



KFU
جامعة الملك فيصل
KING FAISAL UNIVERSITY
جامعة ووطن.. نماء.. واستدامة..

Mechanical Engineering Department

at

College of Engineering
King Faisal University
Al Ahsa-Kingdom of Saudi Arabia

June 2020

Mechanical Engineering – Welcome Note

Mechanical Engineering is one of the principal branches in Engineering and it is very broad based. Mechanical Engineering deals with the design, manufacture, production, operation and maintenance of mechanical equipment and systems. A degree in mechanical engineering will open opportunities in any type of industry.

Saudi Arabia, being an oil rich country has several oil and gas industries and power plants. Such plants certainly require the expertise of mechanical engineers to design, operate, and maintain a wide range of mechanical equipment and its associated systems. A thorough knowledge of design aspects, thermal characteristics, manufacturability, material aspects, and more importantly safety is certainly essential while designing, operating and maintaining mechanical equipment or systems. Such knowledge is imparted through interactive lectures, hands on experience in our well-equipped labs and through internships.

The Mechanical Engineering curriculum is meticulously developed and revised periodically. Eminent personnel from the industry & academics and our alumni are periodically invited to review our curriculum. Based on their inputs and the local industry requirements, various special topics are offered to our senior students. The mechanical engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Our faculty members have wide range of exposure in the academic and in the industry sectors. They stay active in research and periodically publish papers in reputed international academic conferences and in archival journals. Our staffs are very friendly and guide students during the academic program and during job search. We provide high quality education for our students, provide good interaction with the industry by conducting field trips and making internship as a part of our curriculum, encourage student's research and projects, support student's participation in technical conferences, enhance faculty skills through workshops, etc. More importantly, we assess our performance each semester and we constantly strive hard to improve our standards.

Welcome to the Department of Mechanical Engineering!

Mechanical Engineering Department Mission

The Mechanical Engineering program strives for providing quality services through close partnership with the community by demonstrating commitment to quality education that prepares graduates through a project-based learning with broad basic engineering knowledge to be professionals and to pursue postgraduate studies and research.

The department is also committed to quality research that leads to better solutions to mechanical engineering related problems with emphasis on issues of national significance by working closely with industry and research centres.

Program Educational Objectives (PEOs)

Within a few years of graduation, the Mechanical Engineering graduates are expected to attain the following program educational objectives:

- PEO 1:** Become technically competent engineers for a successful and productive career in the mechanical engineering profession.
- PEO 2:** Pursue graduate studies, research and design in mechanical engineering.
- PEO 3:** Demonstrate effective communication and teamwork skills in a diverse environment with an integrative perspective to solving mechanical engineering problems.
- PEO 4:** Engage in life-long learning for the purpose of continuous improvement.

Student Outcomes (SOs)

The graduates of the Mechanical Engineering Department, College of Engineering at King Faisal University are expected to demonstrate:

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

Labs

Thermodynamics Lab

In this laboratory, concepts related to first law of thermodynamics, processes, cycles, and efficiencies are studied experimentally. The objective of this laboratory is to enhance the student's knowledge in the area of thermodynamics principles and concepts that include thermal engineering applications, cycles and energy conversion.

Mechanical Systems Lab

In this laboratory, concepts related to heat transfer, solar energy, refrigeration and air conditioning systems and internal combustion engines are studied experimentally. The objective of this laboratory is to enhance the student's skills in thermo fluid applications.

Fluid Mechanics Lab

In this laboratory, concepts related to fluid properties, fluid statics and fluid dynamics are studied experimentally. In addition, energy principle, momentum principle, hydraulics and aerodynamics are investigated.

The objective of this laboratory is to enhance the student's knowledge in the area fluid mechanics.

Strength of Materials Lab

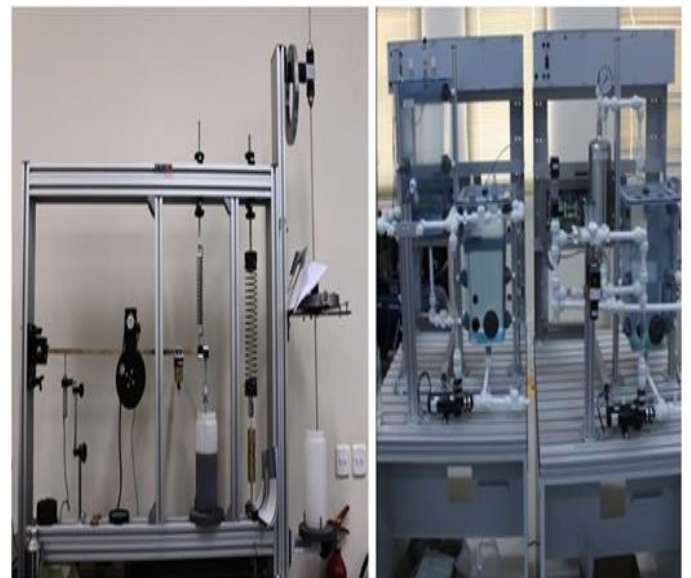
The fundamental principles of mechanics of materials and strength of structural components are studied through a series of experiments. This lab provides students with basic information in design of structural components and analysis of structural failures.

Control and Vibrations Lab

The lab covers topics related to process control systems, hydraulic concepts, vibration systems, DC motor control, and stepper motor control.

Measurements and Instrumentation Lab

The primary purpose of this lab is to provide fundamental knowledge in theory and practical experience in mechanical engineering measurements.



Study Plan of the Undergraduate Program (BSc Degree)

1 First Semester					
Course Code	Course Title	CH	Required/Elective	Pre-& Co-requisite	Curriculum Category
Math 144	Calculus I	4	Required		Math and Basic Sciences
Phys 140	General Physics I	3	Required	C: Phys. 144 C: Math. 144	Math and Basic Sciences
Phys 144	General Physics I Lab	1	Required	C: Phys. 140	Math and Basic Sciences
Chem 140	General Chemistry I	3	Required		Math and Basic Sciences
Engr 100	Introduction to Engineering	1	Required		General Engineering
Engr 106	Engineering Graphics	2	Required		General Engineering
Eng 133	English Composition I	2	Required		General Education
Semester Credit Hours		16			
2 Second Semester					
Course Code	Course Title	CH	Required/Elective	Pre-& Co-requisite	Curriculum Category
Math 145	Calculus II	4	Required	P: Math 144	Math and Basic Sciences
Phys 141	General Physics II	3	Required	P: Phys. 140 C: Phys. 145	Math and Basic Sciences
Phys 145	General Physics II Lab	1	Required	C: Phys. 141	Math and Basic Sciences
Chem 142	General Chemistry II	3	Required	P: Chem. 140 C: Chem. 143	Math and Basic Sciences
Chem 143	General Chemistry Lab	1	Required	C: Chem. 142	Math and Basic Sciences
Engr 105	Engineering Computing & Skills	2	Required	P: Engr. 100 C: Math 145	General Engineering
Eng 134	English Composition II	2	Required	P: Eng. 133	General Education
Eng 138	Fundamentals of Speech Communication	2	Required	C: Eng. 134	General Education
Semester Credit Hours		18			
3 Third Semester					
Course Code	Course Title	CH	Required/Elective	Pre-& Co-requisite	Curriculum Category
Math 244	Multivariate Calculus	3	Required	P: Math. 145	Math and Basic Sciences
Math 246	Linear Algebra	3	Required	P: Math 145	Math and Basic Sciences
Engr. 201	Statics	3	Required	P: Phys. 140	General Engineering
Engr. 206	Electric Circuits	3	Required	P: Phys. 141	General Engineering
ME 102	Mechanical Drawing	1	Required	P: Engr. 106	Core Mechanical Engineering
SSC101	Islamic Creed & Con. Doct.	2	Required		General Education
Semester Credit Hours		15			
4 Fourth Semester					
Course Code	Course Title	CH	Required/Elective	Pre-& Co-requisite	Curriculum Category
Math 240	Differential Equations	3	Required	P: Math. 145	Math and Basic Sciences
CS 204	Engineering Programming	3	Required	P: Math 144	General Engineering
Engr. 202	Strength of Materials	3	Required	P: Engr. 201	General Engineering

Engr. 203	Dynamics	3	Required	P: Engr. 201	General Engineering
ME 202	Thermodynamics I	3	Required	P: Chem. 140 P: Phys. 141 P: Math 145	Core Mechanical Engineering
ME 206	Measurements & Instrumentations	2	Required	P: Engr. 206 C: Eng. 137	Core Mechanical Engineering
Eng. 137	Technical Writing	2	Required	P: Eng. 134 P: Eng. 138	General Education
Semester Credit Hours		19			
5 Fifth Semester					
Course Code	Course Title	CH	Required/Elective	Pre-& Co-requisite	Curriculum Category
Engr. 205	Materials Science	3	Required	P: Chem. 142	General Engineering
Engr. 209	Strength of Materials Lab	1	Required	P: Engr. 202	General Engineering
Engr. 309	Fluid Mechanics	3	Required	P: Engr. 203 P: Math 240	General Engineering
Engr. 310	Numerical Methods	3	Required	P: Math 240 P: Engr. 105 P: CS 204	Math and Basic Sciences
ME 203	Thermodynamics II	3	Required	P: ME 202	Core Mechanical Engineering
ME 331	Theory of Machines	3	Required	P: Engr. 203 P: Math 240	Core Mechanical Engineering
Semester Credit Hours		16			
6 Sixth Semester					
Course Code	Course Title	CH	Required/Elective	Pre-& Co-requisite	Curriculum Category
Mgt. 292	Management Fundamentals & Skills	3	Required		General Education
Engr. 307	Engineering Economics	3	Required	P: Engr. 100	General Engineering
Engr. 312	Fluid Mechanics Lab	1	Required	P: Engr. 309	General Engineering
ME 204	Thermodynamics Lab	1	Required	P: ME 203 P: ME 206	Core Mechanical Engineering
ME 312	Mechanical Vibrations	3	Required	P: Engr. 203 P: Math 240 P: Math 246	Core Mechanical Engineering
ME 325	Heat Transfer	3	Required	P: Engr. 309 P: Engr. 310 P: Math 244	Core Mechanical Engineering
ME 332	Design of Machine Elements	3	Required	P: Engr. 205 P: Engr. 202 P: ME 331 P: ME 102	Core Mechanical Engineering
Semester Credit Hours		17			
Summer Semester					
Course Code	Course Title	CH	Required/Elective	Pre-& Co-requisite	Curriculum Category
Engr. 399	Engineering Training	0	Required	P: Eng. 137	Core Mechanical Engineering
Semester Credit Hours		0			
7 Seventh Semester					
Course Code	Course Title	CH	Required/Elective	Pre-& Co-requisite	Curriculum Category
ME 333	System Dynamics	3	Required	P: ME 312	Core Mechanical Engineering
ME 425	Mechanical Systems Lab	1	Required	P: ME 325 P: ME 312	Core Mechanical Engineering
ME 460	Manufacturing Processes	3	Required	P: Engr. 205	Core Mechanical Engineering

ME 4xx	Technical Elective	3	Required		Mechanical Engineering Elective
ME 4xx	Technical Elective	3	Required		Mechanical Engineering Elective
ME 495	Senior Design I	2	Required	P: ME 325 P: ME 332 P: Engr. 307 C: ME 460	Core Mechanical Engineering
SSC102	Islamic Cultural Issues	2	Required		General Education
Semester Credit Hours		17			
Ⓢ Eighth Semester					
Course Code	Course Title	CH	Required/Elective	Pre- & Co-requisite	Curriculum Category
Deic xxx Before Fall 2018	General Education Elective I	2	Required		University Elective
Deic xxx Before Fall 2018	General Education Elective II	2	Required		University Elective
SSC xxx After Fall 2018	General Education Elective I	2	Required		University Elective
SSC xxx After Fall 2018	General Education Elective II	2	Required		University Elective
ME 422	Air conditioning & Refrigeration Systems	3	Required	P: ME 203 P: ME 325	Core Mechanical Engineering
ME 441	Control Systems	3	Required	P: ME 333	Core Mechanical Engineering
ME 442	Mechatronics	3	Required	P: ME 206	Core Mechanical Engineering
ME 4xx	Technical Elective	3	Required		Mechanical Engineering Elective
ME 496	Senior Design II	2	Required	P: ME 495	Core Mechanical Engineering
Semester Credit Hours		18			
Total Credit Hours of the Program		136			

Department Technical Electives					
Course Code	Course Title	CH	Required/Elective	Pre- & Co-requisite	Curriculum Category
ME 420	Design of Thermal Systems	3	Elective	P: ME 325 P: ME 203	Mechanical Engineering Elective
ME 421	Internal Combustion Engine	3	Elective	P: ME 325 P: ME 203	Mechanical Engineering Elective
ME 423	Renewable & Solar Energy	3	Elective	P: ME 325 P: ME 203	Mechanical Engineering Elective
ME 426	Energy Conversion	3	Elective	P: ME 325 P: ME 203	Mechanical Engineering Elective
ME 427	Turbo machinery	3	Elective	P: ME 325	Mechanical Engineering Elective
ME 430	Computer Aided Design	3	Elective	P: ME 332	Mechanical Engineering Elective
ME 431	Finite Element Methods	3	Elective	P: ME 332 P: ME 325	Mechanical Engineering Elective
ME 445	Robotics	3	Elective	P: Engr. 203 P: Engr. 310	Mechanical Engineering Elective

ME 467	Nanotechnology	3	Elective		Mechanical Engineering Elective
ME 481	Undergraduate Research I	3	Elective		Mechanical Engineering Elective
ME 482	Undergraduate Research II	3	Elective		Mechanical Engineering Elective
ME 484	Special Topics I	3	Elective		Mechanical Engineering Elective
ME 485	Special Topics II	3	Elective		Mechanical Engineering Elective

University Electives (Before Fall 2018/2019)					
Course Code	Course Title	CH	Required/Elective	Pre- & Co-requisite	Category Curriculum
Deic 102	Fiqh Biography	2	Elective	None	University Elective
Deic 302	Islam and Science and Technology Issues	2	Elective	None	University Elective
Deic 317	Islamic Morals and Ethics	2	Elective	None	University Elective
Deic 318	Economic System in Islam	2	Elective	None	University Elective
Deic 401	Islamic Social System	2	Elective	None	University Elective
Deic 418	Political System and Human Rights in Islam	2	Elective	None	University Elective

University Courses (For Batch 2018 & above): From Supporting Studies Center					
Course Code	Course Title	CH	Required/Elective	Pre- & Co-requisite	Curriculum Category
SSC101	Creed and doctrines	2	Required	None	General Education
SSC102	Islamic culture	2	Required	None	General Education
SSC103	Islamic Morals and Ethics	2	Elective	None	University Elective
SSC104	Studies in the Biography of the Prophet	2	Elective	None	University Elective
SSC105	Medical jurisprudence	2	Elective	None	University Elective
SSC106	Economics & Politics in Islam	2	Elective	None	University Elective
SSC107	Islamic Social & Family Behaviour	2	Elective	None	University Elective
SSC108	Management & Entrepreneurship	2	Elective	None	University Elective
SSC109	Health & Fitness	2	Elective	None	University Elective
SSC110	Research skills	2	Elective	None	University Elective
SSC111	Volunteer work	2	Elective	None	University Elective
SSC112	Medicine: Type and use	2	Elective	None	University Elective
SSC113	Human Rights in Islam	2	Elective	None	University Elective
SSC114	Food and Nutrition	2	Elective	None	University Elective

Course Descriptions (Catalogue)

Math 144–Calculus I 4(4-0-0): This is an introductory course of mathematics for college of engineering students. The course covers the basic concepts and methods of calculus. At the beginning of the course the instructor will provide students the knowledge of the number systems, algebraic operations and functions of single variable with domain and range so that students can learn differentiation of the functions. The main topics to be covered in this course include: Limits, Continuity, Differentiation of functions of a single variable, Exponential, Logarithmic, Trigonometric, Inverse trigonometric functions, Applications of derivatives, Differentials, Curve Sketching, L'Hospital Rule, Mean value theorems, Area and estimating with finite sums, Introduction to integrals and definite integrals. **Four 1-hour lectures per week. Co-requisite: None.**

Phys 140–General Physics I 3(3-0-0): The course is an introduction to units, measurements, motion in one and two dimensions, kinematics and dynamics, Newton's laws, work and energy, rotational dynamics, linear and angular momentum, torque, and collisions. Basic calculus and multi-variable algebra will be used. **Three 1-hour lectures per week. Co-requisite: Math 144 & Phys 144.**

Phys 144–General Physics I Lab. 1(0-0-3): Measure basic constants such as length, weight and time, value of acceleration due to gravity. Design and conduct experiments in mechanics. Analyze and interpret experiment data. Write a scientific report. Draw and interpret a graph. Apply experimental principles and error calculations to mechanics. **Three hours Lab. per week. Co-requisite: Phys 140.**

Chem 140-General Chemistry I 3(3-0-0): Matter properties and measurement, Atoms and the Atomic Theory, Chemical Compounds, Chemical Reactions, Reactions in Aqueous Solutions, Liquids Solids and Intermolecular Forces, Electrons in Atoms, Periodic Table and Atomic Properties, Chemical Bonding, Valence-Bond, Hybridization of Atomic Orbital, Multiple Covalent Bonds, Molecular Orbital Theory, Liquids and Solids. **Three 1-hour lectures per week. Co-requisite: None.**

Engr 100-Introduction to Engineering 1(1-0-0): This course introduces engineering to students, particularly those who are interested in an engineering profession. It covers engineering ethics, teamwork, communication skills, engineering topics, and engineering problem solving skills and design methodology. **One 1-hour lecture per week. Co-requisite: None.**

Engr 106–Engineering Graphics 2(1-0-3): An introductory course in engineering graphics focuses on graphical communication. Topics include descriptive geometry elements, visualization, engineering drawing techniques, orthographic projection, pictorial representation, section views, and basic dimensioning. The course incorporates computer aided drafting (CAD) with engineering applications using 2-D drawing. This course is divided in to two sections:

sketching and AutoCAD. The course begins by teaching the basics of engineering graphics using sketching. Freehand sketching using only a pencil and paper is an important skill for any engineer. It is a means of quickly conveying technical information to others. Through sketching the concepts of pictorial projections, section views, auxiliary views and dimensioning are taught. Once the foundation of engineering graphics is known, these concepts can be applied using computer aided design (CAD) software. AutoCAD is taught first. AutoCAD is a drawing software package used to create two dimensional engineering drawings. **One 2-hours lecture per week. Co-requisite: None.**

Eng 133–English Composition I 2(2-0-0): This is an intermediate level writing class. Students are guided through the stages of the writing process to write paragraphs that are both meaningful and organized and include a topic sentence with a controlling idea and conclusion. Students write multi-draft compositions from a variety of practical and academic purposes. They improve their writing by studying model sentences and paragraphs, basic sentence patterns, mechanics, coordinating conjunctions, transitions and vocabulary. **Two 1-hour lectures per week. Co-requisite: None.**

Math 145–Calculus II 4(4-0-0): This is an intermediate level calculus course designed for undergraduate Engineering students. This course covers mainly the integration and basic principles of Vectors and their applications. At the beginning of this course, the instructor will give the review of differentiation and integration. In depth, the students will learn the methods of integration and vectors. The topic covered include, Techniques of Integration, Improper Integration, Applications of Integration, Infinite Sequences and Series, (Power series and Taylor series), Polar coordinates, Transcendental Functions, Vectors, Vector Valued Functions. **Four 1-hour lectures per week. Pre-requisite: Math 144.**

Phys 141–General Physics II 3(3-0-0): This course introduces students to the physics of electricity and magnetism and the connections between them. The concepts of electric charge, electric field, electric potential, Kirchhoff Law, Gauss Law, electric and magnetic fluxes, capacitance, resistivity and resistance, connections in series and in parallel, RC-circuit, magnetic field, magnetic force, magnetic and electric torques, Ampere Law, electromagnetic induction, and Faraday Law and Lenz Law will be taught. **Three 1-hour lectures per week. Pre-requisite: Phys 140. Co-requisite: Phys 145.**

Phys 145–General Physics II Lab. 1(0-0-3): This course introduces students to the basic electrical measurements' techniques and to the physics of electricity and magnetism. The concepts of basic measurements, Resistors in series and in parallel, Verifying Ohm's law, Wheatstone Bridge, Verifying Kirchhoff's Laws, Resistivity, Capacitors in series and in parallel, RC circuit, Introduction to Oscilloscope, the Mechanical Equivalent of Heat, the Negative Temperature Coefficient of Resistance (Thermistor), Galvanometer, and the Magnetic Moment will be

taught. **Three hours Lab. per week.** Co-requisite: Phys 141.

Chem 142-General Chemistry II 3(3-0-0): Properties of Gases: Kinetic-molecular theory of gases, Ideal gas law, Mixtures of gases, Thermochemistry, Principles of Chemical Equilibrium, Acids and Bases, Buffer Solutions, Neutralization Reactions and Titration Curves, Solubility and Complex-Ion Equilibria, Spontaneous Change: Entropy and Free Energy, Thermodynamic, Solutions and Their Physical Properties, Chemical Kinetics and Electrochemistry. **Three 1-hour lectures per week.** Pre-requisite: Chem 140. Co-requisite: Chem 143.

Chem 143-General Chemistry Lab. 1(0-0-3): Laboratory safety rules and Evaluation of analytical data, Definition and determination of density, explanation and determination of specific heat, concept of Acids, bases and Heat of Neutralization Reaction and its determination, reversible reactions, concept of equilibrium constant and its determination, LeChatelier principle and its verification, principle involved in Acid base titrations, indicators, Ionization of electrolytes, determination of dissociation constant of weak acid(K_a), principle involved in complex metric titrations, hardness of water and its determination. **Three hours Lab. per week.** Co-requisite: Chem 142.

Engr 105-Engineering Computing & Skills 2(2-0-0): Problem solving skills and computing using MATLAB. **Two 1-hour lectures per week.** Pre-requisite: Engr 100. Co-requisite: Math 145.

Eng 134-English Composition II 2(2,0,0): This English course is designed to take learners from the paragraph level of writing in English to the Essay level. It concentrates of the essential form and function of the essay and prepares the ground for the academic essay. Particular importance is given to tasks of description and argumentation, including work on comparison, definition, cause-effect and expression of opinion in essay writing. Thus, students are taken through the major stages of the essay composition process. **Two 1-hour lectures per week.** Pre-requisite: Eng 133.

Eng 138-Fundamentals of Speech Communication 2(2-0-0): A study of communication theories as applied to speech: practical communicative experiences ranging from interpersonal communication and small-group process through problem identification and solution in discussion, to informative and persuasive speaking in standard speaker-audience situations. **One 2-hour lecture per week.** Co-requisite: Eng 134.

Math 244-Multivariate Calculus 3(3-0-0): This course is an advanced course in calculus, designed for undergraduate students of engineering. The course covers the basic principles and methods of differentiation and integration of two or more variables. At the beginning of the course, the Instructor will give a review of functions of one variable and its differentiation and integration. Then, the functions of two or more variables with domain and range will be

discussed. Throughout the course, the following main topics will be covered: solid analytic geometry; vector calculus; partial derivative; and multiple integrals. The coverage will also include relevant and important applications in the sciences and engineering. **Three 1-hour lectures per week.** Pre-requisite: Math 145.

Math 246-Linear Algebra 3(3-0-0): Linear transformations, finite dimensional vector spaces, matrices, determinants, systems of linear equations, and applications to areas such as linear programming. Markov chains and differential equations. **Three 1-hour lectures per week.** Pre-requisite: Math: 145.

Engr. 206-Electric Circuits 3(3-0-0): Resistors, capacitors, inductors, currents; voltages; power and energy; circuit analysis techniques; DC and AC analysis; magnetic circuits and transformers; Introduction to DC and AC machines. **Three 1-hour lectures per week.** Pre-requisite(s): Phys. 141.

Engr. 201-Statics 3(3-0-0): The subject of Statics deals with forces acting on rigid bodies at rest covering coplanar and non-coplanar forces, concurrent and non-concurrent forces, friction forces, hydrostatic forces, centroid and moments of inertia. Much time will be spent finding resultant forces for a variety of force systems, as well as analyzing forces acting on bodies to find the reacting forces supporting those bodies. This course also shows how to find the internal forces in structural elements and how to get the centroid and inertia for areas. Students will develop critical thinking skills necessary to formulate appropriate approaches to problem solutions. **Three 1-hour lectures per week.** Pre-requisite(s): Phys. 140.

ME 102-Mechanical Drawing 1(0-0-3): Computer-aided solid modeling concepts, Modeling 3D geometries using solid modeling techniques, Combination of solid modeling techniques to create complex parts, Assembly of 3D parts to form a machine or complete mechanical system, Generating multi-view engineering drawings for 3D parts or assemblies. **1-three hour drafting session per week.** Pre-requisite(s): Engr. 106.

SSC 101-Islamic Creed and Contemporary Doctrines 2(2-0-0): Creed: definition, importance, sources, characteristics, study methodology, pillars of faith, influence of creed on individuals and society, belief nullifiers, thought constraints, study of some contemporary doctrines: secularism, Satan worshipers, Baha'ism, Zionism, Misoneism, Christian fundamentalism. Student is required to memorize part of the holy Quran. **One 2-hour lecture per week.** Pre-requisite(s): None.

Math 240-Differential Equations 3(3-0-0): This course is an introductory course of differential equations for college of engineering students. The course covers different methods and concepts to solve first and second order differential equations. At the beginning of the course we discuss some definitions and terminology about differential equations. Then we move to solving first and second order differential equations. The topics in this course include, linear differential equations, solving first order differential

equations, solving second order differential equations, series solutions of second order linear differential equations, solving systems of linear differential equations, Laplace transform and its applications in solving differential equations. **Three 1-hour lectures per week.** Pre-requisite: Math 145.

Engr. 202–Strength of Materials 3(3-0-0): The course covers strength of materials in depth including the followings: Basic Concepts in Strength of Materials, Direct Stress, Strain, Axial Deformation and Thermal Stress, Torsion, Transverse Shearing Forces, Bending Moments in Beams and Stress Due to Bending, Shearing Stresses in Beams, Combined Stresses and Pressure Vessels, Stress Transformations, Deflection of Beams, Columns. **Three 1-hour lectures per week.** Pre-requisite(s): Engr. 201.

Engr. 203-Dynamics 3(3-0-0): Fundamentals of particle and rigid body dynamics. Kinematics and kinetics of a single particle and system of particles. Application of Newton’s laws and energy and moment principles in solving problems involving particles or rigid bodies in planar motion. Introduction to kinetics of rigid bodies in three dimensions, angular acceleration, angular momentum, instantaneous centre, mechanical vibrations of simple spring-mass systems. **Three 1-hour lectures per week.** Pre-requisite(s): Engr. 201.

ME 202-Thermodynamics I 3(3-0-0): Thermodynamics concepts and definitions, states, properties, systems, control volume, processes, cycles, units, tables of properties, work and heat, first law, internal energy and enthalpy, conservation of mass, steady-state and uniform state processes, second law, reversible processes, entropy, Clausius inequality, principle of the increase of entropy, efficiencies, irreversibility and availability, power and refrigeration cycles. **Three 1-hour lectures per week.** Pre-requisite(s): Math 145 & Phys. 141 & Chem. 140.

ME 206-Measurements and Instrumentations 2(1-0-3): Introduction to measurement systems and experimental methods, basic concepts, calibration, dynamic response, analysis of experimental data, basic electrical measurements and sensing devices, displacement measurements, pressure measurement, flow measurement, temperature measurement, force, torque and strain measurements. Also, some experiments will be conducted. **Three 1-hour lectures per week.** Pre-requisite: Engr. 206. Co-requisite: Eng. 137.

CS 204–Engineering Programming 3(3-0-0): Introduction to computer systems; problem solving methodology; testing and debugging of programs; variables, declarations, and assignments; input and output; data types; control flow and looping; functions and overloading; streams and input/output; one-dimensional arrays; two-dimensional arrays; pointers and dynamic arrays; structures; abstract data types and classes; inheritance; friends, overloaded operators, and arrays in classes; recursive functions.. Projects that will require lab work will be assigned weekly. **Three 1-hour lectures per week.** Prerequisite: Math 144.

Eng. 137-Technical Writing 2(2-0-0): This course introduces students to the fundamentals of writing, designing and conveying technical information to different audiences. Students will learn about technical writing conventions, such as organization, style and tone and illustration and layout as they work through the writing process to produce a variety of common technical documents that they will encounter in their academic work. Two 1-hour lectures per week. **Two 1-hour lectures per week.** Pre-requisite(s): Eng. 134 & Eng. 138.

Engr. 205-Material Science 3(3-0-0): Mechanical, electrical and chemical properties of engineering materials, fundamentals of crystallography, crystal defects, Impurities and imperfections in solids. Atomic diffusion. Single phase metals and alloys; elastic and plastic deformation, recrystallization and grain growth. Multi-phase materials; phase diagrams and equilibrium microstructural development, Heat treatment process, Studies of the widely-used engineering metals, alloys, polymers, composites & ceramics. **Three 1-hour lectures per week.** Pre-requisite(s): Chem. 142.

Engr. 209-Strength of Materials Lab 1(0-0-3): Strength of materials lab contains several equipment that can be utilized to introduce the most important concepts of materials and its ability to withstand external loads without failure which is the base of machine and components design. On the other hand, strength of material lab will support student information in materials and its properties and strength of materials and types of loadings and types of stresses induced in members due to this loading. The most important experiments in the field of strength of materials like tensile test, compression test, torsion test, Fatigue test, Hardness test, impact test, and creep test will be discussed. **1-three hour lab per week.** Pre-requisite(s): Engr. 202.

Engr. 309-Fluid Mechanics 3(3-0-0): The course addresses flow classification, fluid properties, fluid in statics, pressure measurements, buoyancy, fluids in motion, continuity equation, pressure gradient in fluid flow, Bernoulli’s, Reynold’s transport theorem, momentum and energy equations, dimensional analysis and similitude, and an introduction to the hydrodynamic boundary layer. **Three 1-hour lectures per week.** Pre-requisite(s): Engr. 203 & Math 240.

Engr 310-Numerical Methods 3(3-0-0): Introduction to Numerical Methods, Solution of Nonlinear Equations, Solution of Simultaneous Linear Algebraic Equations, Solution of Matrix Eigenvalue Problem, Curve Fitting and Interpolation, Numerical Differentiation, Numerical Integration, Ordinary Differential Equations: Initial-Value Problems, Ordinary Differential Equations: Boundary-Value Problems. **Three 1-hour lectures per week.** Prerequisite: Math 240, CS 204 & Engr 105.

ME 203–Thermodynamics II 3(3-0-0): Basic laws and principles applications to gas power and refrigeration cycles, vapor and combined power cycles, mixtures of gases and vapors, psychrometry, chemical reactions, thermodynamic property relations,

and exergy analysis. **Three 1-hour lectures per week.** Pre-requisite: ME 202.

ME 331-Theory of Machines 3(3-0-0): Theory of Machines & Mechanisms is a study of linear & angular displacements, velocities, accelerations of points & bodies, and the static and dynamic forces required for the proper design of mechanical linkages, cams systems. The course covers both static force analysis of mechanisms and dynamic analysis of linkages. Mechanisms and applications, vector method of analysis of plane mechanisms, mobility and linkages, cams, position, velocity and acceleration analysis in mechanisms. Static and dynamic balancing and balancing machines, flywheels, & reciprocating engines.. **Three 1-hour lectures per week.** Pre-requisite(s): Engr. 203 & Math. 240.

Engr. 312-Fluid Mechanics Lab 1(0-0-3): Conduct experiments to understand the basic concepts of fluid mechanics such as Hydrostatic Bench, Orifice and Jet Flow Apparatus, Bernoulli's Theorem Apparatus, Impact of Jet Apparatus, Piping Loss Test Panel, Open Circuit Wind Tunnel, Pump Test Set, Turbine Service Unit, Series/ Parallel Pumps, Variable Slope Channel. **1-three hour lab per week.** Pre-requisite(s): Engr. 309.

ME 204-Thermodynamics Lab 1(0-0-3): The course covers a wide range of experiments related to thermodynamics concepts. First law of thermodynamics and some thermodynamic relations are investigated. Measure of some fuels properties like calorific value. Thermodynamics cycles will be investigated like Refrigeration, Rankine, Brayton, and Sterling cycle. Compression and expansion of air will be studied. The performance of the solar collector will be investigated. Many parameters will be measured in the internal combustion engines. **1-three hour lab per week.** Pre-requisite(s): ME 203 & ME 206.

ME 312-Mechanical Vibrations 3(3-0-0): This course covers fundamentals of theory and analysis of mechanical vibrations, simple harmonic oscillator, complex phasor representation of harmonic motion, elements of a vibrating system, review of model formulation using Newton's laws and work-energy method, equivalent inertia, spring and damper for lumped parameter and continuous systems, natural frequency and damping ratio, undamped and viscous and dry friction damped free vibrations of SDOF oscillators, Rayleigh-Ritz method, static and dynamic stability vibration of mechanical systems, logarithmic decrement, response of SDOF oscillators to direct harmonic, rotating unbalance, base motion, periodic, transient 1 and non-periodic loads, vibration instrumentation and isolation. Free and forced vibrations of Two DOF systems. Lagrange's equation. Normal modes and principal coordinates, tuned vibration absorber, introduction to vibration of continuous systems, wave equation and Euler-Bernoulli beam bending vibrations. **Three 1-hour lectures per week.** Pre-requisite(s): Engr. 203, Math 240 & Math. 246.

ME 325-Heat Transfer 3(3-0-0): The course addresses the mechanism of heat transfer modes, introduction to conduction, thermal conductivity of solids, diffusion equation, heat transfer in fins &

extended surfaces, multi-dimensional steady-state conduction, transient conduction, lumped capacitance method, introduction to convection, forced convection, natural convection, hydrodynamic & thermal boundary layers, forced convection external flow, heat exchangers, an introduction to basic radiation. **Three 1-hour lectures per week.** Pre-requisite(s): Engr. 309, Engr. 310 & Math. 244.

ME 332-Design of Machine Elements 3(3-0-0): Theory of Machines & Mechanisms is a study of linear & angular displacements, velocities, accelerations of points & bodies, and the static and dynamic forces required for the proper design of mechanical linkages, cams systems. The course covers both static force analysis of mechanisms and dynamic analysis of linkages. Mechanisms and applications, vector method of analysis of plane mechanisms, mobility and linkages, cams, position, velocity and acceleration analysis in mechanisms. Static and dynamic balancing and balancing machines, flywheels, & reciprocating engines. **Three 1-hour lectures per week.** Pre-requisite(s): Engr. 205, Engr. 202, ME 331, & ME 102.

Engr 307-Engineering Economics 3(3-0-0): The course covers the following topics: Engineering Economic Decisions; Understanding Financial Statements; Cost Concepts and Behaviors; Time is Money; Understanding Money and Its Management; Principles of Investing; Present Worth Analysis; Annual Equivalent Worth Analysis; Rate of Return Analysis; Depreciation; Taxes; Break-Even Analysis; Cost Estimation; Developing Project Cash Flows; Inflation; Replacement Decisions. **Three 1-hour lectures per week.** Pre-requisite(s): Engr 100.

Mgt 292-Management Fundamentals & Skill 3(3-0-0): The course covers Management fundamentals & Skill, such as, Global Management - Change and Innovation - Appendix: Managing Entrepreneurial Ventures - Decision Making - Strategic Management - Module Planning Tools and Techniques - In class discussion: Ethics Dilemma - Operations Management - Marketing Management - E Business - Marketing Plan - Human Resource Management - Team Building - Foundations of Individual Behaviour - Communication. **Three 1-hour lectures per week.** Pre-requisite(s): None.

Engr 399-Engineering Training 0(0-0-0): All engineering students are required to undergo a comprehensive "Engineering Training Program" with a reputable and specialized industrial firm. The firm can be in or outside Saudi Arabia relevant to his major area of interest in engineering analysis, design, or construction. The main purpose of this summer training is to enhance the students' practical experience and career abilities. Also, it deepens their engineering knowledge acquired during their academic years in the field of practical experience in real-life engineering projects. Additionally, such a program improves the relationship between the College of Engineering and the governmental and private industrial firms. Also, it can provide the industry with well-trained professionals in the near future. The qualifying student

should spend at least eight weeks in a governmental organization, a reputable industrial firm, or a research center that is involved with engineering activities. **Two months of full time training.** Pre-requisite: Eng. 137 & (Level 7 or above).

ME 333-System Dynamics 3(3-0-0): This course introduces students to basic theory and practices of formulation, simulation and analysis of approximate linear discrete mathematical models for mechanical, electrical, fluid, thermal and electromechanical systems, identification of elements of mechanical, electrical, fluid and thermal systems, elements constitutive relations and governing physical laws. Analytical solutions of first and second order systems, simulations using MATLAB and SIMULINK, Laplace Transforms applications, transfer function state space representations, and frequency response. **Three 1-hour lectures per week.** Pre-requisite(s): ME 312.

ME 425-Mechanical Systems Lab 1(0-0-3): The course covers experiments to understand some basic concepts of heat transfer, refrigeration systems, special humidity sensor and vibration module. and make students familiar as much as possible with the devices by getting readings, analyzing the results then comparing with the theoretical calculations for each experiment, and find the differences between the results of the experiments and the theoretical values, then trying to find the basic technical reasons of these differences. **1-three hour lab. per week.** Pre-requisite(s): ME 312 & ME 325.

ME 460-Manufacturing Processes 3(3-0-0): Metal casting, forming and chip removal processes, cutting tools, cutting fluids, forces and power. Consumption. Investigation of conventional and non-conventional manufacturing processes **Three 1-hour lectures per week.** Pre-requisite(s): Engr 205.

ME 495-Senior Design I 2(2-0-0): Planning, design, construction and/or management of an engineering project that handles contemporary engineering problems under the supervision of one or more faculty members. The course allows the student to apply the knowledge attained from the various courses of the undergraduate program to prepare the proper approach of solution to his project problem. **Two 1-hour lectures per week.** Pre-requisite(s): Senior Standing, ME 332, ME 325 & Engr. 307. Co-requisite(s): ME 460.

SSC 102-Islamic Culture 2(2-0-0): Moderation, Islam globalism and human ties, discrimination and nationalism, Arabic as the medium of education and culture, science and religion, interfaith dialogue, Orientalism and Christianization, Colonialism, Westernization, modernity in literature, Globalization, Terrorism, Development of Moslem nations. **One 2-hour lectures per week.** Pre-requisite(s): None.

ME 422-Refrigeration & Air conditioning Systems 3(3-0-0): Review of psychometry. Air conditioning processes. Thermal comfort, inside and outside design conditions. Ventilation and infiltration. Heating load calculations. Cooling load calculations. Water heating systems layout and design. Air systems design.

Refrigeration systems classification. Theoretical and actual vapor compression cycles. Description of different types of expansion valves. Refrigeration load calculations. Absorption chillers. **Three 1-hour lectures per week.** Pre-requisite(s): ME 203 & ME 325.

ME 441-Control Systems 3(3-0-0): This course introduces the basics of theory of analysis and design of linear feedback control systems, reviews of formulation of linear lumped parameters mathematical models of mechanical, electrical, fluid, thermal and combined systems, block diagrams and state space representations, poles and zeros of transfer function, Block diagram reduction, Mason's gain formula, solution of state equations and state transition matrix, 1st and 2nd order systems response specifications, time constants, overshoot, rise and settling times and steady state errors, Routh-Hurwitz stability criterion, system types and static error coefficients, PID control actions and lag-lead compensators frequency response function and Bode plots, Nyquist stability criterions, phase and gain margins, Root Locus design, simulation using MATLAB tool boxes. **Three 1-hour lectures per week.** Pre-requisite(s): ME 333.

ME 442-Mechatronics 3(3-0-0): The mechatronics course provides the student with a general overview of an integrated electro-mechanical system, which employs analog and/or digital electronics for sensing, actuation and control. Microprocessor based control systems are given special attention and are covered in detail. An important objective of the course is to demonstrate the integration of measurement systems, control, electronics, programming and mechanics in designing competitive systems. The practical assignments and the project work are designed to enhance planning and team skills. **Three 1-hour lectures per week.** Pre-requisite(s): ME 206.

ME 496- Senior Design II 2(2-0-0): Completion of Senior Design I in planning, design, construction and/or management of an engineering project that handles contemporary engineering problems under the supervision of one or more faculty members. Like ME 495 the course allows the student to apply the knowledge attained from the various courses of the undergraduate program to prepare the proper approach of solution and completion to his engineering project. **Two 1-hour lectures per week.** Pre-requisite(s): ME 495.

Deic 101- Islamic Creed & Contemporary Doctrines 2(2-0-0): Definition, importance, sources, characteristics, study methodology, pillars of faith, the influence of creed on individuals and society, belief nullifiers, thought constraints, Study of some contemporary doctrines: secularism, Satan worshipers, Baha'ism, Zionism, Misoneism, Christian fundamentalism. **One 2-hours lectures per week.** Pre-requisite(s): None.

Deic 102-Islamic Morals and Ethics 2(2-0-0): Moderation, Islam globalism and human ties, discrimination and nationalism, Arabic as the medium of education and culture, science and religion, interfaith dialogue, Orientalism and Christianization, Colonialism, Westernization, modernity in literature,

Globalization, Terrorism, Development of Moslem nations. **One 2-hours lectures per week.** Pre-requisite(s): None.

Deic 102-Fiqh Biography 2(2-0-0): Definition, importance, sources, characteristics, study methodology, pillars of faith, the influence of creed on individuals and society, belief nullifiers, thought constraints, Study of some contemporary doctrines: secularism, Satan worshipers, Baha'ism, Zionism, Misoneism, Christian fundamentalism. **One 2-hours lectures per week.** Pre-requisite(s): None.

Deic 302-Islam and Science and Technology Issues 2(2-0-0): Moderation, Islam globalism and human ties, discrimination and nationalism, Arabic as the medium of education and culture, science and religion, interfaith dialogue, Orientalism and Christianization, Colonialism, Westernization, modernity in literature, Globalization, Terrorism, Development of Moslem nations. **One 2-hours lectures per week.** Pre-requisite(s): None.

Deic 317-Islamic Morals and Ethics 2(2-0-0): Morals (Ethics: definition and foundations, characteristics, study of model samples of the Prophets' morals and ethics, tools of moral/ethical education in Islam. Concept of the profession and its importance in human life, constituents of professional morals/ethics and its constraints, model samples of professional morals/ethics in Islam. **One 2-hours lectures per week.** Pre-requisite(s): None.

Deic 318-Economic System in Islam 2(2-0-0): Islamic Economy: (its nature and principles, development, and characteristics), the economic problem and how to face it, contemporary economic systems (capitalism, socialism), economic globalism, World Bank and its goals, World Trade Organization and its goals, ownership in Islam: definition, types, constraints. Islam and economic freedom, Production, distribution, expenditure, economic policies in contracts and transactions. Student is required to memorize part of the holy Quran. **One 2-hours lectures per week.** Pre-requisite(s): None.

Deic 401- Islamic Social System 2(2-0-0): Society: definition, building blocks of society in Islam, Islamic society attributes, Family in Islam: definition, status, importance, building blocks, marriage and its purposes, spouses' rights, parents, siblings, and relatives' rights, women's status and rights in Islam, Family controversial issues about family system in Islam and responding to those issues (polygamy, inheritance, veil, divorce, etc.), Family problems and remedies (women's work, alimony, stewardship, etc.). Student is required to memorize part of the holy Quran. **One 2-hours lectures per week.** Pre-requisite(s): None.

Deic 418- Political System & Human Rights in Islam 2(2-0-0): Political system: definition, characteristics. Country building blocks: homeland, society, authority, goals, foundations, principles of ruling in Islam, ruler selection, ruler duties, state authority, rights of Moslems and non-Moslems in the Islamic state, Manifestations of implementing the

political system in KSA: Governance statute, Shura, judiciary system, security, Hisbah. Human rights in Islam: definition, significance, sources, constraints, Basic rights: (equality, freedom, life, justice, safety), Universal/International Declaration of Human Rights and position of KSA from it. Students are required to memorize part of the holy Quran. **One 2-hours lectures per week.** Pre-requisite(s): None.

SSC 103-Islamic Morals and Ethics 2(2-0-0): Ethics: its definition, importance, swearing, and stature in Islam. Characteristics of Islamic morals. Moral obligation, moral responsibility, and moral sanction. Pictures of the manners of the Prophet Mohammed, peace and blessings be upon him. Pictures of the morals of his companions. Ethics and ethics of the profession. The Kingdom of Saudi Arabia's efforts in the field of protecting integrity and combating professional corruption, while mentioning ethical applications from Saudi professional systems. Introduction to the National Anti-Corruption Commission "integrity". The role of the National Anti-Corruption Commission "integrity" in protecting the integrity and combating professional corruption. **One 2-hours lectures per week.** Pre-requisite(s): None.

SSC 104- Studies in the Biography of the Prophet 2(2-0-0): The importance of studying the Prophet Mohammed's biography. A glimpse into Arab life before Islam: religious, moral, social, and political life. The scientific method in the study of the Prophet's biography. Stages of the Prophet's Biography and the values learned from them. The Characteristics of the Prophet. Prophetic merits: the characteristics of the Prophet, both moral and ethical. The role of the Kingdom of Saudi Arabia in serving the prophetic biography. The personal efforts of some scholars of the Kingdom of Saudi Arabia to defend the Sunnah of the Prophet. **One 2-hours lectures per week.** Pre-requisite(s): None.

SSC 105-Medial Jurisprudence 2(2-0-0): Medical jurisprudence. Treatment in Islamic law. Prophetic Medicine: preventive commandments, and treatment models. Examples of the scientific miracle of prophetic medicine. Legitimate Ruqyah and its evidence. Provisions of acts of worship related to the patient and the medical practitioner. Authorization and medical responsibility. Responsibility for a medical error. Applications of legal rules and intentions on medical provisions. Examples of contemporary medical issues: plastic surgery, fertilization outside the body, birth control and its regulation, milk bank, sperm freezing, miscarriage, gender determination, HIV/AIDS, organ and cell transplantation, resuscitation devices, and weight loss. **One 2-hours lectures per week.** Pre-requisite(s): None.

SSC 106-Economics & Politics in Islam 2(2-0-0): Political system: definition, and characteristics. Characteristics of the Islamic political system. The pillars of the state: the nation, and society. Manifestations of application of the political system in the Kingdom of Saudi Arabia. The Islamic economic system: definition, origin and development, importance, basics, and the characteristics of the economic system in Islam. Contemporary economic systems. Economic globalization. Property in Islam.

Areas of intellectual property. Legitimate methods of ownership. Islam and economic freedom. Socioeconomic solidarity. **One 2-hours lectures per week. Pre-requisite(s): None.**

SSC 107-Islam Social & Family Behavior 2(2-0-0):

The social system in Islam. Social security and its role in preserving society. The importance of the family in Islam. Family protection factors in Islam. The role of the family in achieving community security. The response to the most prominent suspicions raised about the family. The most important social problems and ways to prevent. A study of some contemporary issues in the social system. Development and its impact on social renaissance. The relationship between the individual and society in Islam and positive systems. Study of contemporary issues related to women. The role of women towards their societies. The psychological characteristics of men and women, and their effect on family coexistence. **One 2-hours lectures per week. Pre-requisite(s): None.**

SSC 108-Management & Entrepreneurship 2(2-0-0):

In the first part of this course, students from various disciplines will get acquainted with the most important basic concepts related to management and administrative decision, in addition to the most important traditional administrative functions of planning, organizing, directing and controlling, as well as what the knowledge and capabilities required by modern and future management come in the forefront of, Likewise leadership, participatory management, posterior leadership, technology management.

In the other part of this course, students will have a solid foundation on the concept of entrepreneurship, its strategies, and its role in developing the national economy through small-scale projects. In this part, students will learn how to discover opportunities, understand, evaluate, and then transform them into sustainable business. Each student will also be able to learn the features and characteristics of entrepreneurs and the difficulties associated with entrepreneurship. **One 2-hours lectures per week. Pre-requisite(s): None.**

SSC 109-Health & Fitness 2(2-0-0):

What is health? Physical fitness. Textures. Healthy nutrition. Weight control. Infectious and non-infectious diseases. Smoking. Drug. First aid. Car Accidents. Psychological stress. **One 2-hours lectures per week. Pre-requisite(s): None.**

SSC 110-Research Skills 2(2-0-0):

Research: concept, goals, fields, types, and steps. Research Methods: Descriptive Approach, Experimental Approach, and Historical Approach. Elements of a scientific research plan: Introduction, its problem; Its goals, importance, assumptions, and questions. Review of previous studies: How to critically analyze previous studies. Research hypotheses: definition, types, and formulation. References: books, periodicals, scientific theses, bulletins, and manuscripts. How to obtain information from global databases, and the skills of using the library electronically. Methods for writing references and quotations. Samples: their types and methods of selection. Research tools: (questionnaire - interview -

observation - tests and measurements) and checking their suitability for the application. Scientific writing for research (abstract in Arabic and foreign languages - introduction - discussion - conclusion). Research ethics: Scientific honesty in quoting and avoiding scientific plagiarism. **One 2-hours lectures per week. Pre-requisite(s): None.**

SSC 111-Volunteer Work 2(2-0-0):

The concept of volunteering from a social perspective. The importance, fields, and sources of volunteer work. Voluntary work in Islam. Volunteering in international and Arabic legislations. Theoretical foundations for volunteer efforts. Obstacles to volunteer, with a statement of volunteering culture and the ethics of volunteering in Saudi society. Management and organizations of volunteer work (administrative organization of charitable societies and social institutions in the Kingdom of Saudi Arabia). Evaluating the reality of volunteer work in society, with an indication of the relationship between civil and governmental social bodies. Voluntary work and its relationship to community security. Examples of voluntary work organizations at the Arabic level in general and the Kingdom of Saudi Arabia in particular. Voluntary field exercise for four weeks. Reviewing and evaluating the student's voluntary experience. **One 2-hours lectures per week. Pre-requisite(s): None.**

SSC 112-Medicine: type & use 2(2-0-0):

The main objective of this course is to introduce students to medicine and its various types and forms. This course also aims to provide the student with some special skills for optimal interaction with some common types of drugs such as antibiotics and medications in some famous physiological situations such as pregnancy, lactation, and some chronic diseases. This approach deals with describing known drug interactions, especially when using medicines with some types of foods, herbs, and nutritional supplements. **One 2-hours lectures per week. Pre-requisite(s): None.**

SSC 113-Human Rights in Islam 2(2-0-0):

Human rights: definition and importance. The basic premises of human rights. Principles of human rights in Islam, philosophy, and thought. The history of human rights. The Universal Declaration of Human Rights: legal value and criticism. Islamic Declaration of Human Rights, the Kingdom of Saudi Arabia's concern for human rights. The legal framework for human rights in the Kingdom. Basic human rights: the right to life, the right to justice, the right to freedom, the right to religion, and the right to work. **One 2-hours lectures per week. Pre-requisite(s): None.**

SSC 114-Food & Nutrition: type & use 2(2-0-0):

Introduction to food science and nutrition. Food and nutritional terminologies. The global food security problem. Fields of the food industry in the Kingdom. Main food groups (dairy - meat - vegetables and fruits - grains). Nutrients (food ingredients): moisture, carbohydrates (starch) sugars, dietary fiber, proteins, oils and fats, vitamins, and minerals. Food additive. Food corruption, and the authorities concerned with food control in the Kingdom. Methods of food preservation: drying, packaging, cooling, and freezing. Nutrition and its importance for the human body. Food physiology. Daily needs of nutrients. Nutrition and

general health of the body. Nutritional status sections. An example of obese malnutrition diseases. Dietary energy, production, and use in the body - the body's energy needs. **One 2-hours lectures per week. Pre-requisite(s): None.**

ME 420-Design of Thermal Systems 3(3-0-0): Designing of a workable thermal system, modelling of thermal equipment, system simulation and optimization, thermodynamic properties and steady-state simulation of large systems. Thermal systems and other related topics in the Saudi Arabian industry. **Three 1-hour lectures per week. Pre-requisite(s): ME 203 & ME 325.**

ME 421-Internal Combustion Engines 3(3-0-0): Engine classifications and terminology. Engine operating characteristics and performance parameters. Air standard engine cycles including: Otto, Diesel, Dual and two-stroke cycles. Common fuels used in IC engines, combustion reactions and the associated thermochemical calculations. Engine emissions and their control technologies and strategies. Air and fuel induction methods and technologies, the physics of the combustion phenomena. Friction losses, lubricants and lubrication systems. **Three 1-hour lectures per week. Pre-requisite(s): ME 203 & ME 325.**

ME 423-Renewable & Solar energy 3(3-0-0): Introduction to energy use and renewable energy sources, Non-conventional energy sources such as nuclear, hydrogen, renewable: solar, wind, wave, fuel-cell and advanced energy systems. **Three 1-hour lectures per week. Pre-requisite(s): ME 203 & ME 325.**

ME 426-Energy Conversion 3(3-0-0): Energy classification, sources and utilization, energy growth and economics, fossil fuels, combustion, power plants and steam generators, boiler's performance, pollution, energy conversion systems and energy storage. **Three 1-hour lectures per week. Pre-requisite(s): ME 203 & ME 325.**

ME 427-Turbo machinery 3(3-0-0): Turbo machinery classifications and terminology. Implementation of dimensional analysis for predicting performance of turbo machines and designing engineering systems. Understand the fundamentals of energy transfer between rotating rotors and fluid flow. Demonstrate the ability to construct velocity diagrams for various turbo machines (axial-flow compressors and turbines, radial-flow compressors and turbines, pumps, fans, blowers, hydraulic turbines) and their relation to design. Perform elementary analysis for determining input/output work of various turbo devices. Turbo machinery emissions and their control technologies and strategies. Design and selection of turbo machines for various engineering applications. **Three 1-hour lectures per week. Pre-requisite(s): ME 325.**

ME 430- Computer Aided Design 3(3-0-0): This is a senior-level mechanical engineering course. It exploits the general experience that the students have accumulated throughout the course of their studies. It also introduces students to the analytical basis to CAD

software and the three main ways to represent an entity, namely wireframe, surface and solid modelling. The course can be broken down into three main stages. The first stage of the course aims at introducing the concept and importance of CAD as part of the design process. The second stage focuses on mathematical representation and manipulation of geometrical entities. The final stage discusses current applications of CAD in academic and industrial fields, especially ones related to the instructor's field of expertise. **Three 1-hour lectures per week. Pre-requisite(s): ME 332.**

ME 431-Finite Element Methods 3(3-0-0): Definitions and simple finite element formulation, truss, beam, quadrilateral elements, modelling principles and mesh specification, some computer applications in mechanical engineering. Familiarities with windows operating system are essential. Knowledge of numerical methods is strongly recommended. **Three 1-hour lectures per week. Pre-requisite(s): ME 332 & ME 325.**

ME 445-Robotics 3(3-0-0): Kinematics modelling and simulation of various robot manipulators, rotation matrix, direct/inverse kinematics and dynamics modelling of robotic systems. Introduction to motion control systems, different control schemes and comparison, stability analysis, joint/configuration spaces; interaction control, impedance/compliance/force control, trajectory planning and control, actuators and sensors for robotics applications. **Three 1-hour lectures per week. Pre-requisite(s): Engr. 203 & Engr. 310.**

ME 467-Nanotechnology 3(3-0-0): Nanotechnology is a course that deals with Nano-materials, which is an interdisciplinary introduction to processing, structure, and properties of materials at the Nano-meter length scale. The course will cover recent breakthroughs and assess the impact of this promising field. Specific nanofabrication topics include epitaxy, beam lithography, self-assembly, bio-catalytic synthesis, atom optics, and scanning probe lithography. The unique size-dependent properties (mechanical, thermal, chemical, optical, electronic, and magnetic) that result from nanoscale structure will be explored in the context of technological applications including computation, magnetic storage, sensors & actuators. **Three lectures per week. Pre-requisite(s): Senior Standing.**

ME 481-Undergraduate Research I 3(3-0-0): This course is designed to enhance an undergraduate curriculum in mechanical engineering by providing students with the opportunity to engage in research activities. Requires progress reports and a comprehensive written report. **Three 1-hour lectures per week. Pre-requisite(s): Senior Standing.**

ME 482-Undergraduate Research II 3(3-0-0): This course is designed to enhance an undergraduate curriculum in mechanical engineering by providing students with the opportunity to engage in research activities. Requires progress reports and a comprehensive written report. **Three 1-hour lectures per week. Pre-requisite(s): Senior Standing.**

ME 484-Special Topics I 3(3-0-0): The course covers special topics in an area of mechanical engineering. Given on demand. Three 1-hour lectures per week. Pre-requisite(s): Senior Standing.

ME 485-Special Topics II 3(3-0-0): The course covers special topics in an area of mechanical engineering. Given on demand. Three 1-hour lectures per week. Pre-requisite(s): Senior Standing.

Contact Information

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Mechanical Engineering Program

