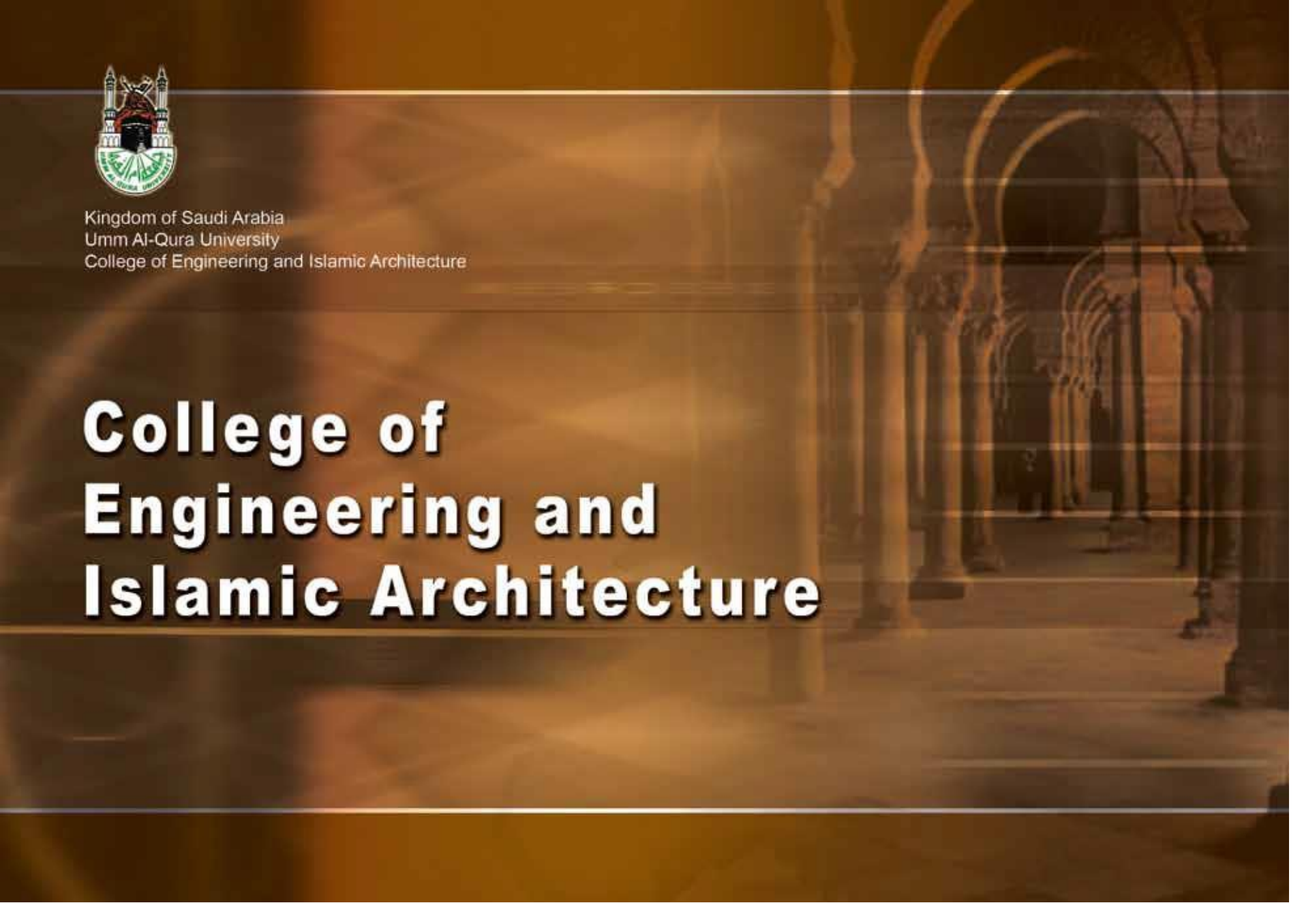


Kingdom of Saudi Arabia
Umm Al-Qura University
College of Engineering and Islamic Architecture

College of Engineering and Islamic Architecture

Umm Al-Qura University

In 1949 (1369H) King Abdul Aziz established the College of Shari`a (Islamic Law) in Makkah Al-Mukarramah, making it the first higher education institution in the country. It constituted the kernel of Umm Al-Qura University and its most prominent college. Henceforward, the establishment of higher education institutions continued. Among them, Umm Al-Qura University is distinguished by its unique location in the Holy City, and it›s academic reputation in the fields of Islamic studies and scientific and applied disciplines.

The Development of Umm Al-Qura University

The religious, historical and cultural significance of the Kingdom of Saudi Arabia gives it a leading role among the countries of the Islamic world. Millions of Muslims flow to it to perform the Haj (pilgrimage) or Umrah or visit the mosque of the Prophet - peace and blessings be upon him. Muslims all around the world say their prayers facing the holy Ka›ba of Makkah everyday. Commitment to Islam and adherence to Islamic Shari›a has always been central to the Kingdom›s domestic and external policies. Such commitment, however, did not hamper the persistent efforts to build a modern society that enjoys all the benefits of contemporary culture. Because of the wise government policy, the Kingdom has acquired an authoritative economic and political status that has produced a considerable effect on regional and international economy and politics. Since the unification of the Kingdom under the leadership of King Abdul Aziz Bin Abdul Rahman Al-Saud tremendous efforts have been exerted to effect comprehensive development of all aspects of life in the country. Entering a new era of rapid development of the country›s infrastructure and economy in the early 1970s, Saudi Arabia devoted special attention to fostering higher education. Established in 1975, the Ministry of Higher Education embarked on a long-term master plan to enable the Saudi educational system to provide the highly trained manpower necessary to run the country›s increasingly sophisticated economy.

In 1949 King Abdul Aziz ordered the establishment of the College of Shari›a (Islamic Law) to become the first higher education institution in the country. It constituted the kernel of Umm Al-Qura University and its most prominent college. Henceforward,

the establishment of higher education institutions continued. In 1952 the Teachers› College was established, followed by King Saud University in 1957 -the first of eight major universities in the Kingdom. Among these universities, Umm Al-Qura University is distinguished by its unique location in the Holy City and the good academic reputation in the fields of Islamic studies and other modern scientific and applied disciplines.

Umm Al-Qura University has developed through three historical phases:

The first phase (:(1971-1949

The start was in 1949 when the College of Shari›a was established, followed by the establishment of the Teachers› College In 1952 which continued until 1959 when the College of Shari›a took the responsibility of teachers› preparation and became the College of Shari›a and Education. In 1962 the College of Education was established as an independent college.

The second phase (1971 -1981):

In 1971 the Colleges of Shari›a and Education became part of King Abdul Aziz University in Jeddah and constituted its branch in Makkah. The College of Education in Taif was established towards the end of this period, followed by the establishment of other academic departments and centers.

The third phase (Umm Al-Qura University):

The University of Umm Al-Qura was established in 1981 by the royal decree number 39 on 301981/7/ . During the first decade of the fifteenth Higri century the Colleges of Da›wa (Call to Islam), Arabic Language, Applied Sciences, Social Sciences, Engineering and Islamic Architecture were established, beside the College of Education in Taif which was established in 1981. By the establishment of the College of Medicine and Medical Sciences in 1997 in Makkah and later in Taif, and the establishment of the College of Natural Sciences in Taif and the college of Community Service and Continuing Education the number of colleges jumped to twelve, beside the Institute for Teaching Arabic for Non-Native Speakers and the Haj Research Institute. Later on, a community college was established in Baha.

The University offers the Bachelors, Graduate Diplomas, Masters and Ph.D degrees in Islamic Studies, Arabic Language, Education, Social Sciences, Applied Sciences, Medicine and Engineering. Thee are about 30,000 students in the campuses of Makkah and Taif.

In 1986 the Custodian of the Two Holy Mosques laid the foundation stone of Al-›Abdiyah campus to continue the university›s educational progress in Makkah and meet the rising demand of the increasing numbers of students. In 1995 The College of Shari›a and Islamic studies, the College of Arabic Language and the College of Engineering and Islamic Architecture began the gradual move to the new campus, followed by the College of Medicine and Medical Studies which was established by a royal decree in 1997. Currently, there are three campuses in Makkah. The first campus is in Aziziyah, housing the university administration, the supporting deanships, the College of Community Service and Continuing Education, the Institute of Scientific Research, the Custodian of the Two Holy Mosques› Institutes for Haj Research, and some other colleges. The second campus is in Al-Zahir, housing the Deanship of Girls Undergraduate Studies and its facilities, and the third one is the new campus of Al-›Abdiyah. There is another campus in Taif embracing the College of Education and the College of Natural Sciences. Beside awarding academic degrees, Umm Al-Qura university gives a special attention to research and publication and community service. The University is playing a significant role in these fields.

The Objectives of the University

The existence of Umm Al-Qura University in the Holy City of Makkah gives it a distinguished character as an academic institution that serves Islam and contribute to the development of human resources and the provision of services at the levels of both the public and private sectors in the light of the requirements of the comprehensive development plans of the country. The major objectives of the University as set by the Council of Ministers Decree number 190 on 211981/7/ include the following:

- Provision of higher education and graduate studies to enable citizens to contribute to the development of their country in the light of Islamic principles in the following fields:
- Islamic studies
- Natural and applied sciences
- Humanities, social sciences and languages
- Contribution to enhancement of scientific research by conducting and encouraging research and establishing research centers, and suggesting means for provision and satisfaction of present-day needs.
- Preparation of specialized scientists and teachers
- Helping other Islamic societies in the specialized education of their citizens in the different fields of knowledge.


Islamic
Architecture
Departement

Islamic Architecture Dept.

The Department of Islamic Architecture was the first department in the college and one of its ambitious departments, which participates in developing human resources qualified to construct our nation. The department focuses on teaching the art and science of forming the constructional environment that contributes to the prosperity and welfare of human life. This takes place in compliance with the teachings of the Qur›an and Sunnah regarding all constructional aspects, and that is the basis of all curricula and subjects of the department.

Objectives:

- Qualifying a generation of architects and planners who are fully aware of the teachings of the Islamic Sharee‘ah in such a way that enables this generation to undertake the mission of designing cities and buildings fit for Muslim communities.
- Promoting the profession of construction and planning in Islamic countries by adopting the call for applying and reviving the principles and objectives of Islamic architecture.
- Encouraging activities of writing, translation, and academic research on Islamic heritage and modern problems.

Research and Library Unit

This unit was established to support scientific research in the department and it benefits the faculty staff and postgraduate students. It was also established to find out solutions for the problems of constructional environment based on scientific research. It is a known fact that any investigation or research must go through successive phases to be worthy of being part of true knowledge.

Equipments and Resources:

The Islamic Architecture Department has a number of resources helping in research and training purposes.

Vocational Workshops Units

Developing local resources, methods of construction, and building-related professions represents an integral part of the local construction activities. It is impossible to study the professional content of any field of the constructional environment away from these dimensions that are related to the building industry.

Vocational workshops include a carpentry workshop, where the student learns how to deal with wood as an important building material. Wood is particularly important as it is used for various purposes, including building structure, skylights, doors, windows, and furniture.

Moreover, internal decorators use wood among several materials to design suitable furniture and optimize the utilization of available space.

Vocational workshops also include a building workshop, where the student learns the various building techniques, and the way of using blocks and bricks in building internal and external walls as well as the various methods of insulation.

As to the metals workshop, it develops the student›s vocational proficiency and teaches him the methods of using aluminum and iron to form architectural elements, such as doors and windows, that are suitable for the local environment. There is also a ceramic laboratory, which acquaints the student with the ways of making ceramic, as it is an important material in finishing.

Environmental Laboratory

This laboratory is equipped with several apparatuses that are used in studying the thermal behavior and measuring humidity inside and outside buildings. In line with the importance of environmental researches, which are directly related to the comfort of people in their dwellings, the environmental laboratory was equipped with several apparatuses for the following measurements:

- Measuring heat and humidity continually over days, months and years
- Measuring the intensity of sunrays and the angle of incidence in different locations
- A planetarium that familiarizes the student with the fall of rays and the formation of shade and shadows practically
- Measuring air speed and direction and studying its connection with the thermal behavior
- Measuring air speed and behavior between buildings in the constructional environment using the «wind tunnel», in addition to knowing the process of wind pressure on different parts of buildings, which it may endanger the structural frame
- Measuring thermal conductivity of the different building materials in the presence of modeling and thermal simulation devices that shows thermal conductivity in different environmental circumstances
- Measuring heat transfer inside and outside buildings through thermal analysis systems that are designed for buildings

Light Laboratory

This laboratory is equipped with several apparatuses that acquaint the student with light and its characteristics and behavior in different environments and under different conditions. In addition, the laboratory enables the student to define the concept of illumination and lighting and the techniques of using light in design to optimize the internal and external utilization of available space. This laboratory serves the following activities:

- Measuring lighting intensity in different locations inside and outside the building
- Acquainting the student with the characteristics of natural and artificial lighting in different environments
- Developing special lighting criteria for the local environment such as developing the «natural lighting factor
- Determining quality and quantity of lighting needed for different spaces according to the type of use.

Sound Laboratory

This laboratory focuses on acquainting the student with the physical characteristics of sound under various environmental circumstances. Due to the importance of studying sound inside buildings, especially where meetings and lectures are delivered, this laboratory was established to achieve the following objectives:

- Teaching the student how to measure sound at different distances from the source
- Knowing the physical behavior of sound in various environments
- Studying the phenomena of sound reflection and absorption in addition to identifying the characteristics of materials that reflect or absorb sound
- Training the student on making a sonic map of different spaces over the day
- Simulating and finding solutions for noise problems in areas near airports, factories, and highways
- Identifying and finding solutions for problems of vibration inside buildings and their effect on the structural frame and comfort

Construction Laboratory

Undoubtedly, the theoretical subjects of construction are not enough to make students understand many of the structural terms and concepts. Thus, this laboratory was established to solve this problem and to acquaint the student with structural problems and mechanisms of force movement within the structural frame. Furthermore, the laboratory aims at achieving the following objectives:

- Acquaintance with mechanisms of force movement within various structural frames
- Measuring the amount and direction of forces on various surfaces
- Acquainting the student with the concept of simple and continuous beams, one- and two-way slabs, and straining joints
- Acquainting the student with iron structures such as trusses and space trusses and how to measure the forces on them
- Acquainting the student with methods of measuring pressure, tension, and moments on different parts of the structural frame.

Photography Laboratory

This laboratory is equipped with traditional and digital cameras of various sizes in addition to a development laboratory. This gives the faculty members, students, and employees of the department the opportunity to use these equipments in taking and developing photographs and slides. These materials are very important to the architect as they shed light on construction in different phases from design to implementation.

Modeling Workshop

Any architectural or planning work should be represented as a 3D scale model to reflect the proposed design before implementation. This worship helps in that regard by making scale models of the projects proposed by the department or its students using its equipment, including cutting and forming tools to build the scale models required for various projects.

Computer Laboratory

This laboratory provides the students with an opportunity to learn various technological skills and develop architectural design and constructional planning through learning computer-based architectural drawing programs such as PhotoShop, 3D, AutoCAD and similar specialized programs in addition to the various methods of presentation.


Civil
Engineering
Departement

Civil Engineering Dept.

The Department of Civil Engineering was initiated in 1407 AH as the college›s third department (preceded by the Department of Islamic Architecture and the Department of Electrical and Computer Engineering).

This department was established to participate in satisfying the Kingdom›s need for civil engineers as part of its ambitious plans to keep up with the ongoing constructional development. Specifically, the department aims at providing Makkah and the neighboring areas with qualified civil engineers who have studied in the same environment so that they know its needs and participate effectively in its development.

The program aims at acquainting the student with his environment and qualifying him to satisfy its engineering needs and develop scientific solutions for Holy Makkah, where hundreds of thousands of Muslims come annually to perform Hajj and Umrah.

Vision

The vision of the Department of Civil Engineering at Umm Al-Qura University is to be a recognized and respected department in Saudi Arabia, the gulf countries and worldwide for its contributions to improve the civil infrastructure of the holy city of Makkah and the kingdom of Saudi Arabia through research, education leading to bachelors, masters and PhD degrees and continuing education for practicing engineers.

Mission

The mission of the Civil Engineering Program is to provide the students with high-quality education and training required for the students to fully develop their professional qualities and skills as civil engineers and to develop their personal potential to the greatest extent possible to be able to pursue higher studies and research to serve the holy city of Makkah with its particular engineering needs due to the pilgrims, and the Saudi Arabian society at large. In particular the mission involves the following:

1. Providing a multidisciplinary curriculum for the students that is fundamental, yet broad and flexible, to produce graduates who are well-grounded in mathematical, scientific, and technical knowledge
2. Training the students during their education to analyze, evaluate, and design civil engineering systems

3. Enabling the students to communicate effectively
4. Providing meaningful opportunities for undergraduate research
5. Producing graduates with understanding and appreciation for global and societal issues for a career path toward leadership in industry, government, and academia.

The mission of the Civil Engineering department includes striving for highly qualified faculty, technicians, laboratory equipments, information resources and learning facilities, to facilitate research activities and to keep its students up-to-date with recent development and advances in science and technology through greater cooperation and involvement with the local industrial activities. Beside its scientific mission, the department is keen to emphasize on the ethical qualities for its graduates

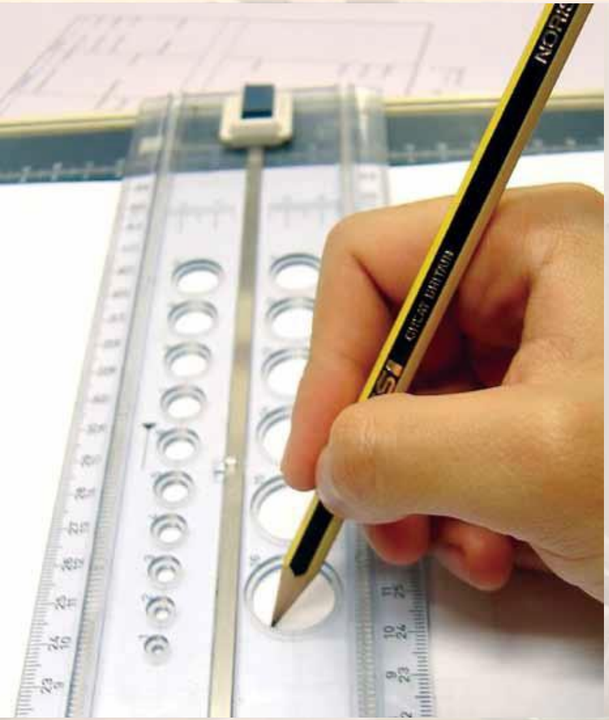
Objectives

- Developing the student›s comprehension of Islamic traditions and his adherence to Islamic morals in practicing the profession.
- Acquiring the basic sciences and engineering sciences that are necessary for developing a strong scientific background for additional specialized studies
- Developing the student›s abilities to apply the acquired academic knowledge practically
- Acquiring leadership competency and skills of engineering business management

Outcomes

The Civil Engineering program outcome is as follows in accordance with the ABET Engineering Program Learning Outcome:

1. An ability to apply knowledge of Mathematics, Science and Engineering
2. An ability to design and conduct experiments, and to critically analyze and interpret data.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. An ability to function in multi-disciplinary teams
5. An ability to identify, formulate and solve engineering problems
6. An understanding of professional and ethical responsibility.
7. An ability for effective oral, written and graphical communication
8. The broad education necessary to understand the impact of engineering solutions in a global and societal context
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice



Equipments and Resources:

The department has equipments and resources that support the educational process in it and allow the students to conduct laboratory experiments, which represent an integral part of the curricula.

These laboratories are equipped with numerous laboratory apparatuses. Each semester, laboratory experiments are conducted in these laboratories according to items of the study plan. In addition, students also use the laboratories to conduct the experiments that they need in their graduation projects.

In addition to a number of service programs such as AutoCAD. The students use these programs in the various areas of civil engineering and faculty members use them also in research.

Computer Laboratory

The computer laboratory is equipped with many computers and printers to train students on using computers in drawing, printing, and graduation projects in addition to learning computer-programming languages such as «Fortran» and conducting the applications that are required for some of the department›s courses.

Asphalt Laboratory

This laboratory has the necessary equipment and apparatuses for conducting the required tests for designing asphalt mixture and testing the basic asphalt characteristics such as penetration, flexibility and liquidity. This laboratory is also used in testing aggregate specifications (such as specific gravity, sieve analysis) and measuring strength of the asphalt mixture (Marshall Stability tests).

Soil Mechanics Laboratory

This laboratory is used in conducting experiments of the Soil Mechanics (1) & Soil Mechanics (2) courses. These experiments acquaint the student with the engineering characteristics of soil and ways of improving them through conducting various studies and experiments such as water content measurement, soil mechanical analysis (Sieve Analysis), classification, permeability, soil integrity, plastic limit, liquid limit, direct shear resistance, soil bearing capacity, different soil stabilization methods, etc.

Hydraulics Laboratory

It is one of the laboratories of the Department of Civil Engineering where experiments of the subjects of «fluid mechanics» and «hydraulics» are carried out. Here, students are trained on conducting laboratory experimentsontheengineeringcharacteristicsof water such asmeasuring hydrostatic power on plates and gates, measuring the speed of water flow in pipes, and measuring the small difference in the different joints, measuring friction loss. Students also study the different types of pumps and ways of connecting them (in series or parallel). In addition, they also study water networks and flux surface measurement, measurement of drainage in open canals (measurements of the hydraulic jump) and effects of the waterbed inclination and shape on water surface.

Concrete Laboratory

This laboratory is equpped with apparatuses that are necessary for conducting some experiments on aggregate, cement, dry concrete, and wet concrete. The laboratory is used by students who study the subject of Concrete Technology, and other students who use it in their graduation projects. The laboratory›s equipment includes:

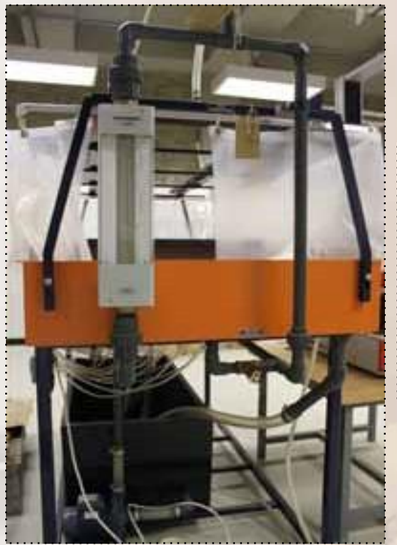
- Electronic apparatus for crushing concrete samples (to measure pressure and bending)
- Concrete permeability measurement apparatus
- Machine for measuring air content of concrete
- Machine for capping concrete cylinders with sulfur
- Treatment room for sample preservation
- Concrete mixer
- Los Angeles Abrasion aggregate-testing machine
- Sieves shaking apparatus
- Dry concrete linear change measurement apparatus

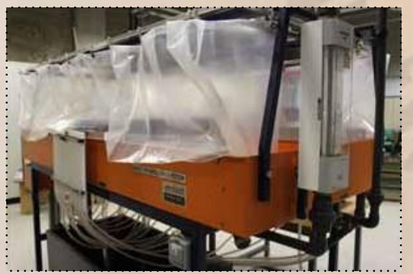
Materials Laboratory

This laboratory is used to carry out experiments of the Materials course, which aims at acquainting students with the characteristics of different materials and their components especially minerals and iron in particular, because it is frequently used in construction.

This subject acquaints students with the mineral›s atomic structure, and then goes on to acquaint them with the atomic dimension measurement inside a single crystal. This takes place through some experiments related to atomic construct and by using explanatory devices depicting the actual structure of the crystals in addition to microscopic methods to identify characteristics of the different materials and minerals after the processes of polishing and softening that are necessary for the microscopic inspection.

The student also learns how to identify the physical characteristics of minerals and the desired mechanical characteristics such as hardness and elasticity at various degrees and conducting tension tests using the universal tension test apparatus to ensure accordance with specifications. Moreover, detailed study of steel ingot, which is used in most fields of construction, inspecting its factors of antirust anticorrosion to be used in construction with the desired characteristics.





Laboratories of Plane Surveying and Photogrammetry:

The survey laboratory is equipped with the traditional survey apparatuses such as robes, cadastral compass, and digital and laser theodolites. It also has modern survey apparatuses such as integrated meteorological stations, electronic distance measurement apparatuses and GPS apparatuses. The laboratory trains students of the departments of civil engineering and Islamic architecture on the applied part of the Survey course. These experiments include training the students on measuring longitudes, vertical and horizontal angles, making linear, horizontal and grid balances to measure height of the different points, and drawing linear sectors and topographic maps.

Moreover, students are trained on defining the line direction and coordinates of a local or international coordinate system and making survey maps of a certain area.

The department also has a photogrammetry laboratory equipped with a stereoscope. In this laboratory, students are trained on experiments of Survey (2) course, including stereoscoping, measuring height based on pictures, producing mosaics, and measuring coordinates based on pictures and turning them into land coordinates.

Kingdom of Saudi Arabia
Umm Al-Qura University
College of Engineering and Islamic Architecture

Mechanical Engineering

Departement

Dr. Hamzah A. Alharthi
Department Chairman

Foreword

The department of Mechanical Engineering was established in 1407 H (1987) in the College of Engineering and Islamic Architecture, which has over 18 members of academic staff in the department, supported by dedicated administration and technical teams.

The department has over 500 undergraduate students, and offers undergraduate courses in both Power and Production Engineering. There is also the opportunity to enhance these degree courses with market demands as elective courses to adapt the requirements in some other particular areas of career choices.

The range of our undergraduate programs covers all areas of mechanical engineering, with particular focus on the specialized needs of industries. It is our aim to prepare our students to excel in all important areas of our profession, such as design systems, power generation, manufacturing, CAD/CAM, air-conditioning, water desalination, and energy management among others.

Our graduates are held in high regard by the industry. As a result, the students find rewarding jobs in various engineering domains, in large, medium and small scale companies of the private sector, as much as excellent positions in power plants, water resources management, oil and petrochemical refineries, of the public sector. Consequently, we have a commitment to provide the undergraduates the state of the art of knowledge. Therefore, they are guided throughout their courses by personal tutors and are taught by experienced and dedicated staffs.

It is our primary mission to always prepare and improve our undergraduate program, in order to bring our students up to the state of art in the development of engineering industry and career. The department is fast growing, with a plan to offer post graduate studies, Master of Science in Mechanical Engineering. Also, we plan to apply for accreditation of our Bachelor degree program by ABET.

Our vision is to achieve distinction, integrity and excellence measured in all our activities. We are dedicated to provide a truly outstanding education opportunity through a proper balance of high quality undergraduate, post graduate and research programs. Our goals include improving our undergraduate technical knowledge by continuously upgrading teaching laboratories and workshops, enhancing the quality and reputation of our research activities, so that we become nationally and internationally known for partnerships with government agencies and industries and other Institution of higher learning.

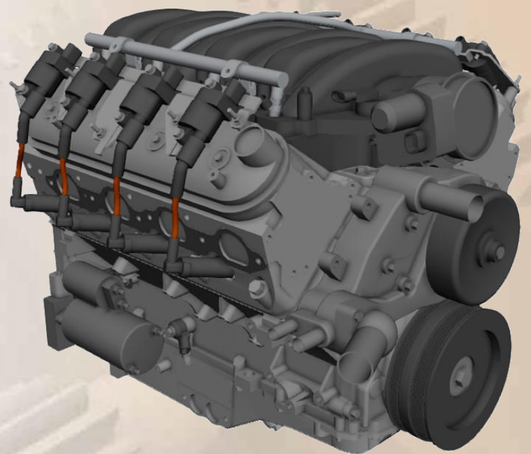
Dr. Hamzah A. Alharthi
Department Chairman

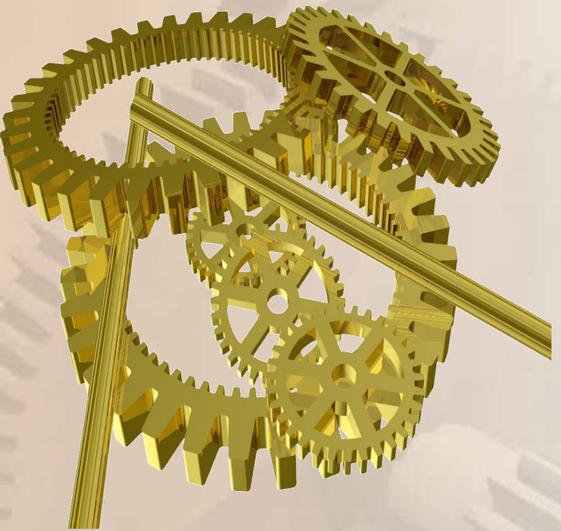
Vision

Generate and promote knowledge and learning nucleus for the mechanical engineering discipline to contribute nationally and internationally in engineering and social development.

Mission

Providing highly qualified mechanical engineers, inspired with Islamic and ethical values, capable of mastering major roles in industry as well as conducting advanced scientific research. In addition, providing faculty with means to develop their intellectual capacity through teaching, research and interaction with society.





Objectives

Provide mechanical engineer professionals with breadth of knowledge, skills, values and confidence to:

1. Take a leadership role on various aspects of real life environments (designing, conducting experiments and simulation, interpreting mechanical engineering applications' outcome and conducting academic as well as applied research).
2. Work individually as well as in multidisciplinary teams.
3. Continually improve their skills through professional and post-graduate education.
4. Demonstrate professionalism as well as sense of societal and ethical responsibility in their endeavor.

Outcomes

The units of knowledge or skill that each student graduating with a B.Sc. degree within the Mechanical Engineering Program is expected to have in order to satisfy the program educational objectives are:

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

b) an ability to design and conduct experiments, as well as to analyze and interpret data;

c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;

d) an ability to function on multidisciplinary teams;

e) an ability to identify, formulate, and solve engineering problems;

f) an understanding of professional and ethical responsibility;

g) an ability to communicate effectively;

h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;

i) a recognition of the need for, and an ability to engage in life-long learning;

j) a knowledge of contemporary issues;

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

Undergraduate Program

The undergraduate program is assigned to provide basic theoretical and technological knowledge in various fields of contemporary importance to the mechanical engineer of the new century. This is to provide awareness of basic physical and engineering sciences, and to encourage the development of inventiveness while searching for engineering solutions to technical problems. The program includes a number of elective courses in different specializations which permit the students to specialize in a particular area of their choice.

Description of Mechanical Engineering B.Sc. Courses

Engineering Mathematics I – (800201)

The aims of this course are to provide the student with good knowledge and understanding of the basic concepts and theorems on linear algebra of matrices (especially in the solving system of algebraic equations with some effective methods of solutions), special functions (Gamma, Beta and Bessel functions). Also, a Fourier analysis with applications on partial differential equations (Heat, wave and potential partial differential equations).

Engineering Mathematics-II – (800202)

To provide the student with good knowledge and understanding of the basic concepts and theorems on linear algebra of matrices, special functions (Gamma, Beta and Bessel functions). An ability to determine Fourier series for some basic periodic functions, convergence to a periodic waveform. Basic understanding of the complex Fourier series. 2nd Order DE problems and a Fourier analysis on PDEs.

Engineering Graphics I – (804151)
The course provides the undergraduate engineering student with a background in descriptive geometry, orthographic projection, engineering drawing standards and annotation, and computer-aided engineering graphics. Point line and plane relationships in projection; multi-view engineering drawings; auxiliary and section views; basic dimensioning and annotation.

Thermodynamics-1 – (804201)
1-Thermodynamics definitions (systems, energy forms &types, properties, process, cycle), 1st law of thermodynamics applications.
2- Properties of pure substances, P-V-T relations of ideal gases &phase change.
3- Energy analysis of closed & open systems (work, heat &mass transfer).
4- Second law of thermodynamics, heat engines, refrigerators& heat pumps.
5-Entropy definition, T-ds relations for ideal gases and isentropic efficiencies.

Dynamics – (804222)
Study on kinematics of a particle, rectilinear and curvilinear motion. Kinetics of a Particle focusing on force and acceleration; Newton Second Law of motion, work and energy. Kinematics of particles - impulse and momentum. Kinematics of a Rigid Body, translation and rotational motion.

Engineering Workshop – (804230)
1-Introduction to Manufacturing Processes by John A. Schey, McGraw-Hill Higher Education, 3rd edition, 1999.
2-Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 2nd Edition by Mikell P. Groover, John Wiley & Sons, 2nd edition, 2001.

Material Science – (804234)
Types of Engineering materials. Atomic structure and arrangement, crystalline structure and type of crystal structure. Miller indices and X-ray diffraction. Imperfections in crystalline structure and diffusion. Equilibrium phase diagram and relationship with cooling curves. Iron- Iron Carbide phase diagram. Heat treatment and phase transformation. Steel and cast iron types and designation.

Mechanical Drawing – (804253)

Learning the drawing principles and using the same in industrial practice is essential for any student and this book acts as a valuable guide to the students of engineering. It also serves as a reference book in the design and drawing divisions in industries. This book acts almost as a complete manual in Machine Drawing. This book is a foundation for students and professionals who from here would like to learn Computer Graphics which is a must in modern days

Thermodynamics-2 – (804301)

1- Gas power cycles used for Petrol& Diesel engines and Gas-turbine engines.
2- Vapor and combined (Gas-Steam) power cycles.
3- Refrigeration & heat-pump cycles basics.
4- Gas mixtures properties for ideal &real gases, and moist-air mixture relations
5- Chemical reactions (combustion processes products balance).

Fluid Mechanics 1 – (804306)

Basic Definitions-Newtonian fluids - non Newtonian fluids - The SI System of Units-Introduction-Pressure- Pressure measurement by Manometer-Forces on submerged Surface –Statics fluids-Stability of Submerged or floating Bodies-Uniform Flow, Steady Flow-Flow-Flow rate-Continuity- The Bernoulli Equation-Work and Energy-Applications of the Bernoulli Equation- The Momentum Equation-Application of Momentum Equation- Laminar and Turbulent flow-Pressure loss due to friction in a pipeline-Pressure loss during laminar flow in a pipe-Boundary Layers-Dimensions and units-Dimensional Homogeneity-Results of dimensional analysis Buckingham's π –Theorems-Manipulation of the π groups similarity- Experiments in fluid mechanics lab.

Engineering Design – (8043081)

Upon completing the course, the students will be able to: Define problems, uses problem-solving techniques, generate ideas, work in teams effectively, define team norms and use ethical judgment.

Heat Transfer 1 – (804314)
Fundamentals of conduction, convection, and radiation. One and multidimensional steady-state heat conduction. Heat transfer from fins. A numerical method for steady-state heat conduction.

Fluid Mechanics 2 – (804316)
Boundary-Layer Equations, Boundary Layers with Pressure Gradient, Momentum-Integral Estimates, Friction Drag and Pressure Drag, Potential Flow, Singularity Elements, Circulation, Superposition of Plane-Flow, Plane Flow Past Closed-Body Shapes, Airfoil Theory, Axisymmetric Potential Flow, Compressible Flow, Speed of Sound, Adiabatic and Isentropic Steady Flow, Normal-Shock Wave, Converging and Diverging Nozzles, Turbomachinery, Classification of Pumps, Pump Performance, Mixed- and Axial-Flow Pumps, Reaction Turbines, Impulse Turbines, Wind Turbines.

Theory of Machinery – (804319)
The course provides students with instruction in the fundamentals of the theory of machines. The Theory of Machines and Mechanisms provides the foundation for the study of types of links and joints, degrees of freedom (mobility), a schematic representation of mechanisms, Grashof criterion, transmission angle, limiting positions, examples of planar mechanisms (slider-crank, four-bar, quick return, Geneva, etc.). Also this course the graphical and analytical analysis of displacements, velocities, accelerations, and static and dynamic forces required for the proper design of mechanical linkages, cams, and geared systems.

Mechanics of materials – (804331)
Introduction to stress and strain as well as basic analysis related to stress and strain, deformation and stress concentration factor. Torsion of circular member, axial loading and transverse shear. Shear diagram and moment diagram, bending of the beam and flexural equation. Analysis of combined loading as well as stress and strain transformation.

Manufacturing Technology (2) – (804334)
During this course the student will study: Bulk and sheet metal forming processes, capabilities of each metal forming process, the forces and powers requirements for each of the studied metal forming processes

Material Testing – (804336)
Introduction to mechanical properties. Tension test: stress-strain relationships. Compression and shearing stresses. Hardness test: Brinell; Vickers and Rockwell hardness tests. Hardenability and Jominy test. Impact test: machines types; effect of the variable. Fatigue test: fatigue cracking and failure; fatigue limit; Smith diagram. Creep test: creep curve and stages; effect of stress and temperature; Larson-Miller parameter.

Engineering Statistics and Probability theory – (804343)
Frequency Distributions. Graphs of frequency distributions. Descriptive measures. Calculations for central tendency and variability. Sample space and events. Counting. Axioms of probability. Elementary probability theorems. Conditional probability. Bayes' theorem. Mathematical expectations. Discrete random variables. Probability distribution functions. Cumulative distribution functions. Binomial distribution. Hypergeometric distributions. Mean and variance of a probability distribution. Chebyshev's theorem. Poisson distribution. Multinomial distribution. Continuous random variables. Normal distribution. Uniform, lognormal, gamma, exponential, beta and Weibull probability distributions. Joint probability densities. Population and samples. Sampling distribution of the mean. Central limit theorem. Sampling distribution of the variance. Point and interval estimation. Test of hypothesis. Probability of Type I and Type II errors. Hypothesis concerning one and two means. Operating characteristics curves. Method of least squares. Inference based on least square methods. Correlation.

Engineering Economy – (804344)
This course consists of fundamentals of engineering economy, the basic principles of the time value of money, drawing the cash-flow diagrams different interest rates i.e., simple, compound, MARR, ROR, nominal and effective, comparing economic alternatives based on equivalent present worth (PW), future worth (FW), annual worth (AW), Using of depreciation methods related to machines/projects and Performing replacement and breakeven

Machine Design-I – (804351)
mechanical engineering design; properties of materials; review of static failure theories; designing against fatigue loading; machine elements design; shafts, keys, couplings, power screws; clutches; belt drives; pins, joints and splines; Threaded fasteners.

Computational Methods – (804370)
Introduction to scientific computing and algorithms; iterative methods, systems of linear equations with applications; nonlinear algebraic equations; function interpolation and differentiation and optimal procedures; data fitting and least-squares; numerical solution of ordinary differential equations.

Computational Fluid Dynamics – (804416)
This course brings together the knowledge gained in fluid mechanics, thermodynamics, heat transfer and numerical methods in order to develop computational techniques for the engineering analysis of heat and fluid flow processes. The student is introduced to the modelling and computational techniques that are incorporated in current computational fluid dynamics (CFD) software. CFD focuses on finite difference and an introduction to finite element & volume solution for ordinary and partial differential equations, different numerical methods to solve problems of an engineering system. Examples and applications of computational projects using C++ or Mat lab or software packages are used to analyse complex flow situations.

Mechanical vibrations – (804420)
The course introduces the foundations of vibration theory and to show its application in the analysis and design of mechanical systems by proving the fundamentals of vibrations, free and force vibration of (undamped / damped) single degree of freedom systems. Vibration under general forcing conditions. Free and forced-vibration of (undamped/ damped) two degree of freedom systems. Free and forced-vibration of (undamped/ damped) multi-degree of freedom systems. Determination of natural frequencies and mode shapes.

Heat Transfer 2 – (804424)
Solve unsteady state heat conduction problem with Lumped, graphical and numerical methods. Learning about convection heat transfer for laminar and turbulent flow. Perform thermal design and performance analysis of common types of boiling or condensation system. Perform thermal design and performance analysis of common types of heat exchangers. Understand the physical nature of thermal radiation and its interaction with matter.

Manufacturing Technology III – (804434)
Upon Completion of the course, students will be able to:
Demonstrate Knowledge of different types of machining processes (Turning, hole making, milling, broaching, abrasive and finishing operations)
Understand the basic principles and techniques of chip removal.
Demonstrate Knowledge of different types of cutting tool materials and cutting fluids, their characteristics, properties and applications.
Demonstrate knowledge of different types of Advanced Machining processes.
Knowing cutting conditions for different materials with different cutting tools and how to estimate the cutting time and the cost.

Industrial Quality Control – (804446)
Basic statistical tools in quality control, control charts for a variable, control charts for attributes, capability studies, sampling plans analysis and calculations, a standard system of plans, reliability analysis, live data analysis is implemented using standard computer software.

Machine Design II – (804451)
On successful completion of this course, students will be able to work as a design team to analyze proposed design solutions and suggest modifications or improvements, select proper machine elements and apply this knowledge effectively and efficiently to integrate the designed component into a working mechanical system.

Engineering Measurements – (804453)
The course involves basic standard concepts and techniques used in Engineering Measurements. A plan for using more engineering application examples and increased reliance on self-study through assignments using real-life data might improve teaching effectiveness. The course includes a 3-hour-per-week hands-on laboratory where you apply the material learned in the lecture. Students will learn not only how to use these devices in the lab, but also the fundamental principles of their operation – how they work. Statistical analysis is integrated into the course, especially in the hands-on laboratories, where statistics are used to analyze, manipulate, plot, and interpret acquired data.

Refrigeration &Air-conditioning-1 – (804461)
-Introduction to Refrigeration & air-conditioning applications, Basics of Vapor-compression refrigeration systems (VCR), Refrigerants,
-Multi-pressure VCR systems,
-Absorption refrigeration cycle.
-Properties of moist-air, Psychrometry of air-conditioning(A/C) processes,
-Design conditions of comfort, Solar radiation, Air-conditioning cooling load.

Solar Energy – (804463)
New and renewable energy resources are introduced in this course. The course considers the details of the solar energy basics of sun-earth geometry, solar radiation and thermal, and electrical applications. Analysis of the solar collectors and photovoltaic performance is considered. Design of a solar system and case studies are taken into consideration during the course.

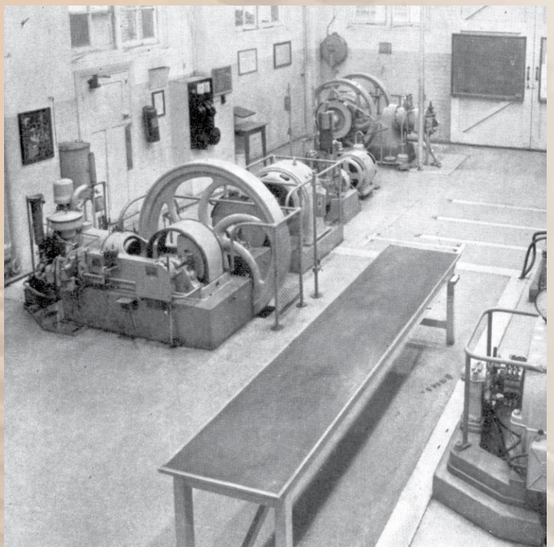
Automatic Control – (804465)
Modelling, characteristics, and performance of feedback control systems. Stability, root locus, frequency response methods. Nyquist/Bode diagrams. Lead-lag, PID compensators. Digital implementation.

Power Plants – (804466)
The course considers the details of the steam power plants. It includes the study of the plant's economics. It considers the power plant elements, steam generator, steam turbines, steam condensers, pumps and heat exchangers. Each element takes a considerable consideration during the course in both lectures and assignments. In addition to improvement of the plant, efficiency is included. The combined gas-steam cycles are also considered.

Graduation Project – (804499)
The course is basically dependent on the efforts of the students. The project should be applicable with clear output, e.g., physical model, computational model, field study, design, economic consideration... etc.

Internal Combustion Engines – (804469)
Engine types – reciprocating engine performance parameters – air standard cycle analysis – fuel/air cycle analysis – fuels properties in SI & diesel engines and combustion calculations –supercharged and turbocharging engines – fuel system in SI engine, spark ignition system - fuel system in CI engines – combustion process in SI engine– combustion process in CI engine– measurements ,engine testing and performance.

Machine Design-I – (804351)
Design procedure, review of stress, strain and deformation analysis as applied to mechanical engineering design; properties of materials; review of static failure theories; designing against fatigue loading; machine elements design; shafts, keys, couplings, power screws; clutches; belt drives; pins, joints and splines; Threaded fasteners.



Laboratories

The Mechanical Engineering Department has a number of laboratories used in undergraduate studies, research work, and community service.

Engineering Workshop

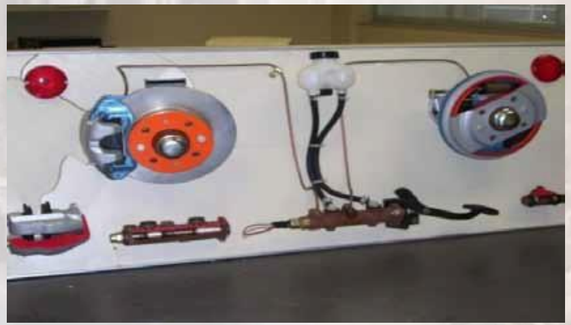
The mechanical workshop is equipped with machines and apparatus for training the students in the fields of casting, metal forming, and machining processes.

Welding Laboratory

The welding laboratory contains different welding equipment for training the students with welding technologies including: gas welding and cutting, electric arc welding (SMAW), Tungsten Inert Gas (TIG), Metal Inert Gas (MIG), Plasma welding, and Spot welding. The laboratory is also used in the graduation projects related to certain welding operations or studying an advanced welding process, and also in research work .

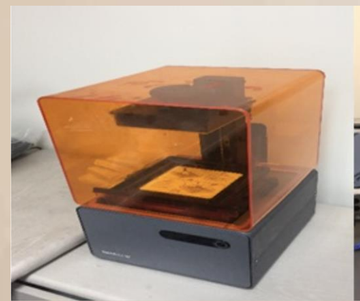
Vibration Laboratory

This laboratory is used in performing the experiments of the vibration course and to introduce the nature of mechanisms and their operation. Also, studying the vibration and its effect on sensitive parts and how to control the vibration and its damping. The laboratory is also used in research related to mechanical vibrations and theory of machines.



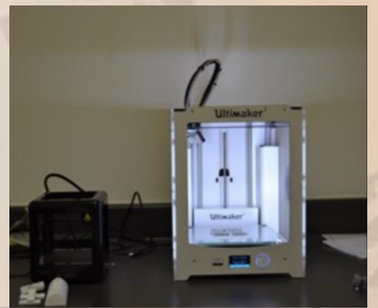
Mechatronics Research Laboratory

This lab provides opportunity to students and faculty members to do their research in the field of electronics, programming and mechanical systems. It provides the following lab facilities to the respective users, e.g., 3D printing with different plastic grades like ABS, flexible, castable, tough and clear material products, CNC Circuit Board Plotter for rigid and flexible PCBs with single or multilayer options, Mini lathe and drill machines for mechanical works, multipurpose hand held rotating tool for grinding, cutting, polishing, etc., and a huge collection of electronic components, sensors, actuators, soldering stations, and hot air for prototyping.



CNC/CAM Laboratory

The laboratory is designed and equipped to be employed in introducing different courses such as CNC – CAM – FMS – Robot – Handling – Automation. The laboratory contains the following facilities: Bench CNC lathe machine (Emco compact 5) – Bench CNC lathe machine (Emco P55) – VMC (Denford TRIAC) – Computer local network consists of master computer and 10 slaves – FMS cell consists of one VMC, one CNC lathe , 5 axis Mitsubishi robot, and 5 stations for inspection sorting and inventory connected together with a conveyor.



Refrigeration and Air-Conditioning laboratory

The Main goal aspect is to give the students an overall background on the components of Refrigeration &Air-Conditioning systems, therefore the following jobs are conducted in the laboratory:

1. Determination of the coefficient of performance, cooling & heating loads, rates of humidification & dehumidification of Refrigeration &Air-Conditioning systems.
2. Construction and systems evaluation of graduatation projects.
3. Possibilities of organizing short training courses in Refrigeration & Air-Conditioning systems design, operation, performance evaluation and fault simulation.
4. Wide range of cooperation in research projects studies in Refrigeration & Air-Conditioning systems.




Solar Energy Laboratory

The main objective of the laboratory is to give the students an overall background on the thermal and electrical applications of solar energy for domestic and industrial uses. That includes determination of the feasibility and efficiency of solar engineering systems, like water &air heating , food &wood drying, water desalination, solar ovens, solar concentrators for industrial processes heat &power generation and solar energy storage systems. Construction and systems evaluation of graduation projects are considered. The laboratory has a monitoring meteorological station for climate conditions &solar intensity measurements. It contains also possibilities of organizing short training courses engineering solar systems design, operation and performance evaluation.




Materials Science Laboratory

This laboratory is used in the experiments of the materials science course to introduce the materials characteristics and its elements. The lab contains microscopic examinations and specimens preparations (polishing and etching operations). The laboratory is used in the graduation projects related to material science.

Materials Testing Laboratory

his lab is used in the determining the mechanical properties of the materials. In this lab mechanical tests are conducted such as tension, compression, hardness, bending, and impact.

Automatic Control Laboratory

Automatic control has played a vital role in the advance of engineering and science. It is an important and integral part of manufacturing and industrial processes. For instance, automatic control is essential in such industrial operations as controlling pressure, temperature, humidity, viscosity, and flow in the industrial proceses. The automatic control course at Um Al-Qura University introduces the students to the theory of automatic control providing means for attaining optimal performance of dynamic systems and improving productivity.

Gaining the practical experience of automatic control comes from direct applications of the automatic control theory. This can be achieved from different practical training modules in the Control lab. The laboratory consists of some training systems to control fluid flow rate, gas pressure, temperature, position, and speed.

Engineering Measurements Laboratory

It isconsideredthedimensionalmeasurements with accuracyupto 1 micron, angularmeasurements with accuracyupto 5 minutesand form measurements such as roundness straightness and flatness. Roughness measurements are also conducted. The lab has the following facilities: Block gauges – angle block gauge – limit gauges – calipers – micrometers – dial indicators – protractors – sensitive levels – bore gauges – clinometers – sine bar – talyvel – talyrond – surtronic+4 – minidekker – surface roughness in 2D and 3D.

Fluid Mechanics Laboratory

The laboratory is used to introduce the principles and types of incompressible fluids flow, and the measurements of pressure, velocity, and flow rate. Also, the friction in pipes and its advantages to flow and the forces resulting in the static fluids. The laboratory can participate in the post graduate researches after developing it with specialized equipment.

Heat Transfer Laboratory

The heat transfer laboratory was established to develop experiments in the field of heat transfer and measurements. Therefore the laboratory contains experiments about the heat conduction, convection and radiation measurements. It has also experiments about the heat transfer applications such as heat exchangers and furnaces. Moreover there are measurements of the material thermal properties like thermal conductivity of the thermal insulations. The temperature measurements by different methods are also considered in the the heat transfer laboratory was established. The facilities are qualified and they can be used for teaching, research and training.

Turbo-machinery Laboratory

This laboratory is used to demonstrate the components of thermal power plants , how to operate and set the performance. As well as introducing the fundamentals variables executable compression, such as climate-sectional area of flow, friction and force the top of the sound and measure the interaction between the force and objects.

Combustion Laboratory-1 (Diesel & Petrol engines)

Laboratory aims to introduce students to the types and components of internal combustion engines, reciprocating and rotary (petrol - diesel - Vankl - gas turbines). The appointment of engine performance under various operating conditions. Set the details of the combustion and measuring the level of emissions and how to control them. Plant can participate in scientific research for postgraduate studies after the development and consolidation of the various devices.

Electrical Engineering

Departement

Foreword

Electrical Engineering is a rapidly growing department within the College of Engineering and Islamic Architecture at Umm Al-Qura University. Its mission is to prepare graduates in the broad field of Electrical Engineering who will contribute effectively toward the development of local community in particular and Saudi Arabian Society in general. Our graduates are well prepared professionally and ethically in order to work successfully on multidisciplinary projects with the complete comprehension and understanding of socio-economic factors impacting these projects. This is the reason that our graduates have received many attractive offers from prominent companies like Saudi Aramco, SABIC, STC, and many other innovative technology businesses in the Kingdom of Saudi Arabia. Many other graduates have been accepted in postgraduate programs in Electrical Engineering and business in the high ranking national and international universities.

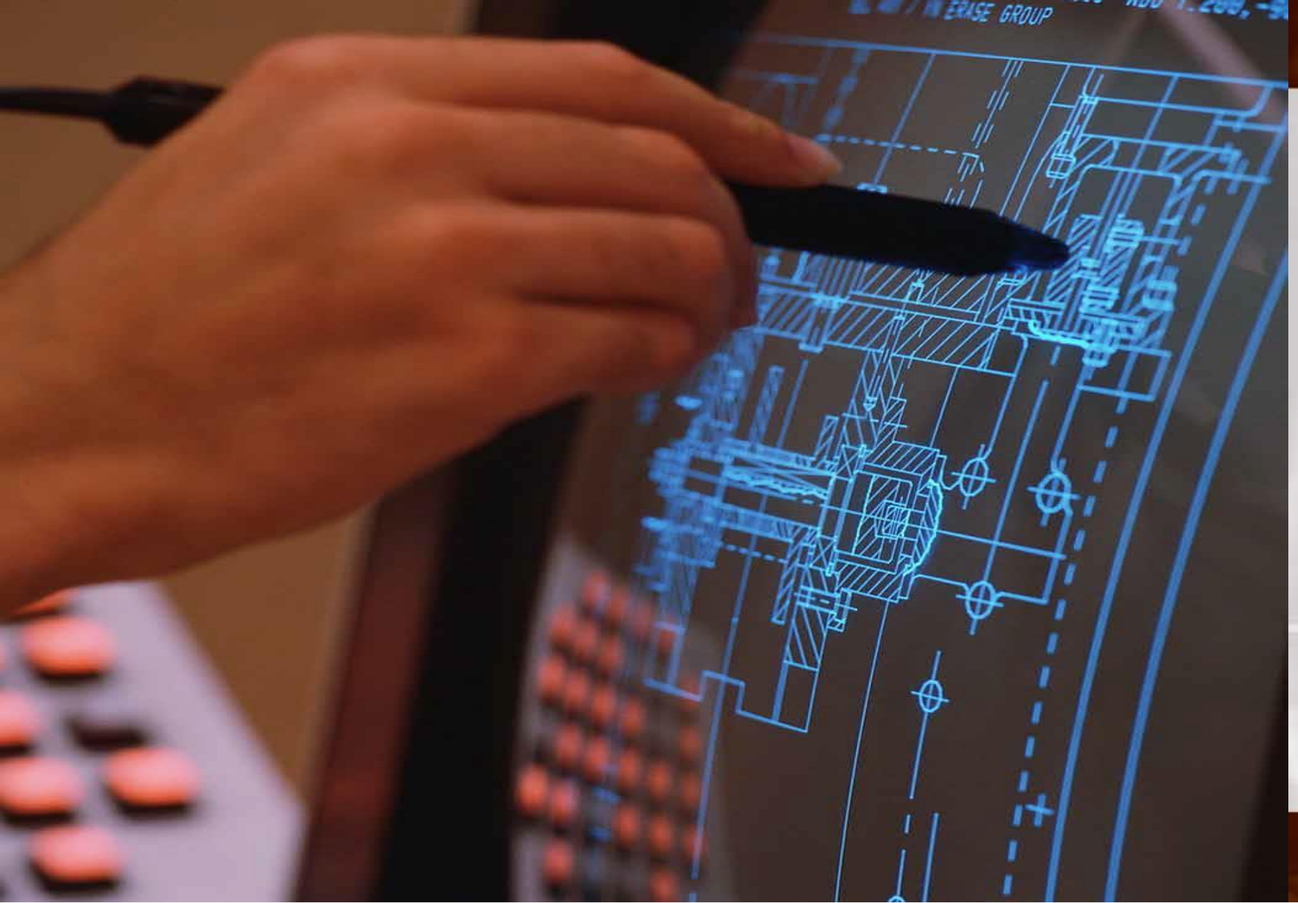
But the Electrical Engineering department always strives for continuous improvement and we continue to update our undergraduate curricula to better meet the needs of current students and future practicing engineers, as well for those students who want a strong technical background in electrical engineering as preparation for a career in business, finance, or a variety of other professions for which EE provides a well-built foundation. Our curricula are well designed and continually improved to complement the fast paced cutting-edge technology and meet the needs of the employers of our graduates.

Our department is a dynamic community of scholars / educators active in most of the principal areas of our field. Our faculty members are diverse and participate in interdisciplinary, pedagogical, and new initiatives. EE department faculty members conduct research and teach course within the areas of expertise: Communications and Signal Processing, Microcontrollers and Microelectronics, Renewable Energy & Power Transmission, Distribution & Protection, and Control.

In summary, Electrical Engineering Program aims to produce next generation innovators and professional leaders, who strive to solve the problems of community in particular and humanity in general, vital to the 21st century economy and society.

If you are a prospective undergraduate, please visit us at Umm Al-Qura University – we are always there to welcome new and talented students to our program.

Dr. Mohammed Saleh Al-Alshaikh
Department Chairman



Vision

To be globally distinguished, professionally recognized, and committed to the service of society and enhancement of humanity.

Mission

To provide quality education that enables graduates to lead and excel in their profession and to serve society and humanity through productive ideas and meaningful collaboration locally and internationally.

Objectives

Electrical Engineering Program prepares graduates to be successful professionals in their fields. Our Curricula prepares our graduates to achieve the three Program Educational Objectives (PEOs) of Electrical Engineering Program. These PEOs in support of EE program mission and the mission of Umm Al-Qura University (UQU), are to prepare graduates:

Engineering Knowledge &Professional Practice

1. To play a leading role in engineering careers and perform innovative research.

Active Team Participation & Lifelong Learning

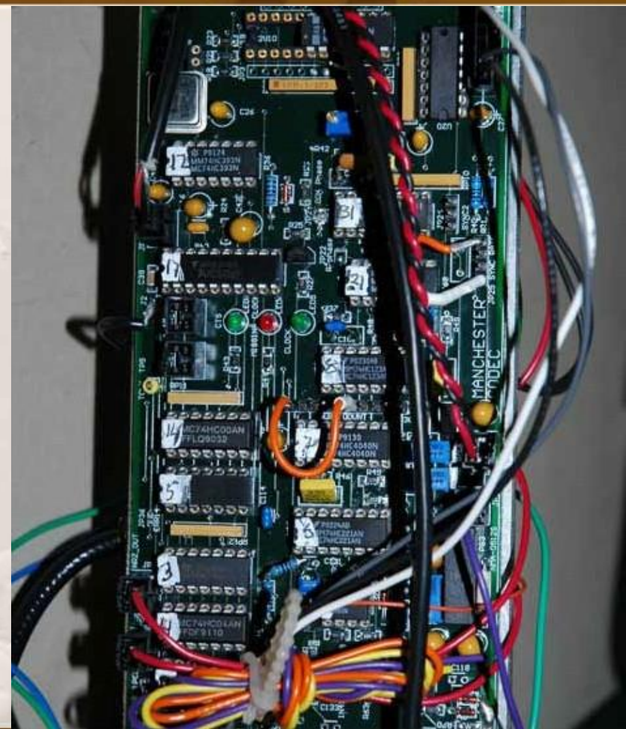
2. To utilize appropriate knowledge, experience and skills to function effectively in multidisciplinary teams and adapt to the changes in engineering practices and environments throughout their careers.

Engineering Citizenship

3. To apply current electrical engineering design principles within the societal, ethical, environmental, safety & economic constraints, and progress in their professional responsibilities in accordance with the Islamic values.

Electrical Engineering Program excellent education so that graduates achieve these objectives after working a few years in their field. This standard of education is achieved by:

- Offering excellent education and an academic program that provides a sound foundation in mathematics, science, and engineering, as well as competencies in a broad spectrum of electrical engineering specialty areas such as; Electrical Power Engineering and Electronics & Communications Engineering.
- Incorporating an effective laboratory practical experience in selected courses; including the use of computer hardware design, test and simulation software applications, and modern test and measurement equipment for designing, testing, and implementing systems.
- Integrating general competencies such as: written and oral communication, critical thinking & decision making, problem-solving, ethical, and teamwork skills in engineering and other general & applied sciences courses.
- Incorporating the graduating project, a major design experience for students based on the knowledge and skills acquired in earlier course work that integrate appropriate engineering standards and multiple constraints.



Student Outcomes

Electrical Engineering graduates are prepared to attain a set of Student Outcomes (SOs) (listed in ABET EC 2000 Criterion 3) by the time of graduation. These student outcomes that contribute toward the attainment of program educational objectives by the graduates of UQU EE program within a few years of working in the engineering practice are as follows:

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

2. an ability to design and conduct experiments, as well as to analyze and interpret data

3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

4. The ability to communicate effectively.

5. Comprehensive education necessary to understand the impact of engineering solutions on a global level, in the context of economic, environmental and social.

6. Recognition of the need and the ability to engage in lifelong learning.

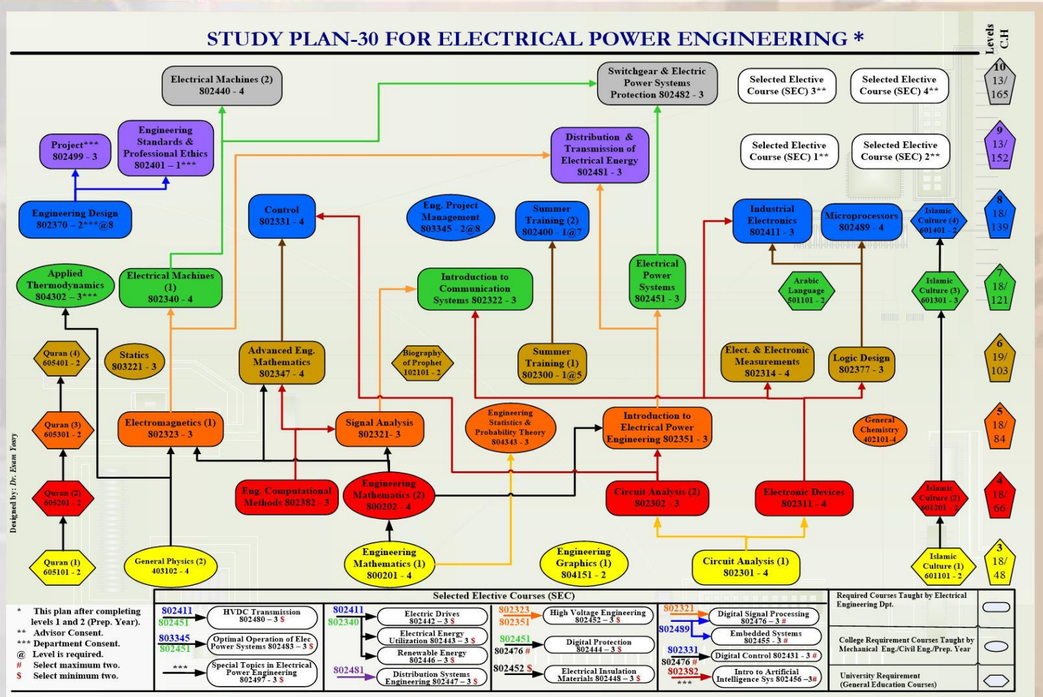
7. Knowledge of contemporary issues.

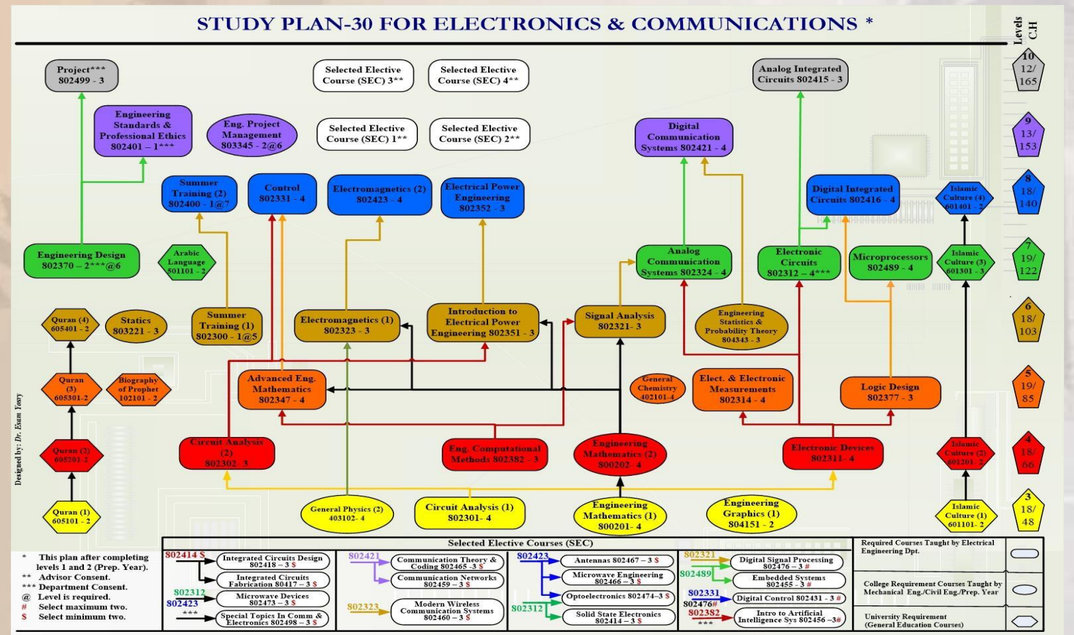
8. The ability to use techniques, skills and modern engineering tools necessary for engineering practice.

9. a recognition of the need for, and an ability to engage in life-long learning

10. a knowledge of contemporary issues

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





Description of Electrical Engineering B.Sc. Courses

802301-4: Circuit Analysis (1)

Dissipative & storage elements, Ohm's & Kirchhoff's laws; resistive circuits, dependent sources, solving dc circuits by: direct application of laws, circuit reduction, nodal & mesh analysis, super-position, Thevenin & Norton theorems, maximum power transfer. Sinusoidal waveforms, effective value, phasor diagram, steady-state ac analysis, complex, active and reactive power in single phase circuits and applications of nodal, mesh analysis, superposition for solving ac circuits.

802382-3: Engineering Computational Methods

To acquaint the students with a variety of current engineering computational tools and scripting languages with applications in numerical analysis. The intent of this course is to introduce students to a number of fundamental concepts and computational methods relevant to different types of engineering fields by writing programs, or using software tools.

802302-3: Circuit Analysis (2)

Review & applications of Laplace transform to circuit analysis, Transient response of first & second order circuits, two-port networks, resonance; definition and circuits; magnetic circuits, ideal transformer, Three-phase circuits, RLC circuits and frequency response, lossless filters, computer applications for circuits' simulation, analysis, and design.

802311-4: Electronic Devices

This course explains the theory and applications of basic electronic devices such as pn-junction diode, Bipolar junction transistor (BJT), Junction Field-Effect Transistor (JFET), and Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET). In addition, it introduces basic principles of operational amplifier (Op-amps) and its circuit applications. Lab experiments are associated with this course to provide the student with practical experience in using electronic devices in some basic circuits.

802314-4: Electrical and Electronic Measurements

Main topics include: Introduction to measuring instruments and their operating principles, measurement of circuit parameters like power, power factor, phase angle, frequency and time. DC and AC bridges, characteristics of discrete and integrated devices, digital instrumentation, transducers. An integrated lab provides students an understanding of sensors and transducer working and its interfacing electronics.

802321-3: Signal Analysis

This course is to study the different theories required for the analysis and design of both Analogue (periodic and non-periodic) and Digital signals. Then, the student can represent both the Time-Domain and Frequency-Domain of any signal. Hence, the student can start successfully in studying the different Electrical, Electronic, and Communication courses. Topics on Fundamentals of the Analysis and Processing of Continuous and Discrete Signals, Fourier Series and Integrals, Linear Systems, Impulse Response, Convolution, Analog Filters, Signal Flow Graphs, Introduction to Discrete Fourier Transforms (DFT & FFT) and z-Transform are covered in this course.

802347-4: Advance Engineering Mathematics

This is an advanced mathematics course that includes complex variables and discrete mathematics. It provides an introduction to the complex analytic functions, complex integration, Cauchy’s theorem, residue calculus, series and product developments. The students will also be introduced to discrete mathematical concepts of logic and set theory, combinatorics, number theory, and graph theory

802323-3: Electromagnetics (1)

Topics covered are: Vector analysis, static electric and magnetic fields, Coulomb, Gauss, Ampere and Faraday’s Laws, Maxwell, Laplace and Poisson's equations. Solution of Laplace equation in Cartesian, cylindrical and spherical coordinates.

802351-3: Introduction to Electrical Power Engineering

Topics covered are: electrical power network, transmission line representation, AC distribution systems, Types of Power stations, Renewable energy sources, Substation layouts, wiring of buildings and per unit systems and symmetrical short circuit calculation.

802377-3: Logic Design

Major building blocks for deigning digital systems and their applications. Binary, Octal, Decimal, and Hexadecimal number systems and 2's complement number representation will be introduced. Basic building blocks of digital system design including gates, MUXes, DEMUXes, decoders, encoders, comparators, flip-flops, counters, registers, RAMs/ROMs, and FPGAs will be studies and applied. Students will also learn to design digital circuits using schematic and hardware description language (HDL), particularly, Verilog / VHDL.

802370-3: Engineering Design

This course instils lifelong learning, creative problem solving, team work, design, and communication (written, oral, graphical, and visual) skills into engineering students. The professional engineers design their projects within certain economic, environmental, societal, and global constraints. They also consider ethics, safety, health, life cycle, manufacturability, and sustainability when designing projects. The course on "Engineering Design" will make the students abreast with all these considerations and prepare them well for the professional skills of engineering design and communication.

802322-3: Introduction to Communication Systems

Introduction to analog communication systems, basic electronic components of analog communication systems, an introduction to analog modulation and demodulation techniques.

802340-4: Electrical Machines (1)

The basic concepts of electromechanical devices with special emphasis on engineering aspects of practical electrical machine performance such as transformers, motors and generators. Magnetic circuits, electrical analogy of magnetic circuits. Transformers: equivalent circuit, losses, efficiency and regulation. D.C. Machines: types, losses, characteristics. Introduction to ac machines; 3- ph Synchronous machines and Induction motors (3 ph. and 1 ph.).

802489-4: Microprocessors

Topics include: Introduction to basic computer organization, Software Architecture of 8088 & 8086 Microprocessors, Assembly Language (8086/8088) Programming and Instruction set, Memory and Interfacing, Parallel and Serial I/O Interfacing Circuits Interrupt Interface of 8088/8086 Microprocessor.

802451-4: Electrical Power Systems

Topics covered are: Load flow studies, Symmetrical Components, Symmetrical and Unsymmetrical Faults, Power System Stability, reliability, Modeling, solution and analysis of power systems using digital computers.

802411-4: Electronic Circuits

This course explains the basics of operational amplifier and its characteristics as well as the op-amp based circuits and systems. In addition, it introduces the concepts of AC models and frequency responses of amplifiers, different amplifier configurations (multistage amplifiers, compound amplifiers and differential amplifiers), feedback and oscillators, 555 – timer and applications. Lab experiments and two mini projects are associated with this course to provide the student with practical experience in using electronic circuits.

802324-4: Analog Communication Systems

This course enables students to develop skills for finding frequency representation of signals and Frequency Response of LTI systems, give them an in-depth familiarization to analog communication systems, different types of noise and their effects on communication system, analog modulation and demodulation techniques, and introduction to sampling theory.

802331-4: Control

This introductory course in control aims at enabling the students to understand basic concepts of closed loop system. A good understanding of 1st and 2nd order systems is developed. An integrated lab provides students experience in the design and analysis of feedback control systems. Communication and team skills, and lab safety concepts are emphasized via formal lab reports.

802411-4: Industrial Electronics

Introduction to basic Power Electronics and emphasis will be placed on Design of Power Electronics Circuits, Protection of Power Devices, Switching systems and triggering circuits, Control Strategy and their applications. An integrated lab provides students experience in the design and analysis of Power Electronic Circuits.

802352-3: Electrical Power Engineering

Topics Covered are: Basic concepts of Magnetic circuits, ac excitation, Transformers; equivalent circuit. dc motors; types, characteristics. Special machines; Servomotors; dc servomotors, ac servomotors, Stepper Motors; reluctance stepper motor, permanent magnet stepper motor, Power converters; ac voltage controllers, choppers, inverters.

802416-4: Digital Integrated Circuits

This course familiarizes students with the construction, operation, analysis, and design of various digital circuits of logic families. Both BJT and MOS logic gates will be considered.

802423-4: Electromagnetics (2)

This course is dedicated to give the student a solid information concerning the following subjects: Electromagnetic Principles: Time Varying Electric and Magnetic waves, Maxwell's Equations, Energy and Power, Polarization, plane Wave, Boundary Conditions, Reflection and oblique incident, Reciprocity Theorem and Image Theory.

Transmission Lines: Types of Transmission Lines, lossles transmission line, lossy transmission line, Characteristic Impedance, Terminated Transmission Line, Quarter wave transmission line, Generator and load mismatch, Description of Smith Chart, Insertion Loss, Return Loss, VSWR

Impedance Matching: Matching with lumped components, Single Stub tuning, Double Stub tuning, graphically and analytically

Research Presentations: Research and Presentations of current development in the field of electormagnetics and electromagnetic radiations effects on human health.

802401-1: Engineering Standards and Professional Ethics

The objective of this course is to make the students understand the importance of and recognize the impact of the engineering profession on the quality of life of all people. Students will be familiarized with the two important aspects of engineering profession, namely, Engineering Standards and Professional ethics, and their impact on the human life.

802481-3: Transmission and Distribution of Electrical Power

Transmission line conductor materials, transmission line representations and performance, power circle diagrams, mechanical design of transmission lines; power cables: types, equivalent circuit, performance and rating. AC. distribution systems.

802421-4: Communication Systems

This course is designed to give the student an introduction to digital communication systems, the behavior of digital communication systems in the presence of noise, an introduction to digital modulation and demodulation techniques, Line coding and M-ary communications and Error detecting and correcting codes.

802499-3: Project

The objective of this course is to prepare students for engineering practice to work in teams to implement a design project based on the knowledge and skills acquired in their earlier course work. This course provides guidance to the students how to accomplish a complete integrated electrical engineering project within multiple realistic constraints, e.g., economical, environmental, ethical, societal, safety, and health, and incorporating engineering standards, write a technical report and defend their work.

802440-4: Electrical Machines (2)
The performance and operation of the most common machines (Induction and Synchronous) that are used in power stations, factories, workshops, and domestics. Introduction to small and special machines. An integrated lab provides students experience in the design and analysis of practical electric machines.

802482-3: Switchgear and Protection
Topics Covered are: The basic philosophy of protection, electromagnetic relays, current and potential transformers. The different methods of protection, power system protection and protection coordination. Also the performance and operation of different switchgear. Circuit breakers: types, ratings, arc interruption, re-striking voltage transients and overvoltage protection.

802415-3: Analog Integrated Circuits
The course is to provide the analysis and design of various modules for analog integrated circuits. The course is intended to cover the Bipolar and MOS current mirrors, differential stage, and active loads, output stage, operational amplifier with single ended output and operational transconductance amplifier.

802431-3: Digital Control
Topics include: Bode and Root-locus plots. Synthesis part includes lead/lag controller design and state-space controller design. This course introduces controller design and analysis methods of digital control loop. The design and analysis is carried out in frequency domain as well as in time domain. Stability analysis is performed both in frequency domain (z-plane) and in time domain (Liapunov's method). Quantization error in digital controller implementation is studied to enhance practical use of the course.

802456-3: Introduction to Artificial Intelligence
Students will be introduced to the basic concepts of Artificial Intelligence (AI). Elements and areas of AI which cover the scientific and engineering applications are also covered. Major topics will include Introduction, Algorithmic and Symbolic Programming, Elements of AI, Predicate Calculus, Knowledge representation, Reasoning, Inferencing and Control, Rule-Based Expert Systems, Neural Networks, Fuzzy Reasoning and Logic, Programming in AI.

802455-3: Embedded Systems
Basic concepts of Embedded systems, Introduction to PIC Microcontrollers, the hardware and software features of PIC, Introduction to recently surfaced embedded hardware platforms.

802476-3: Digital Signal Processing

The objective of this course is to introduce the basic concepts and to provide the theoretical background required for digital signal processing to the student, study and design of various types of digital filters for implementation on a personal computer. Topics include Representation and analysis of digital signals and systems, z-transform, DFT and FFT algorithms, Difference equations solution and Digital Filters are covered in this course.

802442-3: Electric Drives

Basic concepts of electric drive systems. Emphasis on system analysis and application. Topics include: Motor control, types of driving motors, selection of drive components, DC motor drives and control techniques, AC motor drives and control techniques, stepper motor control, computerized drives.

802443-3: Electrical Energy Utilization

This course provides students with the knowledge of different fields of electrical energy utilization such as electrical traction, illumination, electric heating, electric welding, electrolytic processes, and electric transportation.

802444-3: Digital Protection

To make the student familiar with: Basic Concepts of digital relays, Digital Protection, Relaying Algorithms, Applications of signal processing applications for protection applications, Digital filtering methods, Applications: Transmission system protection, sub-station protection, Generator protection, Bus bar protection.

802446-3: Renewable Energy

The objectives of the course consist on the study of main renewable energy sources (solar, wind..) and to explain the principle and the behavior of the power electronics systems associated to these sources. Students will be familiar with alternative energy systems and their different technologies and principles.

802482-3: Distribution Systems Engineering

This course includes topics on distribution, power system planning, load forecasting, system automation, design, design considerations for primary and secondary systems, voltage drops and power-loss, capacitors in distribution systems, voltage regulations and Power system reliability.

802448-3: Electrical Insulation Materials

To make the student familiar with: Theories of gaseous insulation breakdown, Theories of solid insulation breakdown, Conduction process in insulating liquids, Breakdown mechanism in uniform and non uniform electric fields. Corona phenomenon, Gas insulated system (GIS). Voltage stresses. Over voltages, testing procedures and insulation coordination.

802452-3: High Voltage Engineering

Introduce students to the precautions of high voltage, different methods of high voltage generation, measurements, testing, Properties of electrical insulating materials and Earthing systems. An integrated lab provides students with the experience in the design test setup and analysis of the test samples' behavior. Electric Stress, Breakdown in insulating materials (gaseous, liquids, and solids), high voltage generation, testing and measurement, Surge, over voltage protection (Arresters) and earthing system (technical and protective).

802480-3: HVDC Transmission

Comparison of high voltage direct current (HVDC) transmission with high voltage alternative current transmission, Basic 1-ph and 3-ph converter circuits, 6- and 12-pulse converter circuits, Converter control: constant current control and constant voltage control, Harmonics created by HVDC converters and basic filters circuits.

802483-3: Economic Operation of Electric Power Systems

This course provides the students with an introduction to the economic operation of power systems, load curve analysis, economical load sharing between units and stations and optimum power systems planning.

802414-3: Solid State Devices

This course is a basic course provides the student with an emphasis on semiconductor physics: crystal structure, equilibrium and non-equilibrium processes in semiconductors. The course covers the physics of p-n junction diode, Bipolar Junction Transistor (BJT), Metal-Oxide-Semiconductor (MOS) capacitor, and Field-Effect Transistor (FET). The course also provides the student with an idea about device fabrication techniques.

802417-3: Integrated Circuits Fabrication

This course is to study the different process and technology required for the fabrication of modern integrated circuit (IC). In this course, the student will learn different types of IC's and various substrates required for IC fabrication. The students will also learn different fabrication processes such as diffusion, ion implantation, thermal oxidation, photolithography, etching, epitaxial growth, thin film deposition and metallization process. Finally student will perform simulation and modeling of simple IC fabrication unit process.

802418-3: Integrated Circuit Design
Advanced topics in modern ICs design with applications in areas such as digital communications, RF electronics, and bioengineering; implementation strategies of digital ICs and its application in the design of various memory and array structures; design of analog ICs through switched-capacitor circuits and phase-locked loops; the design of mixed-signal ICs through Nyquist-rate and oversampled data converters.

802459-3: Communication Networks
This course is to give the student an understanding of the fundamental concepts of networking and to understand the protocols employed in different layers in communication networks. Upon successful completion of the course, the student would be able to identify network components, design and evaluate the performance of communication networks. Student will learn the effects of physical channels and random events on the performance of networks.

802460-3: Modern Wireless Communication Systems
This course introduces students with the fundamental ideas and techniques in wireless communication systems with a particular focus on cellular systems. The challenges in wireless environments, models and methods to handle these challenges are presented. In particular, propagation models, multi-path propagation effects, Noise and Interference, digital modulation techniques, cellular radio systems, multiple-access techniques (FDMA, TDMA, CDMA), OFDM, and diversity techniques are discussed. Processes for planning and designing wireless communication networks are also covered.

802465-3: Communication Theory and Coding
This course reviews concepts of fundamentals of Probability Theory, Conditional Probability, and Bayes Theorem. The concepts of Measure of Information and Source Coding for efficiency improvement are covered in detail. Discrete Memoryless Channel, Mutual Information, and Channel Coding for better reliability are explained. Students learn how to analyze the 'Information-Carrying Capacity' of a communication channel.

802466-3: Microwave Engineering
This course familiarizes students with theoretical basics of Guided Waves, Electromagnetic waves, Closed Wave Guides, Open Wave Guides, Microwave network analysis.

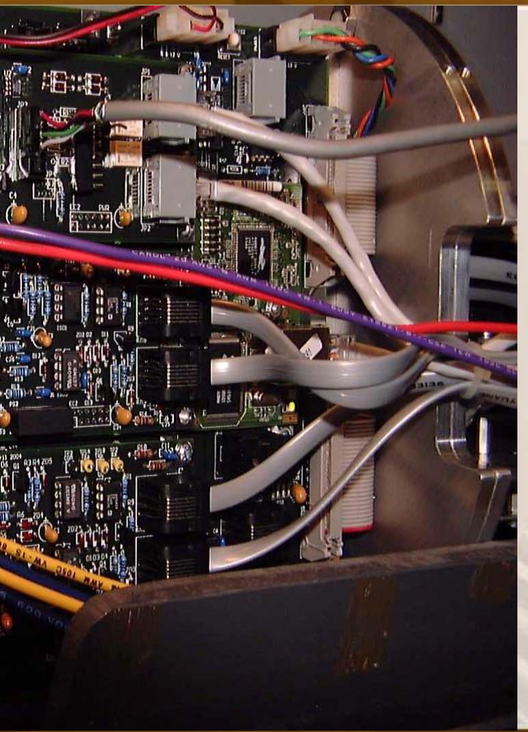
802467-3: Antennas
This course is dedicated to give the student a solid information concerning the following subjects: •Antennas Fundamentals: Antenna Directional Properties, Standing Wave Antenna, Traveling Wave Antenna, Antenna Gain, Effective Area, Antenna Impedance, Effect Of Earth, Antenna Feeding, Matching, Baluns, Near Field, Far Field. Radiation integrals and auxiliary potential function: Vectors of potential, Electric and magnetic field for electric and magnetic current sources, Near and Far fields radiation. Antenna Arrays and Array Synthesis: Two Element Array, Linear Array, Driven Antenna Element, Parasitic Antenna Element, Broadside Arrays, Endfire Arrays, Phase Steered Arrays, Array Analysis & Synthesis. Linear Wire Antennas: Infinitesimal dipole, Short dipole, Half wave length dipole. Loop antenna: Small circular loop, Circular loop with constant current.

802473-3: Microwave Devices

The main objective of this course is to make the student familiar with
microwave tubes including Klystrons, TWT and Magnetrons, and microwave semiconductor devices including microwave diodes (Tunnel, Varactor, Gunn) and microwave transistors (BJT, FET).

802474-3: Optoelectronics

This course reviews concepts of different types of optical emission, detection, modulation and optoelectronic circuits and their applications. The concepts of semiconductor physics and semiconductor junction device are explained. The wave nature of light, polarization, interference, diffraction, light source, quantum mechanical concept is given.



Laboratories

The Electrical Engineering Department has a number of laboratories used in undergraduate studies, research work, and community service.

Electrical Circuits Laboratory

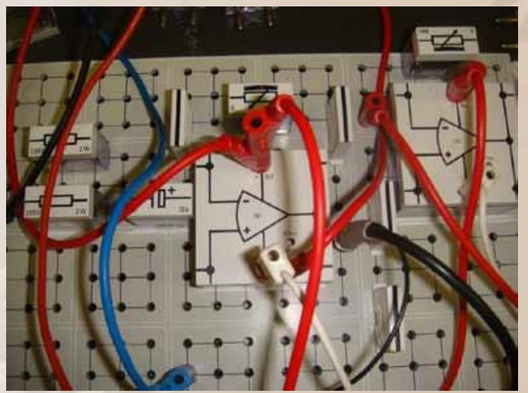
Teaches the student the basic principles of networks, networks of resistance, independent and non-independent sources, applications on the Ohms law and the Krashwvs laws. theories of networks and nodes and simplify networks, elements of storage capacity, response networks with first-class, vectors and analysis of the sinusoidal stable circuits include resistors, capacitors, coils and quantities and measurements to prove the theories.

Electrical and Electronic Measurments Laboratory

Variables measuring circuit, measuring the ability and the power factor, measuring the phase angle and frequency and time, the current bridge fixed and variable, and the specific characteristics of integrated devices, digital devices, the elements of measurement (sensors).

Electronic Circuits Laboratory

Practical applications of the basic concepts of electronic devices and the theory of its characteristics and how to analyze it as well as how to understand, analyze and design electronic circuits for each of the elements of a separate or integrated.

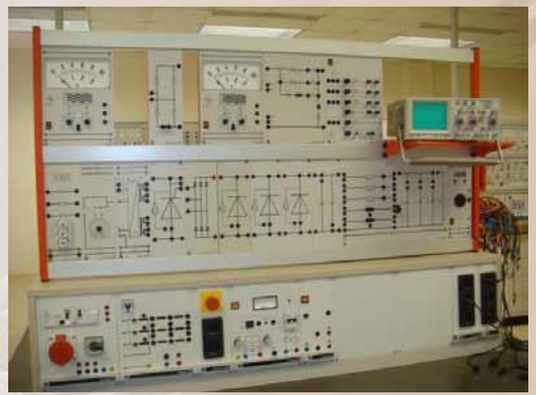


Digital Electronics Laboratory

Analysis and design of various digital circuits of the logical relations, as well as circuit-based logic gates and bipolar metal oxide semiconductor, open, and tie-in electronic devices, three-link inverter, various types of logic gates.

Industrial Electronics Laboratory

Design, function, protection and operating control of Industrial Electronics Devices and design of each of the components, components controlled single and three phase, polarity, dumpers; single and three phase, variable frequency, operating modes and conditions of loads, circuits on and off and protection.



Electrical Machinary Laboratory

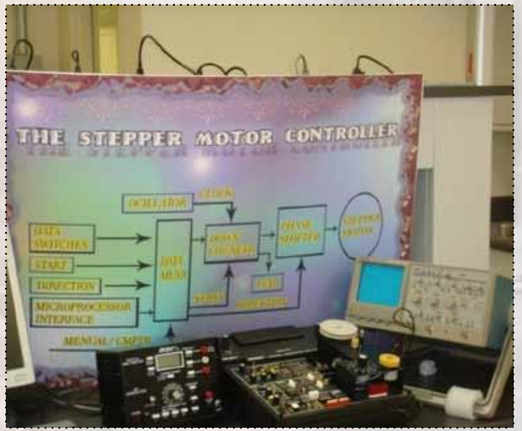
The basic concepts of electric machines focusing on engineering considerations for the performance and characteristics as transformers, engines and electrical generators.

Digital Communications Laboratory

Communication systems and study their performance in the presence we need to use electricity, and displays the adjustment methods (modulated) and digital methods of disassemble as well as an introduction to the symbols of the line and encoding used to detect errors and to correct coding errors.

Automatic Control Laboratory

Control systems and applications of the process variable to represent the status and function of conversion, error analysis in stable situations, stability analysis and design of feedback systems.



High Voltage Laboratory

Different ways to generate and measure the safety and high voltage tests, as well as the properties of electrically insulating materials and the application of theories of the collapse and discharge practice.

Electrical Power Laboratory

1- Transport and distribution of electric power:

Power transmission lines and components, calculate the constants and mechanical design of the lines, power cables, rates and performance, distribution systems DC and AC.

Electrical Power Laboratory

2- Protective and Cutting equipments:

Types of circuit cutters and rates, electric arc cutting transit and effort to re-ignition and to identify the protection devices (relays) for electrical power systems and how they work for all cases, such as the rise in voltage, the rise in power and others.

Microwave Laboratory

Properties of modern microwave circuits and components. Microwave Transistor and diode, patterns of infrared. Generate and amplify microwave, circuits field effect, noise and maximize energy.

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