Bachelor Degree in Mechanical Engineering

1. University Graduation Requirements

To graduate with a BME, a student must satisfactorily fulfill all requirements related to credit hours, grade point average, program of study, and courses.

2. Degree Requirements

Type of Requirement	Credit Hours
University Requirements	30
College Requirements	42
Specialization Requirements	53
Specialization Electives	9
Total	134

First: University Requirements

University Requirements consist of 30 credit hours distributed as follows:

Course Number	Course Title	Credit Hours	Prerequisite
ARAB 101	Arabic Communication Skills	3	
ARAB 201	Advanced Academic Arabic	3	ARAB 101
CSC 101	Introduction to Computing	3	
ENGL 101	Basic Academic English I	3	
ENGL 102	Basic Academic English II	3	ENGL 101
ENGL 203	Advanced Academic English I	3	ENGL 102
SOCS 101	Islamic Civilization I	3	
SOCS 202	World Civilization I	3	
MATH 101	Calculus I	3	
	Free Elective	3	
Total		30	

Second: College Requirements: College Requirements consist of 42 credit hours distributed as follows:

Number	Title of the Course	Credit Hours	Pre-requisite
MATH 102	Calculus II	3	MATH 101
STAT 230	Probability and Statistics	3	MATH 101
MATH 201	Calculus and Analytic Geometry III	3	MATH 102
MATH 202	Differential equations	3	MATH 102
MATH 215	Linear algebra and Numerical Techniques	3	MATH 202
PHYS 101	Physics I	3	
PHYS 102	Physics II	3	PHYS 101
PHYS 103 L	Physics Lab	1	PHYS 102
CHEM 101	Chemistry I	3	
CHEM 101 L	Chemistry Lab	1	CHEM 101
COEN 300	Engineering Economy	3	MATH 102
COEN 401	Engineering Ethics	1	COEN 300
ENGL 206	English Technical Writing	3	ENGL 203
CIVE 215	Computer Aided Engineering Drawing (AutoCAD)	1	CSC 101
ELEE 230	Programming for Engineers	3	CSC 101
MECH 498	Final Year Project (1)	1	ENGL 206
MECH 499	Final Year Project (2)	3	MECH 498
MECH 400	Summer Internship training	1	ENGL 206
Total		42	

Third: Program Specialization Requirements: Program Specialization requirements consist of (62) credit hours as follows:
(53) credit hours as core requirements, (9) credit hours as elective .

A: Compulsory Specialization Requirements: (53) credit hours distributed as follows.

Course Number	Course Title	Credit Hours	Pre-requisite	Co-requisite
ELEE 210	Electric Circuits I	3	PHYS 102	
CIVE 210	Statics	3	PHYS 101	
MECH 200	Engineering Graphics	1		
MECH 210	Thermodynamics I	3	PHYS 101, CHEM 101	
MECH 220	Dynamics	3	CIVE 210	
MECH 230	Engineering Materials	3	CHEM 101	
ELEE 360	Electromechanical Devices	3	ELEE 210	

MECH 231	Strength of Materials	3	CIVE 210	
MECH 320	Theory of Machines	3	MECH 220	
MECH 330	Mechanical Design	3	MECH 200, MECH 231	
MECH 331	Materials Lab	1	MECH 230, MECH 231	
MECH 341	Fluid Mechanics	3	MECH 220	
MECH 342	Heat Transfer	3	MATH 202, MECH 210	
MECH 350	Instrumentation and Measurements	3	PHY 101	
MECH 360	Manufacturing Processes	3	MECH 330	
MECH 361	Manufacturing Processes Lab	1	MECH 360	
MECH 434	Mechanical Vibrations	3	MECH 220, MATH202	
MECH 440	Internal Combustion Engines	3	MECH 210	
MECH 490	Control Systems	3	MECH 220, ELEE 210	
MECH 491	Control Systems Lab	1	MECH 490	
MECH 441	Thermal Fluid systems Lab	1	MECH 341, MECH 342	
Total		53		

B: Elective Specialization Requirements - 9 credit hours to be chosen from the following list.

Course Number	Course Title	Credit Hours	Prerequisite
MECH 432	Computer aided design and manufacturing (CAD/CAM)	3	MECH 200, MECH330, MECH360 CIVE 215
MECH 433	Thermodynamics II	3	MECH 210
MECH 444	Modern Automotive Engineering	3	MECH 440
MECH 445	Hydraulic Machines	3	MECH 341
MECH 450	Tribology	3	MECH 360
MECH 446	Industrial Noise Control	3	MECH 440 CHEM 101
MECH 447	HVAC Systems	3	MECH 341 MECH 342
MECH 448	Power Plants	3	MECH 341
MECH 449	Renewable Energy Systems	3	MECH 341
MECH 460	Finite Element Methods in Mechanical Engineering	3	MATH 215, MATH 202
MECH 461	Mechanics of Composite Materials	3	

C: Free Elective Course: 3 credit hours: (3) credit hours to be chosen from the following list.

Course Number	Course Title	Credit Hours	Prerequisite
ASTR 150	Introduction to Astronomy	3	
CHEM 150	Chemistry & Society	3	
FREN 101	Basic French 1	3	
PHED 101	Physical Education 1	3	
SOC 102	Islamic Civilization II	3	

Proposed Sequence of Study

Year I

First Semester	18 Credit hours			
Code	Course	Title	Credits	Pre-requisites
	ARAB 101	Arabic Communication Skills	3	
	SOCS 101	Islamic Civilization I	3	
	CSC 101	Introduction to Computing	3	
	ENGL 101	Basic Academic English I	3	
	PHYS 101	Physics 101	3	
	MATH 101	Calculus I	3	
TOTAL 18				

Year I

Second Semester	18 Credit hours			
Code	Course	Title	Credits	Pre-requisites
	ARAB 201	Advanced Academic Arabic	3	ARAB 101
	ENGL 102	Basic Academic English II	3	ENGL 101
	MATH 102	Calculus II	3	MATH 101
	PHYS 102	Physics II	3	PHYS 101
	CHEM 101	Chemistry I	3	
	ELEE 230	Programming for Engineers	3	CSC 101
TOTAL 18				

Year II

Third Semester	18 Credit hours			
	MATH 201	Calculus and Analytic Geometry III	3	MATH 102
	ENG 203	Advanced Academic English I	3	ENG 102
	MATH 201	Calculus and Analytic Geometry III	3	MATH 102
	MATH 202	Differential equations	3	MATH 102
	SOCS 201	Islamic Civilization I	3	
	PHY 103L	Physics Lab.	1	PHY 102
	CIVE 215	Computer Aided Engineering Drawing	1	CSC 101
	CHEM 101 L	Chemistry Lab	1	CHEM 101
TOTAL 18				

Year II

Fourth Semester 17 Credit hours				
Code	Course	Title	Credits	Pre-requisites
	ELEE 210	Electric Circuit I	3	PHYS 102
	ENGL 206	English Technical Writing	3	ENGL 203
	STAT 230	Probability and Statistics	3	MATH 101
	MATH 215	Linear algebra and Numerical Techniques	3	MATH 202
	CIVE 210	Statics	3	PHYS 101
	MECH 230	Engineering Materials	3	CHEM 101
TOTAL 18				

Year III

Fifth Semester 16 Credit hours				
Code	Course	Title	Credits	Pre-requisites
	MECH 220	Dynamics	3	CIVE 210
	MECH 210	Thermodynamics I	3	PHYS 101
	MECH 231	Strength Of Materials	3	CIVE 210
	MECH 200	Engineering Graphics	1	MECH 200
	ELEE 360	Electromechanical Devices	3	ELEE 210
	MECH 320	Theory of Machines	3	MECH 220
Total 16				

Year III

Sixth Semester 16 Credit hours				
Code	Course	Title	Credits	Pre-requisites
	MECH 341	Fluid Mechanics	3	MECH 220
	COEN 300	Engineering Economy	3	MATH 202
	MECH 350	Instrumentation and Measurements	3	
	MECH 330	Mechanical Design	3	MECH 200 MECH 231
	MECH 360	Manufacturing Processes I	3	MECH 230
	MECH 331	Materials Lab	1	MECH 230, MECH 231
Total 16				

Year III

Summer Semester		1 Credit hours		
Code	Course	Title	Credits	Pre-requisites
	MECH 400	Summer internship training	1	
Total 1				

Year IV

Seventh Semester		17 Credit hours		
Code	Course	Title	Credits	Pre-requisites
	MECH 401	Final Year Project (1)	1	ENGL 206
	MECH 342	Heat Transfer	3	MECH 341,
	MECH 490	Control Systems	3	MECH 220, ELEE 210
	MECH 361	Manufacturing Processes Lab	1	MECH 360
	MECH 440	Internal Combustion Engines	3	MECH 210
	ME	ME Elective	3	-
Total 14				

Year IV

Eighth Semester		15 Credit hours		
Code	Course	Title	Credits	Pre-requisites
	MECH 402	Final Year Project (2)	3	MECH 401
	ME	ME Elective	3	-
	COEN 401	Communication skills and Ethics	1	COEN 300
	MECH 491	Control Systems Lab	1	MECH 490
	MECH 434	Mechanical Vibrations	3	MECH 220
	MECH 411	Thermal Fluid Systems Lab	1	MECH 341, MECH 342
	ME	ME Elective	3	-
TOTAL 15				

Total Program Credits 134*

Completion of Bachelor in Mechanical Engineering

Course Descriptions

Required Courses

MECH 200 Engineering Graphics 1(1, 0, 2)[1]

An introductory course on 2-D drawing, orthogonal projection, auxiliary views, sectioning and sectional views, dimensioning and tolerance schemes, and standard drawing layouts and an introduction to the use of AutoCAD. Prerequisite: Discretion of advisor.

MECH 210 Thermodynamics I 3(3, 0, 0)

Thermodynamic concepts and definitions, states, properties, systems, control volume; processes, cycles, and units; pure substances, equation of states, table of properties; work and heat; the first law, internal energy and enthalpy; conservation of mass; SSSF and USUF processes; the second law, heat engines and refrigerators, reversible processes, Carnot cycle; entropy, Clausius inequality, principle of the increase of entropy, Efficiencies.. Prerequisite: Discretion of advisor.

MECH 211 Thermodynamics for Civil Engineering 2(2, 0, 0)

Introduction to the thermodynamics: which include thermodynamics state and properties of a pure substance, system and control volume concepts, work and heat, the first law of thermodynamics, energy and mass conservation, entropy, the second law of thermodynamics; applications to closed setups and flow devices; simple vapor and gas cycles applications.

MECH 220 Dynamics 3(3, 1, 0)

Kinematics of particles; Rectilinear and curvilinear motion in various coordinate systems. Kinetics of particles; Newton's second law, Central force motion, Work-energy equation, Principle of impulse and momentum, Impact, Conservation of energy and momentum, Application to a system of particles. Kinematics of rigid bodies; Relative velocity and acceleration, Instantaneous center, Analysis in terms of a parameter. Plane kinetics of rigid bodies with application of Newton's second law, Energy and impulse-momentum. Prerequisites: MATH 201 and CIVE 210.

MECH 230 Engineering Materials 3(3, 0, 0)

Atomic structure and bonding. Crystalline structure. Imperfections in solids (defects in crystals). Diffusion. Mechanical properties of metals. Classification of materials (properties and applications). Failure; Phase diagram and alloy systems. The iron phase diagram. Phase transformations. Ferrous and non- ferrous metal alloys, ceramics, and polymers. Structure-property relationships. Material selection case studies. Prerequisite :CHEM 101

MECH 231 Strength of Materials 3(3, 0, 0)

Axial loading, Material properties obtained from tensile tests, Stresses and strains due to axial loading, Thermal Stresses, Elementary theory of torsion, Solid and hollow shafts, Thin-walled tubes, Rectangular cross-section, Stresses in beams due to bending, shear and combined forces. Composite beams, Analysis of plane stress, Mohr's Circle, Combined stresses, Thin-walled pressure vessels, Deflection of beams, Buckling of columns.. Prerequisite: CIVE 210.

MECH 320 Theory of Machines 3(3, 0, 0)

Mechanisms and applications, mobility and linkages. Cams, gears and gear trains. Velocity and acceleration analysis in mechanisms. Inertia forces. Principles of balance in rotating & reciprocating masses. Prerequisite: MECH 220.

MECH 330 Mechanical Design 3(3, 0, 0)

Meaning and phases of design, considerations of design, stress analysis, deflection analysis, static strength and theories of failure, fatigue strength. Design of fasteners and connections; riveted joints, bolts and screws, force-deflection diagrams of bolted connections. Welded joints. Mechanical springs, helical, leaf, torsional spring Shafts. Prerequisites: MECH 200, MECH 230 and MECH 231.

MECH 331 Materials Lab 1(0, 0, 2)

A laboratory course consisting of standard metallurgical and mechanical characterization tests on metals. Stress-strain plots, derived properties, fracture toughness, crystallography, hardness, and other properties. Ceramic flexure testing: Weibull plots. Polymers: stress-strain plots and derived properties, impact properties, creep, and relaxation. Prerequisite: MECH 230.

MECH 341 Fluid Mechanics 3(3, 0, 0)

Basic and definitions, units, fluid proprieties, hydrostatics, basic control volume approach, continuity equation, Bernoulli equation, Euler's equation, energy equation, momentum principle and its applications, flow through orifice, pipe, major and minor losses in pipe. Prerequisite: MATH 202.

MECH 342 Heat Transfer 3(3, 0, 0)

Introduction to modes of heat transfer, one dimensional conduction; steady state and transient analysis, introduction to convection, forced and free convection analysis, internal and external flow, heat exchangers, introduction to thermal radiation heat transfer. Prerequisite: MATH 202, MECH 210

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[1] Credits (Lecture, Tutorial, Lab)

MECH 350 Instrumentation and Measurements 3(2, 0, 2)

This course introduces general concepts of measurement systems; classification of sensors and sensor types; interfacing concepts; data acquisition, manipulation, transmission, and recording; introduction to LabVIEW; applications; team project on design, and implementation of a measuring device. Pre- or co-requisite: MECH 341.

MECH 360 Manufacturing Processes 3(3, 0, 0)

A course on material removal processes, processes both traditional and non-traditional. Assembly processes such as welding, brazing, soldering, and fastening are also covered with an emphasis on process capabilities and limitations, relative cost, and guidelines for process selection. This course examines the behavior of materials under processing conditions and design for manufacturing guidelines, and involves hands-on exercises in a machine shop environment. Prerequisite: MECH 230.

MECH 361 Manufacturing Processes Laboratory 1(0, 0, 2)

An introduction to the use and operation of selected industrial machinery, various machining operations, selected welding processes and precision measuring instruments. Laboratory projects will emphasize safety and apply selected manufacturing processes, various inspection processes, fixturing and engineering materials. Pre- or co-requisite: MECH 360.

MECH 400 Summer Internship (1 Cr.)

This is an eight to twelve-week professional training course in mechanical engineering. Prerequisite: Senior standing.

MECH 401 Final Year Project I (1 Cr.)

A supervised project in groups of normally three students aimed at providing practical experience in some design aspects of mechanical engineering. Students are expected to complete a literature survey, to critically analyze, and to acquire the necessary material needed for their intended end product. Prerequisite: Senior Standing.

MECH 402 Final Year Project II (3 Crs.)

A course in which the student integrates his/her acquired knowledge to deliver the product researched and planned in MECH 401. Prerequisite: MECH 401.

MECH 444 Internal Combustion Engines 3(3,0, 0)

The course aims to give the student the theoretical background of internal combustion engines. It includes: description of engine classification and parts, Combustion and ignition processes, engine parameters and tests, analysis of two-stroke and four stroke internal combustion engines, rotary engines and thermodynamic cycle analysis, thermochemistry and fuel characteristics; Prerequisites: MECH 210

MECH 441 Thermal-Fluid Systems Laboratory 1(0, 0, 2)

This lab includes a series of experiments on basic thermodynamic cycles, psychometry, combustion, and elementary fluid mechanics, with special emphasis on the use of the computer as a laboratory tool for data acquisition, reduction, analysis, and report preparation. Prerequisite: MECH 342.

MECH 490 Control Systems 3(3, 0, 0)

This course is intended to provide students with the tools that enable them to model and control physical systems. It includes the following: modeling of mechanical, fluid, electrical, and thermal systems; transfer function and block diagrams; time-domain analyses; root-locus; frequency-domain methods; stability analysis; design of PID controllers and dynamic compensators via the root locus and frequency methods. Prerequisites: MECH 220 and ELEE 210.

MECH 491 Control Systems Laboratory 1(0, 0, 2)

This course involves a series of hands-on experiments on modeling and design of control systems using Matlab, Simulink, and LabVIEW. The course also includes a team project. Pre- or co-requisites: MECH 350 and MECH 490.

Elective Courses

MECH 432 Mechanical CAD/CAE/CAM 3(2, 0, 2)

This course seeks to expose the senior ME students to the realm of computer-aided design (CAD), computer-aided engineering (CAE), and computer-aided manufacturing (CAM); geometric modeling; numerical control; dimensioning and tolerancing; statistical tolerancing; process selection; metrology. Prerequisites: MECH 200, MECH 330, and MECH 360.

MECH 433 Thermodynamics 11 3(3, 0, 0)

including studies of irreversibility and combustion. Thermodynamic principles are applied to the analysis of power generation, refrigeration, and air-conditioning systems. Prerequisites: MECH 210.

MECH 450 Tribology 3(3, 0, 0)

Tribology is the study of components moving in relative motion. As such, this course will cover the areas of friction, wear and lubrication. Specific topics include surface properties, wear of materials, frictional contact and energy dissipation, fluid lubricated bearings, lubrication of highly loaded contacts, Prerequisites: MECH 231.

MECH 447 HVAC Systems 3(3, 0, 0)

The course provides a thorough knowledge in the following subjects: review of basic concepts in thermodynamics and heat transfer in buildings, psychometry, human comfort, air-conditioning processes, ventilation and infiltration, heating and cooling load calculations, hot water heating systems, fans and duct design. Prerequisite ME 210, ME 342

MECH 444 Modern Automotive Engineering 3(3, 0, 0)

The course aims to teach the student the following subjects: Suspension systems. Brake system. Manual and automatic gear systems. Electrical and electronic circuits. Starter and dynamo systems. Front and rear axles. Crankshaft and camshaft. Introduction to car body design. Fuel systems. Lubrication systems. Hybrid and electric systems

MECH 449 Renewable Energy 3(3, 0, 0)

Introduction, Energy: Past, Today, and Future. Energy & Environment, Non-renewable energies. Solar Energy basics of Solar Energy , Photovoltaic, wind energy (resources, turbines, power calculations and Weibul distribution. Geothermal Energy, Ocean Energy.

MECH 448 Power Plants 3(3, 0, 0)

The course includes topics in steam turbine; coal and oil burners, waste heat recovery, efficiency improvement, steam condensers and cooling towers, gas turbines, hydraulic power plants and water turbines, Nuclear power plants, technology cooling, control and nuclear wastes management, power plants economics MECH 341.

MECH 446 Industrial Noise Control 3(3, 0, 0)

techniques for measuring sound pressure, intensity, and power levels under various environment; techniques for measuring reverberation time, room constant, and acoustic absorption coefficients; basic noise control principles. Prerequisite, PHY 101,MECH 434

MECH 460 Finite Element Methods in Mechanical Engineering 3(3, 0, 0)

A course on the classification of machine components; displacement-based formulation; line elements and their applications in design of mechanical systems; isoparametric formulation; plane stress, plane strain, axi-symmetric, and solid elements and their applications; modeling considerations and error analysis; introduction to ALGOR general formulation and Galerkin approach; and analysis of field problems. Prerequisites: MATH 215, MECH 330, and MECH 342.

MECH 461 Mechanics of Composite Materials 3(3, 0, 0)

This course covers anisotropic elasticity and laminate theory, analysis of various members of composite materials, energy methods, failure theories, and micromechanics. Materials and fabrication processes are introduced. Prerequisites: MECH 230 and MECH 231.

MECH 445 Hydraulic Machines 3(3, 0,0)

Classification of hydraulic machines, fluid jet on pipe bend, dynamic force exerted by fluid jet on stationary and moving flat &, curved plates (turbines), angular momentum equation. Fundamental equation of fluid machines, positive displacement pumps (reciprocating and rotary), rotary dynamic pumps(centrifugal pumps), theory of centrifugal pumps, head, power and efficiency of a pump, cavitation in a pump