analysis, valuation techniques and outcomes, and Concepts of earnings quality and management of earnings.
Prerequisites: ACCT 210

ACCT 408 Zakat and Business Tax Accounting (3-0-3)
Provides a study of the fundamentals, rules, and objectives of taxation under Saudi Arabian tax and zakat regulations. Equips students with the skills necessary to compute and assess income tax and zakat base for business entities. In addition, students become familiar with the business income tax and zakat rates, and the General Authority of Zakat and Tax (GAZT) functions.

Prerequisite: ACCT 210

ACCT 409 International Business Taxation (3-0-3)
Introduces students to international taxation. Topics of coverage includes: Tax Principles and Rationale for taxation; Corporate Income Tax; Direct and Indirect Income Tax; Value Added Tax; Corporate Income Tax and Zakat in KSA; International Taxation. Legal & Ethical issues will be considered.
Prerequisite: ACCT 210

ACCT 410 Cost Accounting (3-0-3)
Emphasizes contemporary topics in strategic cost management through an understanding of the underlying concepts and fundamental techniques involved in cost accounting for manufacturing and service companies. Stresses on how cost management systems, with their performance evaluation and reward systems, encourage efforts to achieve an organization's strategic goals. Topics include activity-based costing; decision making; pricing and profitability analysis; the balanced scorecard and performance management, 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 & Management Control (3-0-3)
Examines advanced and contemporary issues in cost management and management control with emphasis on industrial and business practices. Topics of coverage includes behavioral and organizational foundations of managerial accounting; strategic cost management; operational efficiency and business process performance; planning, budgeting and forecasting; performance management; responsibility centers and performance measures; decision analysis and risk management; quality and environmental cost management; and cost and management accounting practices. Uses case studies with ethical considerations for managerial accounting.
Prerequisite: ACCT 410

ACCT 421 Oil & Gas Accounting (3-0-3)
Familiarize students with accounting practices in the Oil & Gas industry. Provide an overview of the industry with a detailed focus on certain aspects of the Successful Efforts and the Full Cost Methods of accounting. Petroleum accounting issues specific to the industry are also discussed. Topics covered include oil and gas reserves, the standardized measure, supplemental disclosures, and depreciation, depletion, and amortization of exploration and development costs. Financial statement presentation issues are analyzed to gain an appreciation for the unique impact of IFRS in the petroleum industry.
Prerequisite: ACCT 302

ACCT 495 Special topics in Accounting (3-0-3)
Topics and issues to be advised, covering 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 102, 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 and MATH 202 or equivalent

AE 325 Gas Dynamics I (3-0-3)
Fundamentals of compressible fluid flow in 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, 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; Rayleight-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 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 AE (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.
Corequisite: AE 220

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 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: ME 216, ME 217 or equivalent

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 and 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 factors in flight and ground safety; Aircraft safety systems; Principles of accident investigation; Safety management system; Accident prevention; Risk management; Aviation and airport security.
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: AE 220 and Senior Standing

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 driven rocket engines.
Prerequisite: ME 203 and ME 311

AE 426 Flight Dynamics I (3-0-3)

Introduces fundamental concepts of flight dynamics and control. Topics include equations of motion for a rigid body aircraft, linearization/small perturbation methods, static and dynamic stability derivatives estimation, longitudinal and lateral motions and an introduction to flight control systems and automatic stabilization.
Prerequisite: AE 220, AE 313

AE 427 Aerospace System Design (3-0-3)
This is an integrated aerospace design course which includes 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 design.
Prerequisite: AE 328, AE 333, Senior Standing

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.
Prerequisites: To be set by the Department.

ARCHITECTURE

ARC 102 Design Studio I (0-6-3)

This is a design foundation studio that introduces principles and elements of design as well as graphic thinking as a design tool. Through a sequence of small 2D and 3D design exercises and projects, students develop an understanding of design vocabularies, concepts and organizational principles. Proportion, scale, rhythm, balance, harmony, texture, repetition, movement, as well as other spatial, formal and relational properties are explored and examined using various materials and media. This will be done mainly through 2D exercise/projects. 3D exercises are introduced in the last third of the semester. Design process and diagrammatic thinking techniques are introduced and integrated into the development, refinement and evaluation of the 2D and 3D compositions.

ARC 103 Design Studio II (0-6-3)

This design foundation studio builds on the concepts and skills introduced in ARC 101. The course focuses on design elements and spatial organizational principles of three-dimensional compositions, including spatial and formal aspects such as color, material, and texture, among others. Through a range of exercises and projects of various sizes, students explore the various forms and methods of three-dimensional design, with an emphasis on graphic thinking and the design process. Mainly non-functional 3D compositions. Simple architectural projects are introduced at the end of the studio. The formal and functional aspects of architecture, as well as the role of design ideas (concepts) in generating innovative design solutions are introduced.
Prerequisite: ARC 102, ARC 113

ARC 105 Engineering Graphics (2-3-3)

This course introduces basic engineering graphics skills, equipment, and applications (manual and digital). Topics covered include sketching, multi-view (or orthographic) drawings, pictorial drawings, sectional and auxiliary views, lettering, dimensioning, and other engineering drawing standards and annotation. Computer-aided engineering drafting is introduced.
Note: Cannot be taken by Architecture Majors.

ARC 113 Architectural Communication I (0-6-3)

The course introduces students to drawings and architectural communication techniques and skills including orthographic, orthogonal, pictorial perspective and freehand drawings. Essential methods of manual architectural drawings are investigated through demonstrations and a series of interrelated exercises. In a studio setting, students learn to produce two and three-dimensional drawings including floor plans, site plans, elevations, sections, axonometric as well as one-point and two-point perspective drawings. Basic technical rendering as well as basic shade and shadow techniques are also introduced for enhanced architectural drawings.

ARC 114 Architectural Communication II (0-6-3)

Study and application of various design media as means for architectural design presentation. Emphasis is placed on developing and applying rendering and presentation techniques using range of design media including color pencil, markers, ink, graphite charcoal, digital medial among others to present and communicate architectural design ideas and concepts. The focus is on applying various physical representation media using various materials and methods to create two and three dimensional architectural presentations, including physical models and digital image processing. Students' ability to apply shade and shadow and drawing accurate freehand perspective, introduced in ARC 113, is further developed in this course.

Prerequisite: ARC 113

ARC 121 History of Architecture I (3-0-3)
This course is an introduction to the development of architecture from pre-history to the mid seventh century that covers Ancient near East, Egyptian, Aegean, Greek, Roman, Byzantine, and Romanesque highlighting the development of structural systems, materials, construction and other building systems. Emphasis is on the Middle and Near East. The eastern Architecture 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 social and cultural factors that contribute to the development of the unique architecture of the various cultures.

ARC 122 History of Architecture II (3-0-3)
This course covers development of architecture from mid seventh century to mid nineteenth century that is the rise Islamic period through the Gothic, Renaissance, and Baroque until beginning of Industrial Revolution. The focus of this course are those of developing an understanding for material use, and of creating an appreciation as to the social and cultural factors that contribute to the development of the unique architecture of the various cultures.
Prerequisite: ARC 121

ARC 204 Architectural Design Studio III (0-10-5)
The studio continues to develop students' skills in the architectural design process, with focus on analytical approaches to problem solving. Through carefully selected small-scale architecture design projects, students further develop their understanding of form, massing, space, spatial relationships, material, texture, function, user experience and user needs. Conceptual thinking, graphic thinking, problem identification, problem solving processes and related analysis and synthesis techniques and skills are emphasized.
Prerequisite: ARC 103

ARC 205 Architectural Design Studio IV (0-10-5)
An intermediate studio that continues to explore form, function, and context with focus on their interrelationship, using increasingly complex data sets. Through multiple design projects, of different sizes, the studio focuses on formal, tectonic, programmatic aspects of the design and their relationships to the physical and social context of the site. Site analysis and precedents (case study) analysis are emphasized as analytical tools and sources to generate concepts and guidelines for design solutions. Methodological and procedural issues such as analysis, research, critical thinking, conceptualization, theory application and issue-based thinking are also covered to further develop student's design process and refine their ability to work independently.
Prerequisite: ARC 204

ARC 213 Digital Communication I (0-6-3)
The course focuses on developing digital communication techniques for the study and presentation of architectural design ideas. Through demonstrations and practical exercises, the course focuses on digital techniques for 2D drawing, 3D modeling, material creation and application using relevant digital software and tools. Lighting, rendering, animation are introduced on a basic level. Students learn major software used in the local architecture design market, such as 3DMax, Revit and AutoCAD, and their application in presenting as well as exploring, manipulating and creating architectural design ideas.
Prerequisite: ARC 114

ARC 214 Digital Communication II (0-6-3)

The last course in architectural communication sequence. The course further develops student's digital communication skills and techniques acquired in ARC 213. Using industry standard parametric CAD programs, the course focuses on advanced topics in three dimensional modeling, material, rendering and animation techniques. BIM and digital fabrication using rapid prototyping laser cutting and CNC technologies are explored concurrently. Emphasis will be on using digital media as design creation, exploration, manipulation, as well as communicative tool.

Prerequisite: ARC 213

ARC 226 Theory of Architecture I (2-0-2)

The course explores the path of the principal architectural thoughts and events which led to the development of major architectural design theories; starting form industrial revolution until the end of modernity (1850-1960 AD). The theories behind the origin of the modern movement emphasizing the various interpretations of functionalism and its opposition, e.g. art deco, and classicism. Concepts of architectural space, form and vocabulary, as well as major town planning and urban design concepts and theories within these periods are discussed and critically analysed.

Prerequisite: ARC 122

ARC 227 Theory of Architecture II (3-0-3)

The course outlines the theories foundations of twentieth Century trends in architecture in the light of worldwide historical developments and their social and technological influences (1960 – to date). The focus of the course is on the Modem Movement and recent developments to the Post-Modem aspects of architectural aesthetics. The course examines twentieth-century architecture and its origins through a critical examination of architectural works and theoretical writings, in an attempt to locate the formative conditions, duration, and effect of the principles of Modernism on the discipline of architecture. The course focuses on issues concerning style, technology, urbanism, regionalism, function, and reform of postmodern movement, deconstruction, and digital morphogenesis trend and so on to address the diverse forces that have shaped contemporary architecture.

Prerequisite: ARC 226

ARC 228 Architecture of Saudi Arabia (2-0-2)

The course introduces vernacular architecture of Saudi Arabia, including both traditional vernacular and contemporary vernacular. The course introduces students to native architecture of various regions in Saudi Arabia. This includes historic, social, morphological, and topological analysis of traditional architecture. In addition, the course addresses contemporary vernacular and the influence of Modernism on traditional vernacular architecture of Saudi Arabia. Theories and approaches that aim to utilize vernacular traditions in contemporary architecture are explored. The course will have a field trip to a selected area for in depth study.

ARC 231 Structure in Architecture I (3-0-3)

The course investigates the static behaviors of structures through the analysis of systems, determinacy, stability hierarchy and order of sub-systems, and the elements which compose a structural framework such as trusses, beams, columns, frames, and floor systems including the spanning concept. This course introduces principles governing structure such as external loads and types of external loads, fundamental concepts of structural behavior, strength of materials,

introduction to and analysis of simple structural systems, Internal forces and unit stress and force equilibrium calculation . The course also provides an introduction to formulas and graphical techniques to analyze bending, shear and moment of beams, columns and slabs.
Prerequisite: PHYS 133

ARC 232 Structure in Architecture II (3-0-3)
The course introduces analysis and design of steel and reinforced concrete structures and computational analysis of steel and RC beams, columns and slabs. The course covers concepts and procedures for the design, manufacture, and construction of structural components (e.g., walls, columns, beams, slabs) using steel and concrete. The course work contains one lab per week to cover experimental work (Shear and Moment tests) on RC and Steel members.
Prerequisite: ARC 231

ARC 306 Architectural Design Studio V (0-10-5)
Students further develop their design skills through designing medium to large-scale buildings. Advanced application in program analysis, spatial development, design language, structure and material selection, using advanced technological and aesthetic principles, and the interface between these aspects. Parametric digital media as tools to generate form and to explore and evaluate design alternatives, as well as digital fabrication are explored and utilized. Issues related to site developments such as site planning, landscaping, vehicular and pedestrian movement and car parking are emphasized.
Prerequisite: ARC 205, ARC 214

ARC 307 Architectural Design Studio VI (0-10-5)
This advanced design studio focuses on exploring and solving complex design problems within context. Medium to large-scale design projects situated in urban context. The studio focuses on developing students' ability to examine and respond creatively and responsibly to the needs and particularities of modern Saudi society. In addition to program, site and form, students will examine and address client needs, human factors, symbolism and interrelated socio-cultural factors as integral part of the building design process. Focus will be on enhancing students' ability to produce and develop region-sensitive design solutions. Using local codes and detailing design solutions through working drawings is considered.
Prerequisite: ARC 306, ARC 227

ARC 308 Community Design Exploration (3-0-3)
The course aims to engage students with society and the environment. The course encompasses hands-on activities and diverse forms of engagement with local communities through cooperation with local community organizations in need of architecture related services. Varied content that address the analysis and development of solutions for real problems in local communities.

ARC 309 International Studio (3-0-3)
Offered in a summer semester, the international studio is an opportunity for Architecture students to immerse in regional or foreign cultures and architectural traditions which is a unique experience that is expected to transform students understanding of precedents, cultural, and contemporary influences on architectural and urban designs. When offered, travel abroad to a country of architectural significance will be a component of the course. A pre-approval from KFUPM on the travel plan, names of participating students, and a host university (project partner) in a selected country is required.
Prerequisite: ARC 205, ENGL 102, Minimum GPA of 2.75, Approval of Department

ARC 316 Digital Architectural Photography (1-4-3)
This course will serve primarily Architecture students but it is not limited to them. It explores different types of cameras with advanced computer applications and printer to allow students to visually communicate their creative works using digital photography. Topics on fundamental aspects of camera functions, characteristics of lenses, lighting, creative control of the camera, color management and photo composition are discussed throughout the course.
Prerequisite: Junior Standing or Approval of Instructor

ARC 319 Special Topics in Computer Applications (1-4-3)
Varied content. Exploring emerging ideas and techniques in design computing, design visualization and the application of information technology and digital media in design and architectural practice. The specific content and format of the course varies.

ARC 329 Special Topics in Islamic Architecture (2-0-2)
This course is a study of Islamic Architecture in urban context. The course concentrates on architectural development during Islamic period and how it influences shaping up urban spaces and affects public activities. Case studies of Islamic cities are presented and explained in details how Islamic culture, local climate and environment influenced developing architectural characteristics of the important civic, commercial, domestic building. The topics of this course also cover how does Islamic values and cultural activities influenced distinctive development of major urban spaces such as courtyards, plazas and walkways.
Prerequisite: ARC 122

ARC 345 Working Drawings (0-6-3)
The course provides students with a comprehensive knowledge of the construction documentation divisions, a standardized language developed to clearly communicate complex designs to a third party. Students produce a full working drawings package, drawn in 2D using CAD programs, for a small to medium-scale building. Students also develop technically precise working drawings with proper sequence and languages of different components in buildings such as floor plans, sections, elevations and detailing.
Prerequisite: ARE 212

ARC 349 Local Materials in Architecture (2-0-2)
This course introduces local building materials in different parts of the world and how these materials influence the construction pattern locally. It also discusses the benefits of using local building materials. Case studies are presented. Focus is given to local regions in Saudi Arabia with highlighting some of local examples.

ARC 354 Landscape Design (2-2-3)
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 355 Human Factors in Architecture (3-0-3)
An introductory course that introduces fundamental concepts and theories related to the interaction of people with their natural and built environments. Topics such as privacy,

perception, cognition, proxemics, personal space, territoriality, symbolism, social and cultural aspects of the environment, among others will be examined and their influence on architectural theory and practice will be highlighted. The aim is to expand students' understanding of human factors as related to architecture and urban design, and how to implement them in design studios to optimize design solutions.

ARC 356 Principles of Sustainable Design (3-0-3)
Introduction to sustainable design background, concepts, methods, and applications within the built environment. Exploring environmental control systems and their emphasis on building energy and user comfort. Highlighting the factors that contribute to the occupants' comfort and wellbeing in a building. Overview of best practices in passive and active strategies for reducing energy consumption of a building will be explored highlighting available computer applications that assess in evaluating sustainable measures in design.

ARC 357 Urban Design (3-0-3)
This course is an introduction to the theories of urban design. Influential urban design theories and trends in modern and post-modern times, their implications and feasibility, are studied. The emphasis is on the visual, perceptual, social, morphological aspects of urban public spaces. The course also concerned with researching and analyzing urban form to understand its elements and its underlying organizing principles. Streetscape and public realm should also be emphasized.

ARC 358 Real Estate and Housing Development (3-0-3)
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 and real estate 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 real estate, housing concept, and design procedure of a housing community, structure of housing areas as criteria for the design of housing, construction technologies, materials, costs, climatic conditions and code issues.

ARC 359 Design Determinants of Arid Region (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. Case studies of traditional buildings and settlements are used to introduce basic design principles and strategies for climate responsive design in arid climatic zones around the globe. Emphasis is given to design for the arid, semi-arid and humid regions of the tropics.

ARC 399 Summer Training (0-0-2)
The internship program offers Architecture students the opportunity to gain a professional training for 8 weeks during summer in a professional Architectural Consulting firm. The objective of the course is to obtain first hand professional training in the building design and construction industry. A faculty coordinator will be assigned to the course to approve the firm of training whether locally of internationally. Upon the completion of the summer internship, students are required to promptly submit a portfolio, clearly outlining their individual

contribution. The course coordinator will assign a grade based on the student's report, and a confidential report by the training firm.
Prerequisite: ARC 345, ENGL 214, Junior Standing

ARC 401 Senior Project Preparation and Programming (3-0-3)
In addition to understand the basic techniques of architectural programming, this course is designed to help the senior student to prepare a comprehensive proposal for the final project in ARC 408. Topics include: literature review, client objectives, functional relationships, facility space requirement development, site development requirements, site selection criteria and analysis, prioritizing functions, spatial restrictions and budget constraints. The student carries out research on his chosen building type, location, analyzes and 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 design project.
Prerequisite: ARC 307

ARC 405 Architectural Design Studio VII (0-12-6)
This studio emphasizes the comprehensive nature of architectural design. Comprehensive design project of a large-scale urban building that explores the broad range of issues & concerns of architectural design within the sustainability framework. Students utilizes a compressive design approach that addresses and integrates various architectural and urban issues as related to the context, program and technology including constructability, integration of major building systems, material innovations, sustainability, as well as contemporary social and environmental issues. Construction documents, specification writing and using of local building codes as related to above issues are emphasized. The aim is to expand students' ability to use research and integrative design processes that address wide range of architectural design issues to prepare students for the Senior Project.
Prerequisite: ARC 307, ARC 345

ARC 409 Architectural Design Studio VIII: Senior Project (0-12-6)
Individual design work based on the architectural program document developed in ARC 400. The aim of this studio is to develop an architectural solution for a project with appropriate scope, sophistication, and complexity. The proposed design solution should reflect an integrative approach toward design and demonstrate the student's readiness and ability to engage responsibly, critically and creatively in the profession of architecture. The design solution must exhibit a comprehensive mastery of architectural design, reflecting the breadth and depth of the knowledge and skills acquired during the study in the architecture program.
Prerequisite: ARC 401, ARC 405

ARC 419 Parametric Design (1-4-3)
This course provides a foundation for understanding and using of parametric design in architecture. Students can expect to develop a good understanding of parametric techniques to serve their design process and practices. This is achieved through learning parametric design history and development, parametric fundamentals, advanced tools, techniques, and methods. The course examines and discusses leading edge typologies of practice, technology and associative parametric design techniques.
Prerequisite: Junior Standing or Approval of Instructor

ARC 429 Special Topics in Regional Architecture (2-0-2)

The course investigates regionalism in architecture as a historic and contemporary global phenomenon. Regional architecture is examined as architecture situated in place, time, and context, and drawing upon regional traditions in response to present-day conditions. In addition to exploring various and evolving definitions of regionalism and the theories that enhance our understanding of regionalism as a link between the past, present and the future; the course also examines pertinent issues and themes such as Contextualism, heredity, third space, identity, authenticity, critical regionalism, critical vernacular, inventions and technology, among others.
Prerequisite: ARC 228

ARC 440 Architectural Conservation and Preservation (2-0-2)
This course introduces briefly the contemporary preservation policy and planning through illustrated lectures, readings, and classroom discussions. The course provides an introduction to the historic preservation research methods and documentation techniques used by professional historic preservationists to identify and to record historic structures and heritage sites using archival and physical evidence. The course introduces techniques for heritage site research and documentation, including the development of building descriptions, historical narratives, and skills in digital photography.

ARC 455 Critical and Creative Thinking for Designers (3-0-3)
This course explores techniques and issues about the nature of both critical and creative thinking processes as related to design. The course aims to increase students' understanding of creative and critical thinking techniques/processes, to enhance their ability to use these processes in both identifying and formulating design problems and developing solutions to those problems, and to improve their creative problem-solving skills. Creative and critical thinking techniques, strategies, and processes are examined from various theoretical perspectives. Students will engage in various exercises, case studies and analysis/synthesis activities.
Prerequisite: Junior Standing

ARC 456 Advanced Sustainable Design Workshop (3-0-3)
This workshop explores advanced issues on Architectural sustainability and urban environments. Sustainable rating systems, principles of energy efficiency in buildings, and recent trends on net zero energy buildings will be examined. Energy modeling will be introduced. A final project is required and students are expected to propose sustainable solutions on a selected design utilizing available computer applications.
Prerequisite: ARC 356

ARC 457 Topics in Mosque Architecture (3-0-3)
This course surveys Mosque Architecture around the world emphasizing the role of local and Islamic cultures in developing Mosques. The aim of this course is to examine Architectural components, elements, and design criteria that impacted the development various mosque typologies around the world. In addition, students are expected to utilize their knowledge and skills in Architectural analysis to examine selected mosque typologies and case studies to gain in-depth understanding of Mosque Architecture in terms of typology, form, function, structure, circulation, supportive functions and activities, site planning, and relation to the city urban fabric. Field studies on local mosques, including analysis, documentation and reporting are essential part of the course.

ARC 458 Advanced Topics in Housing (2-0-2)

This course explores the issue of affordable housing in consideration of specific topics as related to socio-cultural, economic and political factors, building materials, structural systems, shelter accessories, and manufacturing technologies. The course examines major development theories and contemporary design issues and characteristics of affordable and low-income housing needs and housing delivery systems. It also examines the formal and informal housing sector and asks why the housing sector is important for both national governments and international organizations.

ARC 491 Professional Practice (3-0-3)
This course is a comprehensive introduction of architectural practice in the marketplace considered from individual practices to the different architectural related fields of employment. The course highlights practices in Saudi Arabia and compares them with best international practices. The course is divided into three parts: The first part discusses the role of Architects in societies with background on Architecture profession, its ideological structure, and its obligations to society, in addition to career path and the professional ethics of practicing as Architects. The second part highlights the organization and management of Architectural firms, and requirements to run an Architectural practice. The last part deals with the profession's future as it responds to its changing socio-economic context, including the challenges of globalization and environmental sustainability. The last part deals with the profession's future as it responds to its changing socio-economic context, including the challenges of globalization and environmental sustainability.
Prerequisite: Junior Standing

ARC 499 Special Topics in Architecture (3-0-3)
Selected advanced topics in the areas of architecture or built environment are covered. Topics will vary from semester to semester and information will be available during registration.
Prerequisite: Senior Standing or Approval of Instructor

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 lager 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 and 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: Not Credited for 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: ME 203, ARE 322

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 industry to acquire practical experience under the supervision and guidance of the employer and the academic advisor. Ethical responsibilities and professional integrity in practicing field work in a multi-disciplinary team are covered. The course also includes the development of a major design experience in a project covering the curriculum areas of Building Structures, Building Mechanical Systems, Building Electrical Systems, and Construction/Construction Management. Students are required to reach the synthesis level in one of these four curriculum areas, the application level in a second area, and show comprehension of the remaining two areas. The design of a system, component, or process to meet desired needs should be within appropriate and realistic constraints. A technical report and public oral presentation documenting the field work activities, involvements, skills gained and the project final design are required.
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 capstone course integrates various components of the curriculum in a comprehensive engineering design project. The project includes integrative design and analysis techniques in the curriculum areas of Building Structures, Building Mechanical Systems, Building Electrical Systems, and Construction/Construction Management. Students are required to reach the synthesis level in one of these four curriculum areas, the application level in a second area, and show comprehension of the remaining two areas. The design of a system, component, or process to meet desired needs should be within appropriate and realistic constraints. A technical report and public oral presentation addressing the final engineering design are required. Team-work is emphasized and 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 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 and 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 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 250 Quantitative Financial Models for Actuaries (2-2-3)

Introductory Derivatives: Forwards and Futures. Options and Related Strategies. European put and call options. Put-call parity. Arbitrage opportunities. Rational valuation of derivative securities. Binomial tree and Black-Scholes Pricing Models. Actuarial Applications of Options Embedded in Insurance Products. Risk Management and Hedging. Introductory Stochastic differential equations. Ito's formula. Other SOA FM and IFM/MFE topics. Spreadsheet programming software.

Prerequisite: AS 201, STAT 214

AS 289 Actuarial Science Problem Lab I (0-2-1)

Preparation for the second Society of Actuaries and Casualty Actuarial Society professional examination, FM (Financial Mathematics). Society approved calculators. Review exam logistics and exam-taking strategies.

Prerequisite: AS 201

AS 322 Numerical Methods for Actuaries (2-2-3)

Computer arithmetic (Floating-point, error analysis), Matrices and linear equations, Numerical Integration and Differentiation, Interpolation, Smoothing, approximations, Computing probability functions, Solving nonlinear equations with application in maximum likelihood and nonlinear regression. Numerical programming language and database software use in Actuarial modeling, Monte Carlo simulation, and data analysis.

Note: Not to be taken for credit with MATH 371 or CISE 301

Prerequisite: MATH 201, ICS 103, STAT 214

AS 350 Begin Cooperative Work (0-0-0)

See contents in AS 351.

Prerequisite: Same as in AS 351

AS 351 Cooperative Work (0-0-6)

A continuous period of 28 weeks of industrial employment for Actuarial Science and Financial Mathematics students to work in appropriate industries or firms. The student is evaluated on his job performance and is required to submit and present an extensive formal report on his work experience.

Prerequisite: AS 250, AS 322, STAT 301, STAT 310, ENGL 214

AS 352 End Cooperative Work (0-0-0)

See contents in AS 351.

Prerequisite: Same as in AS 351

AS 380 Actuarial Contingencies I (2-2-3)
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 389 Actuarial Science Problem Lab II (0-2-1)
Preparation for the first Society of Actuaries (SOA) and Casualty Actuarial Society (CSA) professional examination, Exam P (Probability). Society approved calculators. Review exam logistics and exam-taking strategies.
Prerequisite: STAT 301

AS 450 Risk Modeling (2-2-3)
Types of Risks faced by an organization; Risk Modelling, its evaluation and Analysis; Techniques used in quantifying financial and non-financial risks. Covers value at risk (VaR), extreme value theory (EVT), scenario and stress testing, risk aggregation techniques including use of correlation, integrated risk distributions and copulas. Approaches for managing risk.
Prerequisite: AS 201, STAT 214

AS 460 Enterprise Risk Analysis (2-2-3)
Enterprise risk management (ERM) framework and process. Importance of the of ERM function. Risk Management tools and techniques. Capital Management. Data Issues. Application of risk Analytics, from risk identification to treatment, on six actuarial fellowship fields: (1) Retirement Benefits, (2) Individual Life and Annuities, (3) Group and Health, (4) Investment, (5) General Insurance, and (6) General Corporate ERM.
Prerequisite: AS 450

AS 470 Models for Risk Managing Financial Options and Derivatives (2-2-3)
Option Greeks and Elasticity. Risk management techniques (with delta-hedging method). Properties of Options. Cash flow characteristics and pricing of exotic options (Asian, barrier, compound, gap, and exchange). Real Options. Diffusion process for stock prices.1-dimensional Itô's lemma. Interest rate models. Vasicek and Cox-Ingersoll-Ross bond price models. Black-Derman-Toy binomial model. Simulation of stock prices.
Prerequisite: AS 250, STAT 301

AS 476 Survival Models for Actuaries (2-2-3)
Introduction to survival models. Estimation and testing of models with various types of survival data; Non-parametric Estimation (Kaplan-Meier, Nelson-Aalen). Parametric survival models. Regression models for survival data; proportional hazards and Cox regression model. Techniques for estimating mortality rates. Graduation. Model Selection. A statistical/actuarial computing software will be used.
Prerequisite: STAT 302, STAT 310

AS 481 Actuarial Contingencies II (3-2-4)
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 380

AS 484 Actuarial Risk Theory and Credibility (3-2-4)

Claims Distributions (Severity, frequency, and aggregate). Risk Measures. Aggregate loss models (individual and collective Risk models). Parametric model Estimation. Introduction to credibility theory (limited fluctuation, greatest accuracy, Buhlmann, Buhlman-Straub, Empirical Bayes models). Introduction to Simulation. A statistical/actuarial computing software will be used.

Prerequisite: STAT 302

AS 490 Topics in Actuarial Science and Financial Mathematics I (3-0-3)

Variable content. Presents a special topic in Actuarial Science or various insurance fields parallel to advancements as recognized by the Society of Actuaries.

Prerequisite: Junior Standing

AS 491 Topics in Actuarial Science and Financial Mathematics II (3-0-3)

Variable content. Presents a special topic in Financial Mathematics, Financial Modeling, or Enterprise Risk Management fields parallel to advancements as recognized by the Society of Actuaries.

Prerequisite: Junior Standing

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 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.
Note: Not open for CE students

CE 201 Statics (3-0-3)
Basic concepts and principles of mechanics; algebraic vector operations on action and reaction vectors; equilibrium of particles in two and three dimensions; definitions of moment and couple; reduction of system of forces; equilibrium of rigid bodies; statically determinate structures including beams, trusses, frames and machines; analysis of internal forces; shear and bending moment diagram for beams; static friction forces and engineering applications; center of gravity of masses, and centroid of lines, areas, and volumes; area 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; analysis of truss-type structures and internal forces; geometric properties of cross-section area; centroid and moments of inertia; shear and bending moment diagrams in beams; stress, Stress-strain relationships; stress and deformation of axially loaded members; stress-concentration; thermal stresses; pressure-vessels; torsion-stress and deformation; elastic bending and shear stresses in beams; compound stresses; stress transformation.
Note: Not open for CE students, 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, shear stress in beams, compound stresses, stress transformation, deflection of beams, and introduction to the concept of singularity functions.
Prerequisite: CE 201

CE 204 Civil Engineering Materials (3-0-3)
Introduction; hydraulic cements; water; aggregates for Portland cement and asphalt concrete mixes; admixtures; design of concrete mixtures; production, handling and placement of concrete; properties of fresh concrete; curing of concrete; properties of hardened concrete; asphalt types, physical properties, grading systems and usage of asphalt; asphalt concrete mix design; engineering properties and usage of structural steel. 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 201
Corequisite: CE 206

CE 206 Civil Engineering Materials Laboratory (0-3-1)

Laboratory sessions on tests of concrete constituents using standard procedures generally ASTM standards, 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.

Corequisite: CE 204

CE 216 Computer Graphics (1-3-2)

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, AutoCAD Civil 3d, Contour Map Lines, Cut and Fill, Blue Print Reading, and 3D Drawings.

CE 230 Engineering Fluid Mechanics (3-0-3)

Properties of fluids, hydrostatics with applications to manometers, forces on plane and curved surfaces, bouncy, equations of continuity, energy and linear momentum with applications, dimensional analysis, dynamic similarity, open channel flow, and conduit flow.

Prerequisite: CE 201, MATH 102

CE 262 Surveying (2-3-3)

Introduction to basics of surveying, surveying instruments, accuracy and precision, ratios, errors; leveling, types of leveling instruments, techniques of leveling, profile and cross-section leveling; distance measurement techniques, steel tape corrections; angles and directions, azimuth and bearing computations; traverse surveys, latitude and departure computations, traverse adjustments. Area of a closed traverse by coordinate method; satellite positioning systems, Global Positioning System (GPS) codes, signals and frequencies, Receivers, GPS position measurements; topographical hydrographic surveying and mapping. Maps and plans, introduction to contours, cross-section, end areas and volumes, introduction to geographic information systems (GIS).

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 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 appropriate computer software in design; completion of a design project; interpretation of blueprints; 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, MATH 208

CE 330 Environmental Engineering Principles (3-0-3)
Introduction to water treatment along with physical operations and chemical processes; Introduction to wastewater treatment and reuse along with preliminary, primary, secondary, and tertiary treatment; municipal solid and hazardous waste management and disposal.
Prerequisite: CHEM 111 or CHEM 102
Corequisite: CE 375

CE 335 Engineering Hydrology (2-3-3)
The hydrologic cycle, precipitation; evaporation and transpiration; infiltration; streamflow; hydrograph analysis including unit hydrograph; hydrologic flood routing; introduction to flood frequency analysis; occurrence of groundwater; fundamentals of groundwater flow including Darcy’s law and its applications; steady and unsteady flow to wells.
Prerequisite: CE 230

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
Corequisite: CE 343

CE 343 Transportation Engineering Lab (0-3-1)
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; laboratory sessions on 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 software; application of transportation related software.
Prerequisite: CE 206
Corequisite: CE 341

CE 350 Begin Cooperative Work (0-0-0)
See contents in CE 351.
Prerequisite: Same as in CE 351

CE 351 Cooperative Work (0-0-6)
A continuous period of 28 weeks is spent in the industry to acquire practical experience in civil engineering professional practice 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 detailed reports about his training period under regulations of the CE department.
Prerequisite: ENGL 214, One Core Course, 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 354 Introduction to Geotechnical Engineering (3-0-3)
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.
Prerequisite: CE 203
Corequisite: CE 230, CE 356

CE 356 Geotechnical Engineering Laboratory (0-3-1)
Conduct and report on experiments in geotechnical engineering, including: specific gravity; moisture content; sieve analysis; hydrometer analysis; Atterberg limits; compaction; field density; permeability; consolidation; direct shear; unconfined compression; California bearing ratio; triaxial shear.
Corequisite: CE 354

CE 375 Environmental Chemistry Laboratory (0-3-1)
Introductory environmental chemistry laboratory sessions for water & wastewater treatment; Standard solutions; Elementary concepts in solution & colloidal chemistry including chemical equilibrium, kinetics, precipitation; pH measurement; Dissolved-oxygen analysis; Alkalinity analysis; Water-hardness analysis; Turbidity and solids characterization; Total organic carbon (TOC) & Chemical oxygen demand (COD) analysis; Biochemical oxygen demand (BOD) analysis; Total coliforms analysis; Residual chlorine analysis; Jar Test; Adsorption.
Corequisite: CE 330

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 204

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 204

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 FEM software; column buckling and introduction to beam-columns; failure theories and fracture mechanics.
Prerequisite: CE 203

CE 408 Steel Design I (2-3-3)
Properties of structural steel; steel sections and introduction to Load Resistance Factor Design (LRFD), design of tension members, compression members and capacity calculations; laced columns width-thickness ratios; design of beams with and without lateral supports; design of members under combined axial and bending loads; design and details of simple bolted and welded connections, and an introduction to common building connections; use of software for design of elements and overall design of frames.
Prerequisite: CE 305

CE 411 Senior Design Project (1-6-3)
Students undertake a civil engineering design project under the supervision of a faculty member with the aim of achieving a comprehensive design experience through a coherent study of all applicable principles, strategies and methodologies of design, including construction operation, and maintenance as and when applicable. The project should also take into consideration other appropriate factors such as alternative designs, economic feasibility and social and environmental impacts. The student chooses the project in the field in which he is most familiar through his co-op work experience or summer training. The student is required to make an oral and written presentation of the design project to an examining committee.
Prerequisite: Senior Standing

CE 415 Reinforced Concrete II (2-3-3)
Design of two-way slabs using ACI 'direct design method'; design of continuous beams; behavior and design of columns under axial load and bending moment including slenderness effect; design of beam column joints; design of shear wall and load bearing wall system; simple design of stairs; introduction to various types of foundations; lateral resistivity, design

of wall footings and combined footings; design of retaining walls; simple design of prestressed precast elements; appropriate computer software in design; completion of a multistory design project.
Prerequisite: CE 315

CE 418 Steel Design II (3-0-3)
Introduction to elastic-plastic material behavior, plastic analysis and design of beams and simple frames using Load Resistance Factor Design (LRFD), design of built up beams and plate girders, optimum proportioning of I-beam, design of composite girders, design of rigid connections, design for torsion, computer applications to design rigid frames and steel buildings.
Prerequisite: CE 408

CE 422 Construction Management and Economy (3-0-3)
An overview of construction industry; professional responsibilities, ethics, liabilities and licensing; contracts and project delivery systems; business ownership; project planning and scheduling; cost estimation, cost control, resource leveling, introduction to construction economics, equipment productivity and selection; construction productivity and safety; construction types, equipment, materials, and foundation; concrete form design; contemporary issues in Construction Engineering; field projects and life-long learning.
Prerequisite: Junior Standing

CE 433 Groundwater Engineering (3-0-3)
Introduction and definitions; Groundwater Aquifers of Saudi Arabia; groundwater storage and supply; Darcy’s law and its applications; 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; methods of drilling and construction; development of maintenance of wells.
Prerequisite: CE 335

CE 436 Open Channel Hydraulics (3-0-3)
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.
Prerequisite: CE 335

CE 437 Applied Hydraulic Engineering (3-0-3)
Application of the basic laws of fluid mechanics to hydraulic problems. Analysis and design of water supply, sanitary and storm sewer systems and their components; open channel flow hydraulics; hydraulic structures; computer applications in the design and analysis of hydraulic systems.
Prerequisite: CE 335

CE 439 Civil Engineering Systems Analysis (3-0-3)
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.
Prerequisite: CE 318

CE 440 Highway and Airport Materials (3-0-3)

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 204

CE 441 Design of Pavement (3-0-3)

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.

Corequisite: CE 341

CE 442 Construction and Maintenance of Highways and Airports (3-0-3)

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.

Prerequisite: Junior Standing

CE 444 Traffic Engineering and Roadway Safety (3-0-3)

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 systems; computer applications.

Prerequisite: CE 341

CE 454 Soil Stabilization and Site Improvement (3-0-3)

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.

Prerequisite: CE 354

CE 455 Foundation and Earth Structure Design (3-0-3)

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.

Prerequisite: CE 354

CE 457 Advanced Geotechnical Engineering (3-0-3)
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.
Prerequisite: CE 354

CE 464 Project Surveying (3-0-3)
Route survey; horizontal curves; vertical curves; spirals; construction surveys; applications of Total Stations; topographic surveying and mapping; introduction to Global Positioning System (GPS) and Geographic Information Systems.
Prerequisite: CE 262

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 491 Special Topics in Civil Engineering (3-0-3)
The course covers a special topic with emphasis on recent developments or to explore much deeper into one of the following civil & environmental engineering areas: structural, water resources, transportation, geotechnical and environmental engineering. A detailed syllabus of the course is announced one semester in advance.
Prerequisite: Senior Standing, Approval of the Department

CE 497 Undergraduate Research (1-6-3)
Selection of a research topic, development of research topic, writing a successful proposal, manage and carrying out research tasks, setting up bench scale setup or prototype for lab work or software for modeling based research, communicating the research findings, writing effective reports.
Prerequisite: Approval of the Department

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

CHE 204 Fluid Mechanics (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 101

CHE 300 Heat Transfer (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, MATH 202

CHE 304 Mass Transfer (3-0-3)

This course covers fundamentals of mass transfer, differential equations of mass transfer, steady-state and unsteady-state molecular diffusion, convective mass transfer, interface mass transfer, mass transfer theories, mass transfer equipment, absorption and humidification operations.
Prerequisite: CHE 204

CHE 306 Separation Processes **(3-0-3)**
Review vapor-liquid equilibria. Flash distillation. Column binary distillation. McCabe-Thiele and Ponchon-Savarit methods. Excat and short cut methods for multicomponent distillation. Batch distillation. Staged and packed column design. Absorption and stripping. Immiscible extraction. Computer simulation will be used to solve different type of distillation problems throughout the course.
Prerequisite: CHE 303

CHE 309 Chemical Engineering Laboratory I **(0-6-2)**
This laboratory emphasizes concepts presented in the transport phenomena courses. A safety session is given at the commencement of the course. Safe practices are strictly adhered to throughout the course. Students carry out selected experiments in fluid mechanics, heat transfer, thermodynamics and diffusional mass transfer. Data collected are analyzed and compared to applicable theories.
Prerequisite: CHE 300, CHE 304, ENGL 214

CHE 350 Begin Cooperative Work **(0-0-0)**
See contents in CHE 351.
Prerequisite: Same as in CHE 351

CHE 351 Cooperative Work **(0-0-9)**
In this course the student will spend a period of 28 weeks of industrial employment in industry. Students are required to write a detailed formal report on their experience. Evaluation by the employer will be counted towards the grade given for this course.
Prerequisite: ENGL 214, CHE 309

CHE 352 End Cooperative Work **(0-0-0)**
See contents in CHE 351.
Prerequisite: Same as in CHE 351

CHE 399 Summer Training **(0-0-0)**
A period of 12 weeks of industrial employment in appropriate industries or firms. Students are evaluated on their performance, and are required to submit a report and offer a seminar about their experience before receiving a grade of Pass or Fail for the course.
Prerequisite: ENGL 214, CHE 304

CHE 401 Process Dynamics and Control **(3-0-3)**
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 instrumentation of closed-loop control systems, control block diagrams, frequency response analysis, Bode and Nyquist stability criteria.
Prerequisite: CHE 306, MATH 371

CHE 402 Kinetics and Reactor Design (3-0-3)
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.
Prerequisite: CHE 303, CHEM 311

CHE 404 Hydrogen production and storage (3-0-3)
The aim of this course to provide insight into the alternative resources and technologies for hydrogen production and to discuss the present options of hydrogen storage and future needs.
Prerequisite: CHE 303 or equivalent

CHE 409 Chemical Engineering Laboratory II (0-6-2)
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.
Corequisites: CHE 401, CHE 402
Prerequisite: CHE 309

CHE 422 Properties of Fluids (3-0-3)
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.
Prerequisite: CHE 303

CHE 425 Process Design and Economics (3-0-3)

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.
Corequisite: CHE 402
Prerequisite: CHE 306

CHE 430 Rate-Based Separation Processes (3-0-3)
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.
Prerequisite: CHE 306

CHE 431 Membrane Processes Technology (3-0-3)

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 304

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 or ME 315

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 444 Electrochemical Energy Conversion and Storage (3-0-3)
Fuel cell thermodynamics and electrochemistry. Charge transport in polymer and ceramic electrolytes. Gas phase transport in fuel cells (diffusion and fluid mechanics). Energy balance and heat management. Flux balance for fuel cells. Electrochemical energy storage including batteries and supercapacitors. Power management strategies for hybrid storage systems.
Prerequisite: CHE 303 or equivalent

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: CHE 300, 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 feedback control, cascade control, Ratio, override, selective, feed-forward, and multivariable process control. Dynamic simulation of control systems using SIMULINK and other commercial software packages. Instrumentation, design case studies and tuning case studies.
Prerequisite: CHE 401

CHE 458 Process Safety Engineering **(3-0-3)**
Applications of engineering principles to process safety and hazards analysis, mitigation, and prevention, with special emphasis on the chemical process industries. Includes source modeling for leakage rates, dispersion analysis, relief valve sizing, fire and explosion damage analysis, hazards identification, risk analysis, accident investigations, etc.
Prerequisites: PHYS 102, Senior standing

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: CHE 303

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. Sustainability and minimization of environmental impact.
Prerequisite: Senior Standing

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. Analysis of chemical and physical processes for wastewater treatment in process industries. Sustainability and minimization of environmental impact.
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 477 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 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 303

CHE 485 Fundamentals of Radioactive Waste Management and safety (3-0-3)
This course is designed to provide the students about the technology of the general management of the radioactive waste generated during the operation of nuclear power plant and nuclear fuel cycle facility including the treatment and disposal of the wastes. Background information on the sources of the gaseous, liquid and solid radioactive waste, and process and treatment facilities, solidification and volume reduction technology, packaging and transportation, storage methods of the wastes and spent nuclear fuel, design, safety and construction of the waste repositories, migration of the radionuclide at the subsurface, environmental monitoring and protection, repository safety assessment, decontamination and decommissioning, and the management of spent nuclear fuel will be covered
Prerequisite: MATH 102, PHYS 102

CHE 490 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 492 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

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 497 Chemical Engineering Undergraduate Research (3-0-3)
Selection of a research topic, development of research topic, writing a successful proposal, manage and carrying out research tasks, setting up bench scale setup or prototype for lab work or software for modeling based research, communicating the research findings, writing effective reports.
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.
Note: Not to be taken for credits with CHEM 102
Prerequisite: CHEM 101

CHEM 201 Organic Chemistry I (3-4-4)
Structure, nomenclature, bonding, isomerism, stereochemistry and properties of organic compounds. Synthesis and reactions of alkanes, alkenes, alkynes, alcohols, ethers, alkyl halides and aromatics. Mechanism of addition, elimination, substitution, radical and electrophilic aromatic substitution reactions.
Laboratory: Micro-scale laboratory techniques, basic characterizations, separations, purifications and synthesis of organic compounds.
Prerequisite: CHEM 102

CHEM 204 Organic Chemistry II (3-0-3)
Spectroscopic identification of organic compounds. Synthesis and properties of carboxylic acids and derivatives, aldehydes, ketones, amines, hetereocycles, carbohydrates and amino acids. Conjugate additions, reactions of carbon nucleophiles, pericyclic reactions.
Prerequisite: CHEM 201

CHEM 212 Physical Chemistry I (3-4-4)
Basic gas laws, laws of thermodynamics, chemical equilibria, ideal and real solutions, phase equilibria, electrolytic solutions and electrochemistry, kinetic theory of gases.
Laboratory: Techniques of physical measurements, error analysis and statistics, gas laws, calorimetry, equilibria and phase diagrams, electrochemistry.
Prerequisite: CHEM 102, MATH 102, PHYS 102

CHEM 221 Analytical Chemistry (2-4-3)
Introduction to quantitative and qualitative analyses, analytical processes and validation of analytical methods, data handling and statistical concepts, gravimetric methods of analysis, volumetric analysis. Acid-base, precipitation and complex formation titrations. Redox

reactions, electrode potential and electrochemical cells, potentiometry, voltammetry, solvent extraction, chromatographic methods.
Laboratory: Experiments on basic analytical methods, including gravimetric and titrimetric techniques, sampling, data handling.
Note: Not to be taken for credits with CHEM 321
Prerequisite: CHEM 102

CHEM 236 Inorganic Chemistry I (3-4-4)
Atomic structure and bonding, symmetry and group theory, molecular orbitals, acid-base and donor acceptor chemistry, coordination chemistry, theories and experimental evidences of electronic structure, reactions and mechanisms, transition metal organometallic compounds and catalysis, metal-metal bonds and cluster compounds with special emphasis on transition metal complexes.
Laboratory: Exposure to various laboratory techniques to synthesize, purify and characterize inorganic chemical compounds
Prerequisite: CHEM 102

CHEM 305 Organic Synthesis and Characterization Laboratory (0-8-2)
Laboratory synthesis, purification and characterization of organic compounds. Introduction to multi-step synthesis experiments. Utilization of spectroscopic and wet chemical techniques to determine structures of unknown organic compounds.
Corequisite: CHEM 204

CHEM 311 Physical Chemistry II (3-4-4)
Reaction rates and mechanisms, temperature dependence of rate constant. Lindemann mechanism, catalysis, adsorption isotherms, photochemistry, transport properties, the Schrodinger equation, quantum mechanical postulates, a particle in a box, vibration-rotation spectroscopy of diatomic molecules, ensembles and molecular partition functions.
Laboratory: Experiments involving chemical kinetics, transport properties of gases and liquids, infrared, Raman and ultraviolet spectroscopy.
Prerequisite: CHEM 212 or CHE 303 or ME 203

CHEM 313 Introduction to Computational Chemistry (2-4-3)
Overview of molecular mechanics, semiempirical and quantum mechanical approaches, basic theory and algorithms behind common computational chemistry methods. Emphasis will be placed on molecular modeling and its applications to interpret physicochemical properties of chemical systems. Implementation of selected software to solve chemical and numerical problems.
Laboratory: Projects dealing with energy minimization, conformational analysis, reaction mechanisms, spectroscopic analysis and others topics for selected chemical systems.
Prerequisite: CHEM 311

CHEM 315 Chemical Kinetics and Reaction Mechanisms (3-0-3)
Determination of kinetic order and rate constants, catalysis, isotope effects, medium effects, fast reactions, chemical interpretations of the transition state, structure-reactivity relationships, methodology of mechanistic organic/inorganic chemistry, reactive intermediates, kinetics of homogeneous and heterogeneous catalysis.
Prerequisite: CHEM 311

CHEM 321 Instrumental Analysis for Engineers (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.

Note: Not open for Chemistry or Industrial Chemistry students

Prerequisite: CHEM 102

CHEM 324 Advanced Instrumental Chemical Analysis (2-4-3)

A survey of modern instrumental techniques in chemical analysis including electrochemical, spectroscopic and separation methods, covering instruments handling, calibration, optimization and output interpretation. Similarities and differences between various techniques will be emphasized.

Laboratory: Experiments related to spectroscopic methods, separation methods and electrochemical methods using advanced instrumental techniques.

Prerequisite: CHEM 221 or CHEM 321

CHEM 327 Environmental Chemistry (3-0-3)

Environmental chemistry in global perspective, chemistry of earth's atmosphere, chemistry of urban and indoor atmospheres, global climate, chemistry of the hydrosphere, aquatic systems, water pollution, wastewater analysis and treatment chemistry, environmental chemistry of colloids and surfaces, microbiological processes, solid wastes, organic biocides.

Prerequisite: CHEM 102 or CHEM 111

CHEM 336 Inorganic Chemistry II (2-0-2)

Topics related to modern inorganic chemistry such as physical techniques in inorganic chemistry, the structures of solids, solid state and materials chemistry, inorganic nanomaterials, nanoscience, and nanotechnology, biological inorganic chemistry.

Prerequisite: CHEM 236

CHEM 355 Industrial Catalysis (3-0-3)

The role of transition metals in homogeneous catalysis, important catalytic processes such as alkylation, carbonylation, oxidation-oxygenation, hydrogenation, etc., homogeneously catalyzed industrial processes such as Oxo and Wacker processes, fundamentals of heterogeneous catalysis, catalyst production and applications, shape selective catalysts, role of environmental catalysis in green chemistry, electro-, photo-, and phase transfer catalysis, most important catalytic processes operating in Saudi Arabia and worldwide.

Prerequisite: CHEM 201, CHEM 236

CHEM 363 Biochemistry (3-0-3)

Structures and functions of proteins, carbohydrates, nucleic acids, lipids and membranes, enzyme kinetics, mechanisms and regulation, bioenergetics, metabolic pathways, oxidation, reduction and electron transfer reactions, DNA and information transfer.

Prerequisite: CHEM 201

CHEM 388 Chemistry Research I (0-8-2)

Each student is introduced to research through a specific research project under guidance of a faculty member. The students are exposed to the fundamentals of basic research where they gain experience in experimental techniques, data analysis, and interpretation of results with

focus on the process of scientific discovery. Submission of a final report is required at the end of this course.
Prerequisite: Junior Standing

CHEM 399 Summer Training (0-0-2)
A period of two months of industrial employment in appropriate industries or firms. Summer training could also be conducted in a university or a research institution/center. 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 204

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 204

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 204

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 311

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 311

CHEM 418 Quantum Chemistry (3-0-3)
Transition from classical mechanics to quantum mechanics, review of quantum mechanical postulates, the hydrogen atom, angular momentum, perturbation theory, chemical bonding, molecular structures and symmetries, atomic spectra and atomic structure, molecular rotations and vibrations.
Prerequisite: CHEM 311

CHEM 426 Advanced Instrumental Analysis Laboratory (0-4-1)
A four-module project-based approach covering experiment design, troubleshooting, team work and communication skills. Students work in small groups, with supervision from a faculty member, to explore and develop their own idea and test or investigate an analytical problem. The themes to be covered are environmental, bioanalysis, material science and forensic.
Prerequisite: CHEM 236, CHEM 324

CHEM 427 Quality Assurance in Chemical Laboratories (3-0-3)
Introduction to quality assurance in the analytical chemistry laboratory, principles of valid analytical measurements (VAM), different approaches to ensure quality of analytical measurement results, quality control measures such as control charts, use of certified reference materials and inter-laboratory trials. Measurement uncertainty, method validation, metrological traceability, accreditations to good laboratory practice (e.g. ISO 17025 and OECD).
Prerequisite: CHEM 321 or CHEM 324

CHEM 428 Separation Science and Applications (3-0-3)
Separation techniques used in various analytical applications, separation techniques principles, operation, design, problems, optimization and interpretation. Modern techniques to be covered include gas chromatography, high-performance liquid chromatography, ion chromatography, capillary electrophoresis and two dimensional separation methods. Recent developments in chromatographic techniques and applications of analytical separations in oil industry, petrochemicals, biomedical, food and environmental chemistry.
Prerequisite: CHEM 321 or CHEM 324

CHEM 436 Application of Group Theory to Chemistry (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 236

CHEM 451 Polymer Chemistry (3-0-3)
Basic concepts of polymer chemistry, condensation polymerization, addition polymerization using anionic, cationic and radical processes, copolymerization. Polymer structure and properties, molecular weight determination, characterization and analysis of polymers. Specialty polymers, plasticizers and industrial reactions of polymers.
Prerequisite: CHEM 201

CHEM 452 Polymer Chemistry Laboratory (0-4-1)
Practical experience in polymer chemistry, synthesis of polymers, kinetics and mechanisms of polymerization reactions, structural analysis, characterization and properties of polymers.
Corequisite: CHEM 451

CHEM 453 Chemistry of Petroleum Processes (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 201, CHEM 321 or CHEM 324

CHEM 454 Chemistry of Corrosion (3-0-3)

Electrochemical corrosion processes and variables, anodic and cathodic corrosion, corrosion acceleration versus passivation, electrochemical thermodynamics: the Gibbs function, electrochemical reactions and equilibrium potentials, kinetics of electrode processes, electrochemical corrosion-rate measurements, localized corrosion, corrosion protection, inhibition and materials selection.

Prerequisite: CHEM 311

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 236

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 201

CHEM 458 Materials Chemistry (3-0-3)

Basic concepts of material science. Development, characteristics and uses of advanced materials. The role of chemistry in the preparation and processing of advanced materials and their applications. Ceramics, refractory materials, optical materials, composites, semiconductors, thin films, nanoscale materials, crystalline and amorphous solids. Nucleation and growth of a crystal, preparation of single crystals. Fuel cells and hydrogen energy.

Prerequisite: CHEM 201, PHYS 102

Corequisite: CHEM 236

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: Senior Standing

CHEM 488 Chemistry Research II (0-8-2)

Students continue their research under the direct guidance of faculty members to build on experience gained in CHEM 388. They are given the opportunity to carry out a literature survey, to train on and use advanced instrumentation, to develop their ability of independent thinking and the skills with which they carry out their experiments and interpret results. Submission of a final report and delivering a brief presentation are required at the end of this course.

Prerequisite: CHEM 388

CHEM 489 Chemistry Research Experience (0-12-3)

Students interested in continuing their chemistry research, beyond CHEM 488, can take this course under the supervision of faculty members. A thorough literature survey and a greater degree of independent thinking and creativity, and a mastery of a set of laboratory skills are the hallmarks of this course. Submission of a final report as well as an oral presentation relating to the outcome of the research work is required at the end of this course.

Prerequisite: CHEM 488, ENGL 214

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 305 Linear Control Systems (3-0-3)
Linear systems, Modeling of physical systems, Modeling of Inventory Control, Production and Financial Systems, Ordinary Differential equations models, Laplace Transform, transfer functions, block diagram manipulation. Open loop and close loop systems, time domain analysis, response of systems to different test signals, steady state analysis, concept of stability, Routh-Hurwitz criteria, controller design, and simple root locus analysis and controller design.
Prerequisite: MATH 208, EE 204 or (EE 202, EE 212)

CISE 306 Linear Control Systems (0-3-1)
This course consists of set of lab experiments for students to gain hands-on experience with modeling, analyzing and controlling linear control systems. They also develop proficiency in using MATLAB and SIMULINK software for simulating such systems.
Corequisite: CISE 305

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 305, CISE 306

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 305, CISE 306

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 305, CISE 306

CISE 421 Simulation and Control for Process Industry (3-0-3)
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.
Prerequisite: Senior Standing

CISE 422 Intelligent Controllers (3-0-3)
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.
Prerequisite: Senior Standing

CISE 423 Model Predictive Control (3-0-3)
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.
Prerequisite: CISE 316

CISE 424 Identification of Linear Systems (3-0-3)
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.
Prerequisite: CISE 301, CISE 318

CISE 431 Industrial Automation (3-0-3)
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.
Prerequisite: Junior Standing

CISE 432 Digital Signal Processing (3-0-3)
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.
Prerequisite: CISE 315

CISE 433 Condition-based Maintenance (3-0-3)
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 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, Weiner-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_∞ 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 343.
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 evaluatingubiquitous 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

COE 497 Undergraduate Research (3-0-3)

The course is intended to expose the student to the process of scientific research. The student is expected to acquire research skills and methodologies including formulation of a research plan, organization of a literature review, selection of appropriate research methodologies, design and implementation, assessment, analysis, and presentation. By the end of the course, students will complete a technical paper and will be encouraged to participate in conferences and present their work.

Prerequisite: Junior Standing, GPA **≥ 3**

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 262

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 Axwoman 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

COLLEGE OF PETROLEUM AND GEOSCIENCES

CPG 199 Summer Camp (0-0-1)

Eight-week summer camp. Oilfield applications experience. Exposure to some geological, geophysical, and petroleum engineering field activities. Camping at geologic sites. Visits to drill sites. Visits to oil and service-company head offices.

Prerequisite: GEOL 101, GEOP 102, PETE 101

CPG 498 Integrated Design I (0-3-1)

Use of geoscientific data, knowledge and skills as well as reservoir and well data to build a geological model of a hydrocarbon trap. Uncertainties associated with petrophysical and field data. Work is achieved by a team of petroleum-engineering and geoscience students.

Prerequisite: GEOL 315 or GEOP 320 or PETE 315

CPG 499 Integrated Design II (0-6-2)

Continuation of CPG498. Evaluation of various development plans for the hydrocarbon trap utilizing all petroleum engineering tools and skills. Selection of the best plan based on technical and economic feasibility within environmental and legal constrains following the industry's standards and practices. A detailed technical report with presentation.

Prerequisite: CPG 498

ECONOMICS

ECON 101 Principles of Economics I (Microeconomics) (3-0-3)
Provides the fundamentals of microeconomics. It introduces 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. Topics include 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)
Introduces the 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.
Prerequisite: ECON 101

ECON 301 Intermediate Microeconomic Theory (3-0-3)
Studies the efficiency of choices made by individuals, including consumers, workers, firms' owners, and social planners, who have limited resources, and the relationship between their individual interests. Topics covered include 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; social costs and benefits, and regulation.
Prerequisite: ECON 102

ECON 302 Intermediate Macroeconomic Theory (3-0-3)
Studies 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 macroeconomic 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 102

ECON 305 Money and Banking (3-0-3)
Covers 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 102

ECON 306 Economy of Saudi Arabia (3-0-3)
Analyzes 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.
Prerequisite: ECON 102

ECON 330 Labor Economics (3-0-3)
Introduces 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 102

ECON 401 Managerial Economics (3-0-3)
Applies 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 102

ECON 405 Introduction to Econometrics (3-0-3)
Focuses on practical and conceptual issues involved in substantive applications of econometric techniques. Estimation and inference procedures are formally analyzed for simple econometric models and illustrated by empirical case studies using real-life data. The course covers linear regression models, time series models, and panel data models.
Prerequisite: ECON 102, STAT 212

ECON 410 International Economics (3-0-3)
Focuses on 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 102

ECON 415 Public Finance (3-0-3)
Analyzes 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 102

ECON 420 Islamic Economics (3-0-3)
Discusses the 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, Islamic monetary policy reforms.
Prerequisite: ECON 305

ECON 425 Economic Development (3-0-3)
Introduces economic development theory and applies it 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, healthcare, and other parameters in the development process. Mathematical and graphical tools used in the measurement and analysis of development. Political economy, international trade, and fiscal policies for development.
Prerequisite: ECON 102

ECON 450 Introduction to Energy Economics (3-0-3)
Analyzes energy resources (such as petroleum, coal, gas, electricity, and 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 306

ECON 495 Special Topics in Economics (3-0-3)
Focuses on advanced, contemporary, and specialized areas in economics not covered extensively in other courses.
Prerequisite: ECON 102

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 or 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)
Microcontroller and microprocessor architectures. Assembly language programming and debugging. Memory, input/output mapping and interfacing. Interrupts. ADC/DAC, Programming in C.
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)
Planner transmission. Planar impedance matching techniques. S-parameters. Microwave filters, microstrip, planer microwave elements (directional copular, 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 team work project 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, incorporating appropriate engineering standards and multiple constraints. The design may involve experimentation, realization and/or computer project.

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 490 Undergraduate Research (3-0-3)
Introduction to research methodologies and related skills including problem definition, literature review, verification, experimentation, and writing and presenting technical papers; Research community and its functionalities; Nature of applied research and the iterative process of research writing. The course features specific research problems where students are required to write their own technical papers and participate in scientific gatherings.
Prerequisite: Junior Standing

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 introduce 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. Organizational 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

ENTREPRENEURSHIP

ENTR 322 Introduction to Entrepreneurship (3-0-3)
Introduction to the concepts of entrepreneurship, opportunity recognition and evaluation, characteristics, traits and behaviors of entrepreneurs, creativity and innovation, the role of the entrepreneur in the economy and society, and entrepreneurship in non-entrepreneurial settings. This course will help students to identify and diagnose their skills and abilities to be entrepreneurs. It will help students to understand how to develop their entrepreneurial abilities, knowledge and skills necessary to create an entrepreneurial structure. Entrepreneurial managerial functions of a new venture will be included in this course. A student will be introduced to some successful entrepreneurial business models to learn from.
Prerequisite: ENGL 214

ENTR 413 Entrepreneurial Marketing (3-0-3)
An examination of marketing theory, concepts, frameworks and processes used by entrepreneurial companies to create customer value while accomplishing their strategic mission and objectives. Key topics to be covered include Marketing the Entrepreneur, Finding and evaluating entrepreneurial opportunities, market development through customer value creation, building relationships, entrepreneurial pricing, entrepreneur distribution strategy and entrepreneurial communication strategy.
Prerequisites: MKT 250

ENTR 415 Social Entrepreneurship (3-0-3)
Social Entrepreneurship is an emerging and rapidly changing business field that examines the practice of identifying, starting and growing successful mission-driven for profit and nonprofit ventures, that is, organizations that strive to advance social change through innovative solutions. This course emphasizes an entrepreneurial approach to creating solutions for social problems and unmet needs of society, transforming them into authentic opportunities to create social value.
Prerequisite: MGT 301

ENTR 416 Entrepreneurship and New Venture Creation (3-0-3)
Provides the student with a capstone experience, which will enable him to integrate what he has learned in his business program. Develop students' skills for evaluating, articulating, refining, and pitching a new business venture or service, either as a start-up business or a new initiative within an existing firm (corporate entrepreneurship). Coverage include the foundations of entrepreneurship, identifying real opportunities, design thinking, developing business models and plans, ownership issues, financing the venture, marketing strategies, human resources planning and management, profit and cash flow planning and management. This course should be appropriate for all students interested in business start-ups and Entrepreneurship. The mentoring process will provide critical analysis and feedback throughout this process.
Prerequisite: (MGT 301, MGT 311 or MGT 313, MKT 250, FIN 250) or (Approval of Department for Non-Business Students)

ENTR 423 Small and Medium Enterprise Management (3-0-3)
Designed to facilitate students in understanding the unique characteristics of SMEs, which make them different from that of large enterprises, and how does contemporary business knowledge, which students acquire during their undergraduate study at CIM,

can be tailored to manage SMEs. The course aims to equip students with necessary skills and orientation to perform and excel in SME milieu, or look for career opportunities in national and international SME development companies. Basic SMEs functions such as finance, marketing, HRM, communication and MIS will be discussed in this course in order to equip students with knowledge and skills necessary to manage SMEs.

Prerequisite: MGT 301

FINANCE

FIN 200 Introduction to Finance (3-0-3)
Introduces the basics concepts and tools of financial accounting and corporate finance. Topics covered include income statement and statement of financial position, purposes and limitations; statement of cash flows; analysis of financial statements; introduction to corporate finance, introduction to financial markets and institutions, time value of money, interest rates, and risk and return. Covers ethics in accounting and financial management.

FIN 250 Financial Management (3-0-3)
Discusses the 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, the cost of capital, techniques of financial planning and analysis and working capital management.
Prerequisite: ACCT 210, ECON 102

FIN 315 Corporate Finance (3-0-3)
Covers the theory and practice of financial decisions and their interaction to determine the firm's value. Capital investment decisions are examined with certainty and under risk. Financing decision is examined through capital structure theory, cost of capital. The dividends policy choices are explained with their implications. The management of working capital and short-term financing is explained. Valuation of securities integrates the impact different financial decisions. Other topics are also discussed such as real options analysis, leasing, mergers and acquisitions, agency theory and corporate governance.
Prerequisite: FIN 250

FIN 320 Investments (3-0-3)
Discusses the function of the financial markets, different asset classes, and how are they issued and traded and an introduction to security market indexes weighting schemes. Establish the relationship between risk and expected return within the framework of modern portfolio theory. Fundamentals of asset pricing theory, market efficiency, and behavioral finance are also covered in this course. Topics such as technical analysis, basic analysis of equity securities, fixed income securities, and basics of options are also covered in the course.
Prerequisite: FIN 250, STAT 212 or STAT 214

FIN 350 Begin Cooperative Work (0-0-0)
See contents in FIN 351.
Prerequisite: Same as in 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 submits a formal written report.
Prerequisite: ENGL 214, FIN 315, FIN 320, at least 85 credit hours

FIN 352 End Cooperative Work (0-0-0)

See contents in FIN 351.
Prerequisite: Same as in FIN 351

FIN 410 International Financial Management (3-0-3)
Covers the analysis of the key financial decisions made by multinational corporations (MNCs). The course provides an international perspective on 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)
Discusses the theoretical and practical aspects of decision making in financial institutions including commercial banks, insurance companies, pension 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 416 Entrepreneurial Finance (3-0-3)
Introduces financial management tools and techniques that are encountered by entrepreneurs in the lifecycle of their venture. The course builds on the basic financial tools and financial decisions framework with an emphasize on the unique challenges of start-ups in the stages of planning, financing, operations, governance, and valuation. Also, the course explains the role of venture capital and private equity and how they would contribute to start-up development. In addition, deal structuring, choices of achieving liquidity are also discussed in the course.
Prerequisite: FIN 250 or (FIN 200 for Non-Business Students)

FIN 421 Security Analysis and Portfolio Management (3-0-3)
Focuses on the 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 422 Financial Risk Management (3-0-3)
Discusses different types of risks that face business entities including financial institutions face in their day-to-day operations. It discusses various types of risks such as interest rate risk, credit risk, market risk, liquidity risk, operational risk, and reputational risk. This course will also introduce some important risk management tools and techniques such as hedging techniques to manage local and global markets risks.
Prerequisite: FIN 315, FIN 320

FIN 423 Fixed Income Analysis (3-0-3)

Covers the valuation and the analysis of risk of fixed income securities. The topics covered include risk measures, namely duration and convexity and their relation to the term structure of interest rate. Also, fundamentals of credit analysis and the credit analysis models. In addition, asset-backed securities and their structure and valuation are discussed.

Prerequisite: FIN 315, FIN 320

FIN 424 Investment Valuation (3-0-3)

Builds on basics of security analysis and valuation tools learned in corporate finance, investment, and other business courses. Variety of valuation techniques are covered such as discounted cash flow models, multiples valuation, asset-based models, contingent claim models. Also, special topics of valuation will be introduced. For example, valuation of financial services firms, valuing start-ups, high-tech firms, and valuing businesses with negative earnings. In addition, accounting shenanigans and their impact on valuation will be discussed.

Prerequisite: FIN 315, FIN 320

FIN 425 Financial Modeling (3-0-3)

Focuses on 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 315, FIN 320

FIN 430 Risk Management, Conventional and Islamic Insurance (3-0-3)

Introduces 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)

Overviews the 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)

Introduces 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 320

FIN 450 Financial Policy (3-0-3)
Examines practical problems in all areas of finance in a case study format. 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 focus on business case analysis.
Prerequisite: FIN 315, FIN 320

FIN 460 Derivatives (3-0-3)
Introduces derivative securities and the markets in which they trade. Explores the regulatory framework for financial derivatives and the operations of derivatives exchanges. Investigates the characteristics of futures and option contracts and their associated trading strategies to achieve risk return objectives. Discusses arbitrage principles and pricing of derivative securities.
Prerequisite: FIN 320

FIN 470 Financial Engineering (3-0-3)
Covers the pricing/valuation of derivative securities including futures, options and/or fixed-income and interest-rate derivatives. Presents the classic pricing theory based on stochastic process. Also, examines dynamic hedging and synthetic options based classic Greek Letters and numerical methods. In addition, it conducts empirical tests for financial asset return process as well as market anomaly. Besides that, it discusses the market microstructure, limits to arbitrage and trading algorithm that affect derivative pricing. Introduces special topics if there is a breakthrough in financial engineering research.
Prerequisite: FIN 320

FIN 495 Special Topics in Finance (3-0-3)
Focuses on advanced, contemporary, and specialized areas in finance not covered extensively in other courses.
Prerequisite: FIN 315

GEOLOGY

GEOL 101 Principles of Geology (2-3-3)
Origin and structure of the Earth and planets, the rock cycle, rock and mineral identification, plate tectonics, volcanism, erosion and sedimentation, metamorphism, geological time, relative and absolute dating, earthquakes, geological structures, desert landforms, natural resources. Laboratory exercises concentrate on mineral and rock identification, and map interpretation. At least one field trip 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: Cannot be taken by Geology Majors.

GEOL 213 Earth History and Paleontology (2-3-3)
Introduction to the principles of geology and stratigraphy. Magneto- bio- lithostratigraphy, stratigraphic correlation, the geological time scale, origin of the Earth, evolution of Earth's biota and environments over the last 4 billion years. Critical events in Earth history. Laboratory exercises cover major fossil groups used in biostratigraphy. At least one field trip is required.
Prerequisites: GEOL 101

GEOL 217 Mineralogy and Optical Mineralogy (2-3-3)
Systematic mineralogy including detailed 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 forms. Crystal chemistry. Structure of minerals. Optical mineralogy. Laboratory exercises include studies of common rock-forming minerals using the polarizing microscope, determination of mineral specimens by their physical properties, and morphological crystallography using crystal models.
Prerequisites: GEOL 101, CHEM 101

GEOL 220 Petrology (2-3-3)
Nature and origin of igneous, sedimentary, and metamorphic rocks. Phase relations in silicate melts, modes of occurrence, textures, and petrography of igneous rocks. Texture, structure, composition, provenance, diagenesis, and classification of sedimentary rocks. Processes and types of metamorphism. Facies, textures, and mineralogy of metamorphic rocks. P-T paths. Laboratory studies of igneous, sedimentary, and metamorphic rocks in hand specimen and under the microscope. At least one field trip is required.
Prerequisites: GEOL 217

GEOL 270 Sedimentology and Stratigraphy (2-3-3)
Sediments and their properties, sedimentation processes, depositional environments, facies and facies analyses, provenance, principles and fundamentals of stratigraphic units, Walther's law, correlation and overview of seismic and sequence stratigraphy. Laboratory covers types, texture, and composition of common sedimentary rocks, core description, lithofacies mapping, facies analyses, and correlation. Computer software used for stratigraphic column construction and data interpretation. At least one field trip is required.
Prerequisites: GEOL 213

GEOL 303 Sustaining the Earth (3-0-3)
Introduction to environmental issues facing humanity. 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.
Prerequisites: Junior Standing

GEOL 305 Structural Geology (2-3-3)
Principles of structural geology. Both tectonic and non-tectonic structures. Fundamentals of rock mechanics, stress, strain and deformation, and their effects on rock structures. Brittle deformation, fractures, faults, and joints. Ductile deformation and associated structures. Cross section construction and interpretation. Cleavage, foliation and lineations; their types and interpretation. Lab sessions include display and analysis of structural data, structural map analysis, three-point problems, and use of structural geology software for analyses. At least one field trip is required.
Prerequisites: GEOL 101

GEOL 312 Remote Sensing and GIS Applications in Geology (2-3-3)
Introduction to Geographic Information Systems (GIS) and its application to geosciences, and introduction and principles of remote sensing. Aerial photography and other remote sensing techniques, principles of photogrammetry and image interpretation for geological information.
Prerequisites: GEOL 305

GEOL 315 Petroleum Geology (3-0-3)
Fundamentals of the geology of oil and natural gas. Definition and properties of petroleum fluids and reservoir properties. Origin, migration, and accumulation of hydrocarbons as related to source, reservoir, and seal rocks. Structural, stratigraphic, and combination traps. Survey of exploration methods. Concept of petroleum province and basin analysis. Computer software used for basin analysis and data interpretation. At least one field trip is required.
Prerequisites: GEOL 305

GEOL 318 Regional Geology (3-0-3)
Tectonic elements of the Arabian Peninsula. Rocks and the sedimentary cover of Arabia. Geological, structural, and geomorphological evolution of Arabia with emphasis on hydrocarbon potential, mineral wealth, and groundwater resources. At least one field trip is required.
Prerequisites: 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 studies. Case histories.
Prerequisites: GEOL 101 or Consent of Instructor for Non-Geosciences Majors

GEOL 345 Integrated Petroleum Geology (3-3-4)
Sedimentary rock properties and classification, major depositional environments, lithostratigraphic units, sedimentary basins. Origin and migration of hydrocarbons. Petroleum system elements. Reservoir rocks and controls on reservoir quality. Tectonic framework of the Arabian plate. Petroleum systems of Saudi Arabia. Laboratory analysis on identification, classification, and description of clastic and carbonate sedimentary rocks in hand specimen. Porosity evaluation of reservoir rocks under the microscope. Well log interpretation.
Note: Cannot be taken by Geology Majors.

Prerequisites: GEOL 101

GEOL 354 Computational Methods in Geology (2-3-3)
Introduction to modern concepts of quantifying geological variables. Integration, analysis, and interpretation of geological data. Application of statistical, spatial, and numerical techniques to characterize oil reservoirs, groundwater aquifers, mineral resources and contaminated sites. Computer software for modeling purposes is introduced.
Prerequisites: GEOL 220, GEOL 270

GEOL 356 Fundamentals of Geochemistry (2-3-3)
Investigation of the abundance and distribution of chemical elements in the solid Earth and its oceans and atmosphere. Solar system nucleosynthesis, basics of geochemical thermodynamics, aqueous geochemistry, phase and mineral equilibria, stable and radiogenic isotopes, geochronology, and petroleum geochemistry. Application of geochemistry to understanding global cycling of elements, finite resources, and environmental and climate issues.
Prerequisites: GEOL 220

GEOL 357 Stable Isotope Geochemistry (3-0-3)
Introduction to stable isotope systematics. Theoretical aspects of isotope exchange, isotope fractionation, and isotopic variations in geologic systems. Application of light stable isotope geochemistry to understanding the hydrologic cycle, biogeochemical cycling, diagenesis, and global change.
Prerequisites: GEOL 356

GEOL 364 Carbonate Geology (3-0-3)
Carbonate sediment and rock constituents, rock classification, carbonate porosity, and sedimentary processes. Environments of deposition, facies associations, and economic importance. Modern carbonate sedimentary environments as analogs for ancient accumulations. Carbonate petroleum reservoirs. Study of outcrops, hand specimens, and thin sections. At least one field trip is required.
Prerequisites: GEOL 270

GEOL 399 Summer Training (0-0-1)
Each student must work as a trainee geologist for a period 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.
Prerequisites: ENGL 214, Junior Standing

GEOL 409 Geology Seminar (1-0-1)
Preparation and presentation of various geological topics, selected in consultation with course faculty. Collection of geological information (e.g., journals, books, maps, government publications), primary geological literature, proper citation, data synthesis, elements of organization and style for presentations and geological reports. Each student submits a written report on a chosen topic and delivers an oral presentation.
Prerequisites: Senior Standing in Geology

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 media, flow nets, well hydraulics, and analysis and evaluation of pumping test data. Groundwater quality and groundwater occurrence in various rock types and sediments, field techniques used in groundwater exploration and survey. Computer software used for data interpretation, simulation, manipulation, and graphs survey.
Prerequisites: GEOL 101

GEOL 430 Field Geology (0-18-6)
Six weeks of systematic field work for training in geological field and laboratory techniques. Field safety and field mapping techniques. Preparation of field notebook, geological maps, stratigraphic sections, and cross sections. Laboratory analysis of rocks collected in the field, and preparation of oral and written final report. On-site fieldwork and on-campus laboratory study required.
Prerequisites: GEOL 318

GEOL 434 Marine Geology (3-0-3)
Introduction to geology of the world's ocean basins. Continental margin geological processes and features. Characterization of continental shelves, barrier islands, reefs, atolls, slope, rise, and abyssal plains, submarine canyons, and plate-tectonic activity. Global sea-level history, oxygen isotope stratigraphy, plate tectonic control of ocean circulation, ocean gateways, critical events in ocean history. Collaborative international ocean drilling programs. At least one field trip is required.
Prerequisites: GEOL 270

GEOL 436 Oceanography (3-0-3)
Fundamental principles of geological, chemical and physical oceanography. Historical overview of ocean exploration. Distribution of terrigenous and biogenic sediments. Seawater characteristics including temperature, salinity, and density. Tidal theory, geostrophic flow, surface and deep ocean circulation. Water column zonation. Concept of CCD, lysocline, thermocline, halocline and pycnocline, nutrients, the oxygen minimum zone, and oxygen utilization. The global carbon cycle. The glacial ocean. At least one field trip is required.
Prerequisites: GEOL 270

GEOL 444 Undergraduate Research (3-0-3)
Students in high standing undertake research. The student joins an ongoing research project with one of the faculty members of the college. The student, with help of the faculty, identifies an aspect of the project that can be accomplished within the span of one semester, prepares a brief proposal, writes a literature review, collects and interprets original data, and produces a written report and an oral presentation.
Prerequisites: GPA > 3.0 or Approval of Program Coordinator

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. At least one field trip is required.
Prerequisites: Junior Standing

GEOL 447 Energy and the Environment (3-0-3)
Energy supply and demand. How various forms of energy impact the Earth's environment. Traditional and alternative energy: hydrocarbons (conventional and unconventional), nuclear, solar, geothermal, hydroelectric, biofuels, wind. Policy considerations. Subsurface engineering and problem-solving methods. Provides an understanding of the Earth relevant to the production of natural energy resources.
Prerequisites: Junior Standing

GEOL 450 Biostratigraphy of the Arabian Plate (2-3-3)
Introduction to micro- and macrofossils, including preservation, biodiversity, and basic aspects of zoological nomenclature. Principles of biostratigraphy and biochronology. Review of major fossil groups. Laboratory sessions cover practical examples from the Arabian Peninsula, including foraminifera, palynomorphs, calcareous nannofossils, conodonts, trilobites, graptolites, ammonites. Applications of fossils for biostratigraphic and paleoenvironmental determinations applied to hydrocarbon exploration.
Prerequisites: GEOL 213

GEOL 465 Subsurface Geology (3-0-3)
Characterization and analysis of sedimentary rocks in the subsurface specifically related to hydrocarbon exploration and production. Integration of well logs, seismic data, and core data. Creation and interpretation of subsurface structural, isopach, and depositional facies maps. Computer software used for subsurface analysis.
Prerequisites: GEOL 315 or GEOL 345

GEOL 482 Current Topics in Geosciences (3-0-3)
A seminar-style course, taught by various members of the Department. Faculty members discuss their own research in the broader context of cutting-edge geoscience.
Prerequisites: Senior Standing in Geology

GEOL 490 Special Topics (3-0-3)
Special topics in the broad topical area of the geosciences.
Prerequisites: Senior Standing, Approval of Department

GEOPHYSICS

GEOP 102 Essentials of Geophysics (2-0-2)
Introduction to the ways that geophysics contributes to our understanding of the Earth, and the key concepts and principles of widely used geophysical methods. Emphasis is on physical basis, data acquisition, processing, interpretation of each method, and their application to hydrocarbon exploration, ground water exploration as well as engineering and archaeological applications.

GEOP 204 Introduction to Seismology (3-0-3)
Basic seismological theory, relationship of earthquakes to plate tectonics, causes and effects of earthquakes, source parameters, earthquake location, determination of earthquake magnitude. Interpretation of seismograms, earthquake statistics, seismic hazard and risk assessment, earthquake prediction, seismometers and seismological networks. At least one field trip to a seismic station is required.
Prerequisite: GEOP 102

GEOP 205 Computational Geophysics (3-0-3)
Elements of geophysical data inversion, linear systems theory, basic digital signal processing, statistics, error propagation, numerical differentiation, matrix calculus, linear parameter estimation, data fitting, spectral analysis, convolution, deconvolution, and filter design, analysis and implementation.
Prerequisite: MATH 201, ICS 103, GEOP 102

GEOP 215 Introduction to Seismic Exploration (3-0-3)
Seismic waves (elasticity, wave equation, anisotropy, body and surface waves, propagation and interface effects, reflection coefficients), time-distance curves (NMO, DMO), seismic velocity (sedimentary rock model, velocity types, velocity determination), seismic signal and noise (primary reflections, direct, air, surface, and head waves, diffractions, multiples, random noise), seismic equipment (positioning, sources, receivers, recording), field procedures (spreads, arrays, CMP method, survey parameter selection), 3-D seismic exploration (terminology, swath shooting, marine 3-D).
Prerequisite: GEOP 102

GEOP 304 Gravity and Magnetic Exploration (3-0-3)
Physics of gravity, description of the Earth's gravity field, its temporal variations, and the small-scale perturbations that are the signal of gravity exploration methods, field procedures, data acquisition, correction and processing, basic interpretation techniques, estimation of source parameters for simple anomalies by manual methods and by data inversion and case histories. Physics of magnetism and description of the Earth's magnetic field and its variations in space and time, rock magnetism, instrumentation, survey procedure, interpretation and case histories. Matlab is used for computation and modeling.
Prerequisite: GEOP 205, PHYS 305

GEOP 320 Seismic Data Processing (2-3-3)
Objectives of seismic data processing, basic data processing sequence, Fourier transform, delta and sinc functions, convolution, correlation, wavelet phase, frequency filtering and aliasing, amplitude gain, deconvolution (spiking, optimum, predictive), velocity analysis (velocity spectrum, constant velocity stacks), static corrections (elevation, residual), NMO correction and stacking, migration (2D, 3D, poststack, prestack, time, depth, algorithms including Kirchhoff,

finite difference, and FK. Students will apply basic data processing sequence on a real seismic data set using a seismic data processing package.
Prerequisite: GEOP 205, GEOP 215

GEOP 340 Borehole Geophysics (3-0-3)
Introduction to downhole geophysical well logging and borehole seismics (VSP; cross-hole methods), key concepts and techniques utilized to identify geological formations and to characterize rock units of interest using data gathered from wells, physical and mathematical foundations to conceptual and practical understanding of varieties of borehole data and properly using them in reservoir characterization and Earth modeling. Basic logging and VSP principles, theory of tool operation, analysis of open-hole logs to estimate rock and fluid properties via integration of different log data and calibration with other data types such as core samples and seismic data, techniques of tying log depths to seismic times and rock property extraction from wells and seismic data.
Prerequisite: GEOP 102

GEOP 353 Electrical and Electromagnetic Exploration (3-0-3)
The basic theory of electrical and electromagnetic exploration, electrical properties of minerals and rocks. Natural-source methods (self-potential and magnetotelluric,) and artificial-source methods (direct current resistivity, induced polarization, ground penetrating radar, electromagnetic induction) are studied in terms of field acquisition procedures, data processing, and data interpretation. One data inversion and modeling software will be utilized during the course to get hands on experience in forward and inverse modeling techniques used in interpretation of electrical and electromagnetic data.
Prerequisite: GEOP 205, PHYS 305

GEOP 399 Summer Training (0-0-1)
A continuous period of eight weeks of summer working in the exploration industry to gain practical experience in the field 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, CPG 199, Junior Standing

GEOP 405 Seminar (1-0-1)
This course requires 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 416 Seismic Data Interpretation (3-0-3)
Seismic resolution, types of events on seismic sections, characteristics of events, vertical seismic profiling, geologic aspects of velocity, and seismic response of various stratigraphic and structural features. Direct hydrocarbon indicators, 2-D and 3-D seismic exploration techniques will also be covered along with an introduction to seismic stratigraphy.
Prerequisite: Senior Standing

GEOP 420 Current Topics in Geosciences (3-0-3)
A seminar-style course, taught by various members of the department. Faculty members discuss about their own research in the broader context of cutting-edge geophysical research.

Prerequisite: Senior Standing

GEOP 430 Geophysical Well Logging (2-3-3)
Introduction to general aspects of well logging, drilling mud, compositional properties of rocks, porosity, permeability, and fluids content. Logging techniques – resistivity, self-potential, gamma ray, neutron, density, sonic, calipers, and dipmeters will be studied to determine formation factor, water saturation, oil and gas zones, shaliness, and permeability. The course will also cover well log patterns of known rock units, the geological interpretation of well logs, correlation between wells, and tying wells to seismic sections.
Note: Not to be taken for credit with PETE 313
Prerequisite: GEOP 102

GEOP 455 Geodynamics (3-0-3)
Basic physical principles applied to the study of the Earth's material properties and the Earth dynamical processes. A variety of geological phenomena such as heat and fluid flow, rock rheology and deformation, lithospheric flexure and isostatic equilibrium, and mechanics of plate tectonics will be discussed too.
Prerequisite: GEOP 102, PHYS 210

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 102

GEOP 470 Geophysical Engineering (3-0-3)
The practical and theoretical aspects of seismic refraction and electrical resistivity methods as applied for the 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 will be covered. Interpretation techniques and fieldwork constitute the main part of the course.
Prerequisite: GEOP 102

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, magnetics, gravity, and borehole geophysics are used in such environmental problems.
Prerequisite: GEOP 102

GEOP 478 Data Inversion in Geophysics (3-0-3)
Basic concepts and techniques of inverse theory and its application to geophysical problems. Focus is on linear inverse problems in gravity, magnetic, seismic, and electrical data modeling and interpretation.
Prerequisite: GEOP 102, MATH 202

GEOP 480 Special Topics (3-0-3)
The topic of this course is determined based on mutual agreement and interest of the instructor and the students.
Prerequisite: Senior Standing

GEOP 488 Petrophysics (3-0-3)
Introduction to basic petrophysical properties of permeability, porosity, and acoustical impedance. Laboratory measurement of porosity, permeability, capillary pressure, wettability, fluid saturation and relative permeability, principles of acoustic, electric, electromagnetic, and nuclear measurements and their applications to exploration and production of hydrocarbons. Lab topics also include measurement instruments and techniques, analysis and uncertainty of measured data.
Prerequisite: Junior Standing

GEOP 490 Geophysics Field Camp (0-9-4)
Four weeks of geological and geophysical field training and geophysical data acquisition followed by four weeks of data processing, interpretation and scientific communication. Students spend four weeks in the field learning basic geological and geophysical field techniques, participating in designing geophysical surveys, acquiring field data using different geophysical techniques such as gravity, seismic and geoelectrics. Then, they process, analyze and interpret the acquired data. Completion of weekly reports and final report and oral presentations are requried.
Prequisites: GEOP 320, Junior Standing

GEOP 495 Advanced Reservoir Characterization (3-0-3)
Reservoir modeling using software tools for statistical analysis of reservoir data, cluster analysis, semivariogram analysis and modeling, spatial interpolation (Kriging), tools for data integration in Kriging, stochastic simulation of rock-types (lithology), pay thickness, porosity, and permeability, use of geological models in flow simulation, and uncertainty assessment.
Prerequisites: Senior Standing

GEOP 497 Undergraduate Research (3-0-3)
This course introduces the undergraduate students to research projects during the junior and/or senior years. It will provide, at an early stage, an appreciation of research and real-world problem solving. Students may take either a well-defined role in an ongoing research project or initiate a project of their own in consultation with a faculty advisor.
Prerequisites: ENGL 214, Junior Standing, Approval of the Department

GLOBAL AND SOCIAL 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 424 Business Psychology (3–0–3)

Introduction to business psychology. Research and application of business psychology. Individual differences and the foundation and procedures of assessment. Psychological aspects of organizational processes related to employee selection and recruitment, job analysis, and performance measurement. Psychological health, wellbeing, and attitude toward work. Teams, leadership and other organizational dynamics.

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

GS 454 Anthropology of Travel (3–0–3)
Introduction of the social implications of travel; exploration of the origins, history, and contemporary development of human travel and its impacts for socio-cultural change of society; examination of multiple theories of travel and global mobility; travel accounts of great travelers and explorers as well as explaining various forms of human travel; investigating globalization and transnationalism and their links to society's capital and economic flow; implications of human travel for changing social boundary and identity; Arab diaspora across the world; Saudi Arabia as a global migrant destination.
Prerequisite: ENGL 102

GS 456 Science, Technology & Society (3–0–3)
Introduction to science, technology, and society. Theories of knowledge, science, and technology. Social and cultural aspects of science and technology. The social construction of scientific and technological realities. Controversies, rhetoric, and discourse in science and technology. Public participation in scientific and technological activities. The political economies of knowledge.
Prerequisite: ENGL 102

GS 457 Social Networks (3–0–3)
Introduction of the subject of social human connectivity through social organization and network analysis; foundations of social networks theory, the constructs of social networks, and transformative properties of networks; exploration of the science of social networks analysis, choice, and its limitations; the role of social capital and social capital's relationship to social networks; consideration of large and egocentric networks and the mapping and visualization of such networks.
Prerequisite: ENGL 102

GS 494 Special Topics I (3–0–3)
The course presents special topics within the disciplines of the Department. Topics are selected from either Cultural Anthropology, History, International Relations, Psychology, or Sociology. A detailed description and syllabus of the course is announced one semester in advance.
Prerequisite: ENGL 102

GS 495 Special Topics II (3–0–3)
The course presents special topics within the disciplines of the Department. Topics are selected from either Cultural Anthropology, History, International Relations, Psychology, or Sociology. A detailed description and syllabus of the course is announced one semester in advance.
Prerequisite: ENGL 102

GS 496 Special Topics III (3–0–3)
The course presents special topics within the disciplines of the Department. Topics are selected from either Cultural Anthropology, History, International Relations, Psychology, or

Sociology. A detailed description and syllabus of the course is announced one semester in advance.
Prerequisite: ENGL 102

HUMAN RESOURCES MANAGEMENT

HRM 301 Human Resources Management (3-0-3)
Covers all 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)
Provides an 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) will be studied. Emphasis will be placed on the processes of designing, administering, revising, and evaluating selection programs that comply with government regulation as well as add value to the organization. This course is designed for future human resource management professionals. Topics covered include legal guidelines, reliability, validity, utility analysis, evaluation of selection techniques.
Prerequisite: HRM 301

HRM 402 Training & Development (3-0-3)
Provides the students with 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. Courses activities will include discussions and individual and team problem solving skill activities in addition to normal classroom lectures.
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. In addition, 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)
Provides an opportunity to students to explore 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. It focuses on 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 111 Belief and its Consequences (2–0–2)

The roots 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 Reading and 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)

IAS 201 Writing for Professional Needs (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 Oral 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 106

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 106

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.
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 Genetic Algorithms with Neural Networks, Combination of Genetic Algorithms and Fuzzy Logic, Applications of Soft Computing (three to four real life applications).

Prerequisite: STAT 319, Senior Standing

ICS 490 **Special Topics I** **(3-0-3)**
State-of-the-art topics in Computer Science and Information Systems.
Prerequisite: Senior Standing.

ICS 491 **Special Topics II** **(3-0-3)**
State-of-the-art topics in Computer Science and Information Systems.
Prerequisite: Senior Standing

INDUSTRIAL AND SYSTEMS ENGINEERING

ISE 205 Engineering Probability and Statistics (3-0-3)
Data description and presentation. Basic concepts in probability. Random variables and probability distributions. Joint Probability Distributions. Covariance and correlation. Sampling distributions. Point estimation of parameters.
Prerequisite: Math 102

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 205 or STAT 319

ISE 307 Engineering Economic Analysis (3-0-3)
Introduction to concepts of economic decision-making from a cash flow viewpoint. 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: Junior Standing

ISE 315 Engineering Statistics (3-0-3)
Review for estimation. Statistical intervals using single and two samples. 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 or STAT 319

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.
Corequisite: ISE 315

ISE 321 Optimization Methods (3-0-3)
Formulation of engineering and planning problems as integer or nonlinear programs. Cutting planes and the branch and bound approach for IPs. Optimality conditions. Solution algorithms for unconstrained and constrained NLPs.
Prerequisite: ISE 303

ISE 324 Work and Process Improvements (2-0-2)
This course explains methods design and work measurement, process analysis, operation analysis, introduction to human engineering, standardization, work measurement, predetermined motion-time systems, standard data, and work sampling.
Prerequisite: ISE 205 or STAT 319

ISE 350 Begin Cooperative Work (0-0-0)

See contents in ISE 351.
Prerequisite: Same as in ISE 351

ISE 351 Cooperative Work (0-0-6)
Twenty Eight weeks of industrial training approved by the department. The student must submit a comprehensive report on his work during that period.
Prerequisite: ENG 214, Junior Standing

ISE 352 End Cooperative Work (0-0-0)
See contents in ISE 351.
Prerequisite: Same as in ISE 351

ISE 365 Information Systems for Industrial and Systems Engineering (2-3-3)
Introduction to spreadsheet application programming and database applications to make decision support for IE problems. Visual Basic applications programming fundamentals, procedures and functions. User forms, application development. Database design. Normalization in design. Introduction to tables, queries, and forms. Structured query languages. Generating reports. Course project.
Prerequisite: ICS 103

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 or STAT 319, ENGL 214, Junior Standing

ISE 399 Summer Training (0-0-0)
An 8-week program of industrial training approved by the department. The student must submit a report on his work during that period.
Prerequisite: ENG 214, Junior Standing or Approval of Department

ISE 402 Production Systems and Inventory Control (3-0-3)
Elements 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 or STAT 319, ISE 303 or (MATH 106, OM 210, OM 311 for KBS)

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 315

ISE 413 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, and employee based productivity improvement, productivity improvement programs, case studies and class project.
Prerequisite: ISE 324

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 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 426 Operations Research II (3-0-3)
Deterministic and probabilistic dynamic programming. Stochastic programming. Poisson process. Theory of queues. Markov Chains.
Prerequisite: ISE 303

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 430 Industrial Engineering in Healthcare Systems (3-0-3)
The course covers topics in healthcare management and operations improvement. The course will cover topics from healthcare prospective and application such as scheduling, simulation, data analysis, productivity, resource allocation, decision-making, etc. Students will become familiar with current methods and resources for implementing change in a health care setting, such as a hospital.
Prerequisite: Senior Standing, Approval of Instructor

ISE 440 Engineering Project Management (3-0-3)
This course deals with projects in engineering organizations including product development. Topics include project initiation; effective project management; project risk management project life cycle; planning and scheduling including PERT/CPM; resourcing; cost estimating; and project monitoring and control. Case studies and project management software.
Prerequisite: ISE 307

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 added activities, process identification, process architect & 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 324

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 315

ISE 464 Industrial Information Systems (2-3-3)
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 365

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.
Prerequisite: Junior Standing

ISE 468 Introduction to Machine Learning and Data Analytics (3-0-3)
An introduction to data analysis, clustering algorithms, classification algorithms, and R programming language.
Prerequisite: ISE 205 or STAT 319

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 e-commerce 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.
Prerequisite: ISE 402

ISE 472 Logistics and Transportation Systems (3-0-3)
This course deals with logistics and transportation issues in the supply chain. Topics covered include logistics management, design of distribution and logistics networks, Transportation systems, routing and scheduling in transportation and transportation and logistics information systems.
Prerequisite: ISE 402
Corequisite: ISE 426

ISE 480 Reliability and Maintainability (3-0-3)
Introduction to Reliability Engineering, hazard and reliability functions, analyzing reliability data, reliability prediction and modeling, fault tress construction and decision tables, maintainability, maintenance and availability, reliability improvement.
Prerequisite: ISE 315

ISE 482 Senior Design Project (1-6-3)
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: ISE 499

ISE 487 Predictive Analytics Techniques (3-0-3)
Characteristics of time series, trends, seasonality, noise, stationarity; Statistical background and model evaluation methods; Time series regression, variable selection and general linear regression; Exponential Smoothing and seasonal data; ARIMA based models including MA, AR, ARMA, ARIMA and SARIMA, Model validation and parameter estimation; Advance predictive analytics: Multivariate prediction, state space models, neural networks, spectral analysis and Bayesian methods.
Prerequisite: (MATH 405 or ISE 315), (ICS 103 or ICS 104)

ISE 491 Special Topics in Operations Research (3-0-3)
A course in an area of operation research reflecting current theory and practice.
Prerequisite: Approval of 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 Department

ISE 493 Special Topics in IE/OR (3-0-3)

A course in an area of reliability and maintenance reflecting current theory and practice.
Prerequisite: Approval of 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

ISE 499 Seminars (1-0-0)
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

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 105 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 106 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 102

MATH 208 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 225
Prerequisite: MATH 102

MATH 210 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.
Note: Not to be taken for credit with ICS 253
Prerequisite: MATH 102

MATH 225 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.
Prerequisite: MATH 102

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 225 or MATH 333
Prerequisite: MATH 201

MATH 310 Logic and Set Theory (3-0-3)
The Propositional Logic, First-order predicate calculus. Truth and Models. Soundness and Completeness for Propositional Logic. Deduction. Models of Theories. Interpretations. Soundness and Completeness Theorems for first-order logic. The Compactness Theorem. Nonstandard models. Naive Set Theory. Zermelo-Fraenkel Axioms. Wellorders and Ordinal Numbers. ON as a proper class. Arithmetic of Ordinals. Transfinite Induction and Recursion. Cardinality. Goodstein Sequences.
Prerequisite: MATH 210

MATH 315 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 π, 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 106

MATH 323 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 210 or (ICS 253, ICS 254)

MATH 325 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 225

MATH 333 Methods of Applied Mathematics I (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 201, MATH 202 or MATH 208

MATH 341 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 210 or ICS 253

MATH 353 Euclidean and Non-Euclidean Geometry (3-0-3)
Classical Euclidean and non-Euclidean geometries. Matrix representations of transformations in R3. Isometries. Transformation and symmetric groups. Similarity and affine transformations.
Prerequisite: MATH 210

MATH 371 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 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. The student may do his summer training by doing research and other academic activities.
Prerequisite: ENGL 214, Junior Standing, Approval of the Department

MATH 423 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 323

MATH 424 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 323

MATH 427 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 210 or Senior Standing

MATH 432 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 208 or MATH 225 or MATH 302

MATH 433 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 333

MATH 434 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 or MATH 208

MATH 435 Ordinary Differential Equations (3-0-3)
First order scalar differential equations. Initial value problems. Existence, uniqueness, continuous dependence on initial data. Linear systems with constant coefficients. The exponential matrix. Asymptotic behavior of linear and almost linear systems. Two

dimensional autonomous systems. Critical points and their classifications. Phase plane analysis. Introduction to the theory of Lyapunov stability.
Prerequisite: (MATH 202, MATH 225) or MATH 208

MATH 437 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 333

MATH 441 Advanced Calculus II (3-0-3)
Theory of sequences and series of functions. Real functions of several real variables: limit, continuity, differentiability. Taylor's theorem. Maxima and minima, Lagrange multipliers rule. Elementary notion of integration on RN. Change of variables in multiple integrals, Fubini's theorem. Implicit and inverse function theorems. Convergence and divergence of improper integrals- Differentiation under the integral sign.
Prerequisite: MATH 341

MATH 443 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 R^n. Line and surface integrals. Green's theorem. Divergence theorem. Stokes' theorem.
Prerequisite: MATH 441

MATH 445 Introduction to Complex Variables (3-0-3)
The theory of complex analytic functions, Cauchy's integral theorem, contour integrals, Laurent expansions, the residue theorem with applications, evaluation of improper real integrals and series, conformal mappings.
Prerequisite: MATH 201

MATH 451 Differential Geometry (3-0-3)
Curves in 3-dimensional Euclidean space: the Frenet frame and formulae, curvature and torsion, natural equations. Surfaces in 3-dimensional Euclidean space: tangent plane, first fundamental form and isometries, second fundamental forms, normal and principal curvatures, Gaussian and mean curvatures, geodesics. Geometry of the sphere and the disc (with Poincare metric).
Prerequisite: MATH 208 or MATH 225 or MATH 302

MATH 453 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. Complete metric spaces.
Prerequisite: MATH 341

MATH 463 Combinatorics (3-0-3)
Enumerative techniques, Recurrence relations, Generating functions, Principle of inclusion-exclusion, Introduction to graph theory, selected topics (e.g. Ramsey Theory, Optimization in graphs and networks, Combinatorial designs, Probabilistic methods.)
Prerequisite: MATH 201

MATH 467 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 208 or MATH 225 or MATH 302

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 371 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 371 or CISE 301

MATH 474 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: MATH 201

MATH 475 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 225 or MATH 302

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. Students are expected to do research on a mathematical problem of their choice or the instructor's. 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 student of at least one written report on a selected topic or problem, reflecting some

independent work and evidence of familiarity with the mathematical literature. With the permission of the instructor, students may work with other faculty members in the preparation of written reports.
Prerequisite: Any two of {MATH 323, MATH 333, MATH 341, MATH 371}

MATH 498 Topics in Mathematics I (1-3, 0, 1-3)
Variable contents. Open for Senior students interested in studying an advanced topic in mathematics.
Note: May be repeated for a maximum of three credit hours total.
Prerequisite: Senior Standing, Permission of the Department Chairman upon recommendation of the instructor.

MATH 499 Topics in Mathematics II (1-3, 0, 1-3)
Variable contents. Open for Senior students interested in studying an advanced topic in mathematics.
Note: May be repeated for a maximum of three credit hours total.
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

ME 203 **Thermodynamics I** **(3-0-3)**
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

ME 204 **Thermodynamics II** **(3-0-3)**
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: ME 307, 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 333, 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 perquisite 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 315 or CHE 300

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 458 Design of Thermo-fluid Systems (3-0-3)
Application of Thermodynamics, mechanical engineering design, fluid mechanics, and heat transfer in the design of thermo-fluid systems. Introduction to system-oriented design methods. Thermo-fluid system component analysis, selection and design. Component and system modeling, simulation, economics and optimization.
Prerequisite: ME 315 or CHE 300

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 or CHE 300

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-Salvary 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 333

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.

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)
Explores 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 313 International Legal Environment (3-0-3)
International business law through an examination of general rules, cases and contemporary legal problems. Topics include sale contracts, international arbitration, regulation of international trade; protection and licensing of intellectual property; and

the legal ramifications of regional and economically integrated trade organizations, including the World Trade Organization, and other multinational trade bodies. Discussion of various international bodies and agreements that affect international trade, including international labor laws, environmental, and climate change agreements.

MGT 350 Begin Cooperative Work (0-0-0)
See contents in MGT 351.
Prerequisite: Same as in MGT 351

MGT 351 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: MGT 355, 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 355 Business Research Methods (3-0-3)
Consists of modules, which cover the fundamentals of research plan, literature review, and qualitative and quantitative methods. The course first emphasizes the research process and the importance of the literature review. It then focuses upon the appropriateness of specific research methods. Students are encouraged to critically evaluate different strategies and methods by identifying both the strengths and weaknesses of qualitative and quantitative methods. Overall, this course equips students with the skills and expertise to develop and implement a research study
Prerequisite: STAT 212, ENGL 214

MGT 413 International Management (3-0-3)
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)
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)

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 teams and will be required to make decisions and strategic choices about the long-term direction of organizations and to justify those decisions and choices through oral and written communication. Case studies and analysis will be used extensively. Specific topics include mission and vision, internal and external assessments, strategies and strategic choices, and strategies in the international environment, and strategy implementation. Instructional techniques include cases, teamwork, and oral and written presentations

Prerequisite: MGT 301

MGT 450 Management of Innovation and Change (3-0-3)

Covers two interrelated dimensions: Innovation and Change. The focus is on the need to keeping introducing innovations and organizational changes with the view to upgrade individual and organizational performance whatever the industry or sector the public and private firm is in. The course will allow students to learn how to manage new ideas, products, and processes and implement new methods of organization. It enhances teamwork, knowledge sharing and innovativeness.

Prerequisite: MGT 301

MGT 495 Special Topics in Management (3-0-3)

Focuses on specific areas of management that reflect contemporary topics not covered by the listed courses.

Prerequisite: MGT 301

MANAGEMENT INFORMATION SYSTEMS

MIS 101 Business Computing (1-2-2)
Introduction to business computing concepts. Topics include business applications and problem solving using high-level programming languages; development of web-based and mobile applications; use of business software with emphasis on database queries and reports; spreadsheet and financial and statistical functions. Concepts are reinforced through practical exercises from real world domains.

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.
Prerequisite: MIS 101 or ICS 102

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

MIS 301 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 or MIS 101

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 System (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 341 Introduction to Data Analytics (2-2-3)
Introduction and scope to business data analytics. Topics include data pre-processing, use of analytical methods, multidimensionality of data, knowledge discovery, data visualization, application of business analytics tools, descriptive analytics, and application of decision support and intelligent systems.
Prerequisite: MIS 215, STAT 212

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)
Twenty-eight weeks of practical training in MIS 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 addressing a business problem related to his coop experience under the supervision of a faculty member in accordance with university regulations.
Prerequisite: ENGL 214, MIS 311, 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 380 IS Security (3-0-3)
Introduce important aspects of IS security, with the focus on common threats to IS and ways to prevent security breaches or information loss. Topics cover techniques, methods, and strategies used by information security professionals to manage security breaches and threats. Overview of information security and managerial methods of analyzing security threats, authentication, cryptography, and web, database and network security methods.
Prerequisite: Junior Standing

MIS 400 Digital Business Project (2-2-3)
Apply conceptual knowledge and technical skills of Digital Business / E-Commerce to a digital business initiative. Team based project course with lecture and labs sessions covering the topics on digital entrepreneurship, digital business applications, current trends in mobile and digital commerce. Design and operate a digital business Enhance the skills set of the students and prepare them for the knowledge economy.
Prerequisite: MIS 300 or Consent of Instructor

MIS 405 IS Project Management (2-2-3)
Examine the application and integration of the project management body of knowledge (PMBOK). The focus is on project management tools and techniques for defining and managing the project's goal, scope, schedule, and budget as well as completing a comprehensive system development where students will develop a business application that meets a set of business requirements using a programming language. Topics include quality management, risk management, and knowledge management as they relate to IS projects.
Prerequisite: MIS 301, MIS 311

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 442 Data Analytics Applications (3-0-3)
Fundamentals of data science and analytics. The use of data, statistical and quantitative analysis to inform business decisions and actions. Topics include classification analysis, multi-criteria decision making, logistic regression, naïve Bayes, nearest neighbors, association rules, neural network and recommender systems. Application of data analytics to different business problems.

Prerequisite: MIS 341

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: Senior Standing

MIS 495 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 313 Marketing for Entrepreneurs (3-0-3)
Introduction to marketing in an entrepreneurial context. Provides appropriate theories, models and other tools to build key marketing skills and to facilitate improved decision-making in relation to launching and managing an entrepreneurial venture. The course activities include idea generation, new product/service development, business modelling, and marketing plan. This course is open to all majors in the University.
Note: Not open for credit to Business Students
Prerequisites: Junior standing

MKT 345 Marketing Research (3-0-3)
A senior level course which emphasizes the applications of marketing research tools to address marketing management problems. Key topics covered include research design, sampling methods, questionnaire design, field work/use of digital media for data collection, basic data analysis, advanced marketing analytics (linear and multivariate), and effective communication of research results via written reports and oral presentation. A key feature of the course involves students undertaking empirical marketing research projects, which seek to provide relevant recommendations to address managerial problems.
Prerequisite: MKT 250, MGT 355

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: MKT 345, 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 390 New Product Development (3-0-3)
Developing new products is at the core of any business organization. New products determine the survival and continued success of any organization. Focuses on identifying market opportunities by understanding customer needs and developing new products that would provide high value to customers. The course addresses the new product development process, including, idea generation, customer needs, new product diffusion, concept generation, concept evaluation and testing, and product launch strategies. The course takes a project based learning approach in creating a new product.
Prerequisite: MKT 250

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 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)
Adopts a problem solving orientation and an integrated view of marketing strategy implementation. Emphasis will be placed on topics relating to corporate and business strategy, segmentation, targeting and positioning, ethical and social issues in customer management, value chain strategy and the effective application of marketing mix elements (product/brand, pricing, distribution, promotion/sales strategies) to meet the needs of various customer segments. The effective implementation of marketing strategy will also be given a strong emphasis.
Prerequisite: MKT 250

MKT 460 Advertising (3-0-3)
Examines the role of advertising in the marketing program. Adopts a communication-theory perspective to management of advertising 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 on 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. Others are the roles and responsibilities of the Sales Manager related to planning, implementing, and controlling the firm's personal selling function, analysis and design of sales territories, recruitment, selection, training, motivation/compensation of sales personnel, evaluation of sales performance, and ethical issues in sales and sales force management.
Prerequisite: MKT 250

MKT 485 Digital Marketing (3-0-3)
The internet and digital media play a very significant role in today’s business world. Focuses on the role of marketing in a digital world. Digital marketing has become an integral part of marketing strategies for creating value, acquiring, and retaining customers. The course addresses marketing research and consumer behavior online,

segmentation, targeting and positioning, the digital marketing mix, owned media, earned media, and paid media. Effective use of different digital vehicles like websites, email, blogs, mobile, and different social media platforms (e.g. Twitter, Facebook, Instagram, YouTube, LinkedIn etc.) will be addressed.
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, developing business-to-business marketing strategy, roles of product strategy, managing innovations and new industrial products, managing services for business markets, supply chain. Other topics are personal selling, promotion, distribution, pricing strategies and the measurement of marketing performance.
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 201 Statistic Methods for Management I (3-0-3)
Frequency tables; histogram; measures of central tendency and dispersion; correlations as a descriptive measure; probability theory; sampling; probability descriptions; estimation and confidence intervals; applications for managerial decisions.
Note: Equivalent to STAT 211 and to be cross listed with it
Prerequisite: MATH 105

OM 202 Statistic Methods for Management II (3-0-3)
Hypothesis testing for means and variances; index numbers and time series; linear simple and multiple regression and correlation analysis; the chi-squared and F distributions and their applications.
N**ote:** Equivalent to STAT 212 and to be cross listed with it
Prerequisite: OM 201

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 311 Business Analytics (3-0-3)
Introduction to business analytics. Decisions theory, linear programming, simplex method and duality, integer programming, goal programming, network models, maximal flow problem, simulation and sensitivity analyses. Emphasis on using spreadsheet modeling in solving problems. Introduction of data mining and its application for decision-making.
Prerequisite: STAT 212

OM 320 Introduction to Supply Chain Management (3-0-3)
Foundations of Supply Chain Management (SCM) and its role in the operations of the organization. SCM strategies, order fulfillment, demand forecasting, inventory management, logistics, facility location, network design, sourcing, supplier relationship management, and global supply chain management. In addition, the course addresses developments in Supply Chain Management, such as optimization, Lean, and integration.
Prerequisite: MGT 301, OM 210

OM 321 Procurement and Supplier Relationship Management (3-0-3)
Purchasing and Supply Management, Supply organization and strategy, Make or Buy decisions, Insourcing and Outsourcing, Needs Identification, Specification and Standardization, Quality, Inventory and Delivery Issues, Price and Cost Analysis, Cost Management, Sourcing , Supplier Selection and Evaluation, Contracting, Negotiations, Types of Compensation, Supplier Relationships, Global Supply Management, Legal and Ethical Considerations, Evaluation of the Supply Function and Trends, Supply Management Integration.
Prerequisite: Junior Standing

OM 322 Inventory and Warehouse Management (3-0-3)

Purpose of Inventory, Inventory Costs, Types of Stock, Electronic Data Interchange, Automatic Identification Systems, Inventory Performance Ratios and Analysis, Forecasting, Planning and Replenishment, Inventory Control Models, Economic Order Quantity, Material Requirements Planning, Enterprise Resource Planning, Cycle Counting, A-B-C Analysis, Just In Time System, The Bullwhip Effect. Types of Warehouses, Quantitative Methods for Warehouse Location and Layout Design, Material Flow Planning, Cross-Docking and other New Warehouse Functions.
Prerequisite: OM 210

OM 323 Logistics and Transportation Management (3-0-3)
Function of Logistics and Transportation in Supply Chains, Global Supply Chains, Responsive Supply Chains, Lead-Time Management, Just-in Time Systems, Network Design, Transportation models, Classification of Freight, Shipping Documentation, Packaging and Handling Issues, Measuring Logistics Costs and Performance, Service Logistics, Managing Risk in the Supply Chain, Revise Logistics, Closed-Loop Supply Chains, Green Logistics, Sustainable Supply Chains, Logistics Information Systems and Technologies.
Prerequisite: 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, and inventory management.
Prerequisite: OM 210, OM 311

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 311

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 101 Introduction to the Petroleum Industry (2-0-2)
Overview of petroleum technology and its importance to society. History of the petroleum industry. Overview of petroleum exploration, drilling and production. Future energy demand and supply. Alternative energy. Oil economics. Engineering ethics and professionalism. Health, safety, environment and social responsibility.

PETE 202 Phase Behavior (3-0-3)
Introduction to the first and second laws of thermodynamics with applications. Phase behavior of pure hydrocarbons. Phase behavior of binary and multi-component hydrocarbon systems: P-V, P-T and P-composition diagrams. Phase equilibrium.
Prerequisite: PHYS 102

PETE 206 Rock and Fluid Properties (3-3-4)
Basic petrophysical properties of reservoir rock-fluid systems such as porosity, permeability, fluid saturation, electrical conductivity, capillary pressure, and relative permeability. Applications of Darcy's law to flow in porous media. Estimation of properties of reservoir fluids under various conditions of pressure and temperature. Vapor-liquid equlibria and crude oil separation calculations. Laboratory measurement of various reservoir rock and fluid properties.
Prerequisite: PETE 202

PETE 301 Reservoir Engineering (3-0-3)
The general material balance equation and its application. Initial oil and gas in place. Steady and unsteady-state water influx models. Fractional flow and the theory of immiscible displacement. Areal and vertical sweep efficiencies and waterflood performance prediction.
Prerequisite: PETE 206

PETE 302 Well Completion (3-0-3)
Subsurface operations needed to prepare the well for production after being drilled and cased. Well completion designs based upon reservoir, mechanical and economic considerations. The production system. Subsurface production control. Completion and work-over fluids. Perforation, remedial cementing, sand control, and well stimulation operations.

PETE 306 Well Testing (3-0-3)
Basic theory and modern practices and applications of well testing. Derivation of diffusivity equation and its solutions for slightly compressible fluids within infinite- and finite-acting systems. Introduction to the principles and techniques of well testing and evaluation using conventional and modern well test analysis. Well test design and instrumentation.
Prerequisite: PETE 301

PETE 311 Drilling Engineering (3-3-4)
Description of rotary drilling systems and operations. Drilling fluid formulation and conditioning. Drill String Design and drilling bits. Casing design, landing and cementing practices. Optimization of drilling parameters, well control and drilling hydraulics. Directional

drilling, horizontal drilling, deviation control, offshore drilling and equipment, drilling problems and economics. Laboratory sessions cover drilling fluids and cement formulation and testing. Simulation of drilling operations and control.
Prerequisite: CE 202

PETE 313 Well Logging (3-0-3)
Introduction to modern well logging techniques. Open-hole and cased-hole log interpretation methods. Production logging. Concepts of logging program design.
Prerequisite: PHYS 102

PETE 315 Reservoir Description (3-3-4)
Principles and techniques of petroleum reservoir description. Subsurface data from geological and engineering sources. Random variables and probability distributions. Linear and non-linear regression. Univariate and bivariate descriptions. Measures of heterogeneity. Estimation techniques. Kriging and sequential Gaussian simulation. Contour and image maps and cross-sections. Averaging and scale up of reservoir properties. Correlation of saturation functions. Deterministic and probabilistic reserve estimation methods. The lab sessions will be devoted to problem solving using statistical, geostatistical and reserve estimation softwares.
Prerequisite: PETE 313

PETE 399 Summer Training (0-0-1)
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.
Prerequisites: ENGL 214, PETE 302, Junior Standing

PETE 402 Reservoir Simulation (2-3-3)
Introduction to the basic theory and practices in reservoir simulation. Formulation of equations governing single phase and multi-phase flow in porous media. Use of finite difference methods to solve ordinary and partial differential equations. Solution techniques of linear equations. Applications using a black oil simulator
Prerequisites: PETE 301, PETE 315

PETE 403 Petroleum Production Engineering (3-0-3)
Introduction inflow and outflow performance. Multi-phase flow in pipes. Nodal analysis and production optimization. Artificial lift with emphasis on electric submersible pumps and gas lift systems. Oil and water treatment and separation processes. Design and economic applications.
Prerequisite: CHE 204

PETE 406 Improved Oil Recovery (3-0-3)
Introduction to current techniques of improved oil recovery. Principles of thermal recovery chemical flooding, and miscible gas displacement methods and performance prediction.

Advantages and drawbacks of each displacement methods. Selection criteria for target reservoirs.
Prerequisite: PETE 301

PETE 407 Petroleum Economics (3-0-3)
Introduction to the standards and practices of economic analysis in the petroleum industry. Review of 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: Senior Standing

PETE 408 Seminar (0-2-1)
Preparation of technical presentations. Use of visual aids, platform and vocal techniques. Student presentations on selected subjects. Attendance of Departmental and SPE local chapter seminars is required
Prerequisite: Senior Standing

PETE 409 Artificial Lift (3-0-3)
Artificial lift methods in oil wells. Basic theoretical and design aspects. Gas lift, electric submersible pumping, and sucker-rod pumping systems. Principles of multi-phase flow integrated with system performance and coupled with in inflow performance. Well performance prediction.
Prerequisite: PETE 302

PETE 410 Natural Gas Engineering (3-0-3)
Methods to estimate gas reserves for volumetric and water-drive gas reservoirs. Performance analysis of gas-condensate reservoirs. Derivation of the basic flow equations for real gas and their solutions and applications. Analysis of gas well testing, including hydraulically-fractured gas wells. Deliverability testing of gas wells. Decline-curve analysis. Estimating static and flowing bottomhole pressures. Fundamentals of gas treatment processes and equipment. Gas flow rate measurement. Gas compression and transmission. Field development plans.
Prerequisite: PETE 306

PETE 412 Formation Damage (3-0-3)
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. Techniques used to diagnose damage and remediate its effects.
Prerequisite: Senior Standing

PETE 417 Surface Facilities (3-0-3)
Processes for the gathering system, fluid treatment, transportation, measurements and storage of produced fluid. Operation and design of oil, gas and water surface handling and processing

facilities. Gas/oil separation, oil sweetening and de-emulsification, produced water treatment, gas treatment, and pipe system.
Prerequisites: CHE 204, PETE 206

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, Kick causes and indicators, shut-in methods, well control methods, and equipment. Theoretical aspects are demonstrated using well control simulators.
Prerequisites: PETE 311

PETE 424 Rock Mechanics (3-0-3)
Rock mechanics as an essential tool in petroleum engineering. 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. Sand production. Brief introduction to hydraulic fracturing, reservoir compaction and surface subsidence.
Prerequisite: Senior Standing

PETE 431 Reservoir Management (3-0-3)
Introduction to techniques that utilize geological, geophysical and petroleum engineering data to predict and manage the behavior of hydrocarbon reservoirs. Field operating plans to optimize profitability: principles of planning, implementing, monitoring, and evaluating reservoir performance. Real case studies.
Prerequisite: PETE 301

PETE 432 Water Flooding (3-0-3)
Introduction to basic theoretical and design aspects of water flooding processes. Review of capillary phenomena and relative permeability characteristics of reservoir rocks. Theory of immiscible displacement including piston-like and frontal advance mechanisms. Injectivity analysis and performance prediction of linear and pattern floods including heterogeneous reservoirs. Problems encountered in water flooding projects such as scaling.
Prerequisite: PETE 301

PETE 453 Production Logging (3-0-3)
Identification of undesired changes in well performance to propose suitable solutions. Various open-hole and cased-hole production logging techniques and tools: Flowmeter, Gradiomanometer, cement evaluation, noise and temperature, thermal decay time, reservoir saturation, formation resistivity. Field examples in vertical and horizontal wells.
Prerequisite: PETE 313

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

PETE 495 Directed Undergraduate Research (3-0-3)

A supervised research project on a theoretical, experimental or simulation problem. It provides the undergraduate student the opportunity for faculty mentorship, active learning, and a chance to create new knowledge. The instructor conducting the course submits a detailed program of the research work with deliverables and grading policy in the preceding semester for Department approval.

Prerequisite: Consent of Instructor

PHYSICS

PHYS 101 General Physics I (3-3-4)
Particle kinematics and dynamics; conservation of energy and linear momentum; rotational kinematics; rigid body dynamics; conservation of angular momentum; simple harmonic motion; gravitation; the statics and dynamics of fluids.
Corequisite: MATH 101

PHYS 102 General Physics II (3-3-4)
Wave motion and sound; temperature, first and second law of thermodynamics; kinetic theory of gases; Coulomb's law; the electric field; Gauss's 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)
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 203 Electrical and Magnetic Properties of Materials (3-0-3)
Electronic structure of isolated atoms; atoms bonding, crystal structure, energy bands in solids; 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.
Prerequisite: PHYS 102

PHYS 204 General Physics III (3-0-3)
Inductance; magnetic properties of matter, electromagnetic oscillations and waves; geometrical and physical optics. Relativity, introduction to quantum physics, atomic physics, solids, nuclear physics, particle physics and cosmology.
Prerequisite: PHYS 102, MATH 102

PHYS 205 General Physics III LAB (0-3-1)
This is the Lab component of General Physics III. It consists of selected experiments in electrical circuits, geometrical and physical optics as well as modern physics.
Corequisite: PHYS 204

PHYS 210 Methods of Theoretical Physics (3-0-3)
Vector Calculus, Matrix algebra, Fourier Series and Transforms, Functions of a complex variable; Contour integration and Residue theorem; Orthogonal Polynomials; Partial differential equations; Introduction to tensors.
Note: Not to be taken for credit with MATH 333 or Math 302
Corequisite: MATH 202

PHYS 213 Modern Physics (3-0-3)
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 from molecular Physics, solid state physics, nuclear physics, elementary particle physics, and cosmology.
Prerequisite: PHYS 102

PHYS 215 Introduction to Astronomy (3-0-3)
Celestial mechanics; the solar system; stellar measurement; stellar magnitudes and spectra; galaxies; cosmology, Light and Telescopes, Parallaxes, Early and Modern History of Astronomy including contributions of Arab and Muslim Scientists.
Prerequisite: PHYS 102

PHYS 234 The Physics of How Things Work (3-0-3)
Selected topics from materials engineering, nuclear physics, aerodynamics, energy, electronics, communications, biological systems, terrestrial and celestial natural systems.
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; energy storage and distribution; automotive transportation.
Prerequisite: PHYS 102

PHYS 271 Introduction to Special Relativity (3-0-3)
Properties of space-time; the Lorentz transformation; paradoxes; four vector formulations of mechanics and electromagnetism.
Prerequisite: PHYS 102

PHYS 300 Classical Mechanics I (4-0-4)
Newton's laws of motion and conservation theorems, Forced damped Oscillations; Coupled Oscillations; Lagrangian Dynamics, Hamilton's equations of motion; Central-force motion; Dynamics of systems of particles, Motion in a non-inertial reference frame, Dynamics of Rigid bodies including properties of Inertia tensor.
Prerequisite: PHYS 101, PHYS 210 or MATH 333 or MATH 302

PHYS 302 Classical Mechanics II (3-0-3)
Lagrangian formalism in the study of Euler equations for rigid body motion and coupled oscillations; continuous systems and waves; special theory of relativity and relativistic kinematics; Hamiltonian dynamics, Poisson Brackets and conserved quantities, introduction to chaos.
Prerequisite: PHYS 300

PHYS 305 Electricity and Magnetism I (3-0-3)
Electrostatics; Laplace and Poisson's equations; Dielectric media, Magnetostatics and magnetic fields in matter; Electrodynamics.
Prerequisite: PHYS 102, PHYS 210 or MATH 333 or MATH 302

PHYS 306 Electricity and Magnetism II (3-0-3)
Conservation Laws; Electromagnetic waves; Diffraction and scattering; Potentials and fields, Electromagnetic radiation, Relativity and relativistic electrodynamics.
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 204 or PHYS 213

PHYS 308 Electronics (3-3-4)

Physics of semi-conductors; junction transistors; amplifiers; feedback circuits; oscillators; nonlinear devices; digital electronics; digital logic; counters and registers; analog-to-digital converters.

Prerequisite: PHYS 205

PHYS 309 Experimental Physics (1-3-2)

Curve fitting processes; fundamentals of the theory of statistics; evaluation of experimental data; estimation of errors; computer interfacing and data acquisition. Selected experiments in physics will be performed in conjunction with lecture material.

Prerequisite: PHYS 308

PHYS 310 Quantum Mechanics and Applications I (3-0-3)

Fundamentals of non-relativistic quantum mechanics. Mathematical tools and basic postulates of Quantum Mechanics. The Schrödinger equation and its applications to various one-and three dimensional systems. Spin and identical particle effects. Addition of angular momenta.

Prerequisite: PHYS 213, PHYS 300

PHYS 311 Optics (3-0-3)

Nature and propagation of light; image formation-paraxial approximation; optical instruments; superposition of waves; standing waves; beats; Fourier analysis of harmonic periodic waves and wave packets; two-beam and multiple-beam interference; polarization; Fraunhoffer and Fresnel diffraction; holography; lasers.

Prerequisite: PHYS 204

PHYS 315 Astrophysics (3-0-3)

Stellar positions, size, luminosity, spectra. 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 204 or PHYS 213

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; Computers will be used in simple criticality calculations and reactor kinetics.

Prerequisite: PHYS 102, MATH 202

PHYS 353 Radiation and Health Physics (3-3-4)

Introduction to atomic and nuclear structure, Radioactivity, Properties of ionizing radiation, interaction of radiation with matter, detection methods, dosimetry, biological effects of radiation, external and internal radiation protection.

Prerequisite: PHYS 102

PHYS 365 Introduction to Medical Physics (3-0-3)
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: PHYS102, MATH 202

PHYS 373 Introduction to Computational Physics (2-3-3)
Computer simulation of physical systems; 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 371 or CISE 301
Prerequisite: PHYS 204 or PHYS 213, 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. Students are required to submit a report and make a presentation on their summer training experience and the knowledge gained. The student may also do his summer training by doing research and other academic activities.
Prerequisite: ENGL 214, Junior Standing, Approval of Department

PHYS 403 Senior Physics Lab (0-6-2)
Students are introduced to some experiments that are 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 is stressed.
Prerequisite: PHYS 309

PHYS 405 Physics Project Laboratory (1-6-3)
A laboratory course which offers an opportunity for students to carry out experimental projects, based on their special interests and ideas to study physical phenomena. Faculty help students determine the feasibility of proposed projects.
Prerequisite: Senior Standing

PHYS 410 Quantum Mechanics and Applications II (3-0-3)
Time-independent perturbation theory. The variational method and its applications; WKB Approximation, The adiabatic approximation, Time-dependent perturbation theory. Scattering Theory. Approximate solutions of several Schrödinger equations obtained via computer packages.
Prerequisite: PHYS 310

PHYS 413 Advanced Optics (3-0-3)
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 306, PHYS 311

PHYS 414 Physics of Lasers (3-0-3)
Stimulated emission and coherence; population inversion; Gaussian beam propagation; optical resonators and cavity modes; stability criteria; phase conjugate resonators; oscillation

threshold and gain; line broadening; gain saturation; density matrix formulation and semi-classical theory of laser; lasers without inversion; mode-locking and pulse compression.
Prerequisite: PHYS 213, PHYS 311

PHYS 416 Cosmology and the Early universe (3-0-3)
Relativity, Gravitational phenomena, Cosmological models, Thermal history of the universe, Cosmic Inflation, Cosmic Microwave Background, Cosmic Structures and Dark Matter.
Prerequisite: PHYS 204 or PHYS 213, MATH 202

PHYS 417 Introduction to General Relativity (3-0-3)
Review of Special Relativity, Tensor Calculus and Spacetime curvature, Equivalence Principle, Einstein Field Equations and their spherical solution, Black Holes; Experimental Tests of General Relativity
Prerequisite: PHYS 306 or Consent of Instructor

PHYS 422 Nuclear and Particle Physics (3-0-3)
Nuclear properties, forces between nucleons, nuclear models, radioactive decays and detectors, nuclear reactions, accelerators. Selected Applications.
Prerequisite: PHYS 310

PHYS 430 Thermal and Statistical Physics (4-0-4)
Concepts of temperature, laws of thermodynamics, entropy, thermodynamic relations, free energy. Applications to phase equilibrium, multicomponent systems, chemical reactions, and thermodynamic cycles. Introduction to Kinetic theory and transport phenomena. Introduction to Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics.
Prerequisite: PHYS 213

PHYS 432 Introduction to Solid State Physics (3-0-3)
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 310

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. Preparation of clean surfaces; experimental methods such as XPS, UPS, Auger, and LEED; thin films; surface states; temperature effects.
Prerequisite: PHYS 432

PHYS 435 Superconductivity (3-0-3)
The two-fluid model, electrodynamics of superconductors. Thermodynamics of phase transition in type I and type II superconductors. Landau-Ginzburg phenomenological theory of type II superconductors: coherence length, vortices, Abrikosov vortex lattice, critical fields and vortex flow dynamics. The microscopic theory of BCS, electron pairing.
Prerequisite: PHYS 432

PHYS 441 Particle Physics (3-0-3)
Symmetries and conservation laws; the quark model, Bound States, Feynman diagrams; Selected topics in Quantum Electrodynamics, Weak Interactions, Quantum Chromodynamics, and Gauge theories. Survey of particle accelerators and particle detectors.

Prerequisite: PHYS 310

PHYS 442 Relativistic Quantum Mechanics (3-0-3)
Relativistic spin zero particles and the Klein-Gordon equation; relativistic spin one-half particles and the Dirac equation; propagator theory; Selected Applications.
Prerequisite: PHYS 410

PHYS 451 Nanophysics and Nanotechnology (3-0-3)
Physical concepts, techniques and applications of nanoscale systems. Quantum Mechanics in the nano-regime. Special properties of Nano-materials: nano-slabs, nano-wires and quantum dots. Magnetism at the nano-level and characterization techniques
Prerequisite: PHYS 213

PHYS 461 Introduction to Plasma Physics (3-0-3)
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 471 Introduction to Quantum Computing and Quantum Information (3-0-3)
Review of relevant Quantum Mechanics concepts including linear vector spaces, Entanglement, the EPR paradox, and Bell's inequality. Quantum Computation including the qubit, quantum gates and search algorithms. Quantum Communication including cryptography and teleportation. Overview of some experimental implementations.
Prerequisite: PHYS 213

PHYS 493 Selected Topics in Physics (3-0-3)
Selected topics of special interest to students. This course may be repeated for credit as an in-depth investigation of a single topic or as a survey of several topics.
Prerequisite: Consent of Instructor

PHYS 497 Undergraduate Research I (0-0-3)
The Student is trained in the process of carrying out scientific research under the supervision of a faculty member. This includes carrying out literature search, writing research proposal, and conducting experimental or theoretical research. The student is expected to present his work at the end of the semester.
Prerequisite: Senior Standing

PHYS 498 Undergraduate Research II (0-0-3)
This is a continuation of PHYS 497. The student carries out research, writes a thesis, and defends it at the end of the semester.
Prerequisite: PHYS 497

PHYS 499 Seminar (1-0-1)
Students have the opportunity to present and attend seminars on topics of current research interest.
Prerequisite: Senior Standing

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 computing systems; Using online learning management systems; Word processing; Numerical data analysis using spreadsheets; Preparing presentations; Introduction to computer networks; Computing ethics; Computational thinking skill by developing algorithms and visual programs.

PYP 003 Life Skills (0-2-1)

This course covers skills needed in student’s life such as thinking skills, goal setting, time management, team building and leadership, presentation skills, problem solving and decision-making skills. The complex problem-solving method is used as a model to expose students to the above mentioned life skills.

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.

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 214 Statistical Methods for Actuaries (3-2-4)

Descriptive Statistics: Graphical and numerical measures. Elementary 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 220 Statistical Computing Software (2-2-3)

Statistical computation with major statistics packages used in academics and industry: data structure, entry, and manipulation; numerical and graphical summaries; basic statistical methods; exploratory data analysis, simulation-based methods, selected advanced methods.

Prerequisite: STAT 201 or STAT 212 or STAT 214 or STAT 319

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 214 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 214 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 Categorial 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 436 Generalized Linear Models (2-2-3)
Nonlinear, Poisson and Logistic regression. Linear models. Multivariate Normal and the distribution of Quadratic forms. Link function. The generalized linear model. Estimation (Estimation of Full and reduced rank models. OLS, GLS, ML and Quasi-likelihood. Fisher Scoring). Evaluation of Models (Including Deviance Residuals). Inference (Gauss-Markov theorem. Wald test). Computational aspects and Computer applications for categorical and continuous data.
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