University of Mosul
جامعة الموصل

First Cycle – Bachelor's Degree (B.Sc.) – Mechanical Engineering

بكالوريوس - هندسة ميكانيك

Table of Contents

1. Overview

This catalogue is about the courses (modules) given by the program of Mechanical Engineering to gain the Bachelor of Science degree. The program delivers (48) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظره عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج الهندسة الميكانيكية للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (48) مادة دراسية، مع (6000) إجمالي ساعات حمل الطالب و240 إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

Module 1

Code	Course/Module Title	ECTS	Semester
ME101	Engineering Mechanics-Statics	8	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	107
Description			
Introduction of engineering mechanics and Newton’s laws, Force system, Moments, Moments and Couple, Resultants, Equilibrium, Structures, Plane Trusses.			

Module 2

Code	Course/Module Title	ECTS	Semester
ME102	Mathematics I	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
Coordinates and Graphs in the Plane, Directions and Quadrants, Distance between Points, Graphs of Equations, Intercepts and More about Graphing, Slope and Equations for Lines, Slope of Non – vertical Lines, Lines That are Parallel or Perpendicular, Point – Slope Equations, Slope – Intercept Equations, Definition of functions, domain and range of functions, graph of functions, symmetry analysis			

Module 3

Code	Course/Module Title	ECTS	Semester
ME103	Manufacturing Processes I	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
Manufacturing can be basically defined as an addition process by which raw materials of low utility and value due to its inadequate material properties and poor or irregular size, shape and finishing are converted into high utility and valued products with definite dimensions, forms and finish imparting some functional ability. An introduction to the principle of the manufacturing processes, properties of materials, types of materials, types of manufacturing processes, general consideration of manufacturing, selection methods of production, casting processes and production of ferrous metals in addition to workshop laboratory will be covered.			

Module 4

Code	Course/Module Title	ECTS	Semester
ME104	Engineering Drawing	7	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	4	78	97
Description			
The course will cover the basic of engineering drawing which is how to draw line, circle, curve and angle. This is one part in this course, will be focused in engineering drawing.			

Module 5

Code	Course/Module Title	ECTS	Semester
ME105	English Language	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	33	17
Description			
This course emphasizes the fundamental language skills of reading, writing, speaking, thinking, viewing and presenting. The course includes studies of various literary genres: short story, novel, and non-fiction. The course also helps students to improve their listening and speaking abilities, and becoming more effective use of grammar and natural self-expression in English.			

Module 6

Code	Course/Module Title	ECTS	Semester
ME106	Human Rights	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	33	17
Description			
حقوق الإنسان بين الشريعة الإسلامية والفكر القانوني العربي, حقوق الإنسان في الوثائق الدولية, الاستخلاف في الأرض وكرامة الإنسان, الحقوق المدنية والسياسية, الحق في حماية خصوصيات الإنسان, الحقوق والحريات الفكرية.			

Module 7

Code	Course/Module Title	ECTS	Semester
ME151	Engineering Mechanics-Dynamic	8	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	107
Description			
The object of this class is to develop the students' abilities in understanding and solving dynamic problems related particles and rigid bodies, Introduction Kinematics of Particles, Rectilinear Motion, Plane Curvilinear Motion, Rectangular Coordinates, Plane Curvilinear Motion, Normal and Tangential Coordinates, Plane Curvilinear Motion, Polar coordinates, Relative Motion (Translating Axes), Kinetics of Particles; Force, Mass, and Acceleration. Work and Energy, Kinetic energy, Potential energy, Impulse and Momentum, Linear, Angular, Kinematics of Rigid Bodies: Rotation, Relative Velocity, Kinetics of Rigid Bodies: Introduction, Appendix A Mass Moment of Inertia.			

Module 8

Code	Course/Module Title	ECTS	Semester
ME152	Mathematics II	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
At the end of this course, the student will be able to find the following topics: Area and Estimating with Finite Sums, The Definite Integral, The Fundamental Theorem of Calculus, Indefinite Integrals and the Substitution Method, Definite Integral Substitutions and the Area			

between Curves, Volumes Using Cross-Sections, Volumes Using Cylindrical Shells, Arc Length., Areas of Surfaces of Revolution, Using Basic Integration Formulas, Integration by Parts, Trigonometric Integrals, Trigonometric Substitutions, Integration of Rational Functions by Partial Fractions.

Module 9

Code	Course/Module Title	ECTS	Semester
ME153	Physical Metallurgy	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
In this course, students will learn how bonding of metals occurs, how to classify the metals and alloys with its properties and microstructures, the defects occurred in the metals and alloys , types of thermal equilibrium diagrams, also the students will learn about the steels ,cast irons with their properties/applications/microstructures and finally the heat treatments of steels.			

Module 10

Code	Course/Module Title	ECTS	Semester
ME154	Introduction to Electrical Engineering	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
Resistance calculation, Connection of resistance, Ohms law, Krichhoff's laws, DC network theorems, AC fundamental wave from equations average and PMS values from reactors/peek factor, Vector representation of AC sine, Application of network theorems in AC circuits, Resonance (series and parallel), three phase AC calculations, Magnetic circuits, Transformers single phase transformers, three phase transformers.			

Module 11

Code	Course/Module Title	ECTS	Semester
ME155	Computer Programming I	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62

Description
In this course many topics learned as: Programming principles, Algorithm and flow charts, Data input and results output, Arithmetic statements and the rules of precedence and mathematical functions, Control statements, variables storage in computer memory. Also, Visual basic environment, Visual basic tools, Form design, Input output data, relations ships coefficients, control statements in visual basics. And finally, Arrays in Visual Basic: Declaring arrays, One Dimension Array, Two Dimensional Arrays.

Module 12

Code	Course/Module Title	ECTS	Semester
ME156	Democracy	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	33	17
Description			
حرية الرأي, حق المساواة أمام القانون, الحق في إلغاء الرق والعبودية, الحق في الجنسية, الحق في تقرير المصير, الحقوق الثقافية والاجتماعية والاقتصادية, الحق في الرعاية الخاصة للأمومة والطفولة, الضمانات لمنع الاعتداء على حقوق الإنسان, تأثير ظاهرة الفساد الإداري على حقوق الإنسان والمجتمع.			

Module 13

Code	Course/Module Title	ECTS	Semester
ME201	Fluid Mechanics I	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
This is an introductory course on fluid motion, the forces that fluids exert, and the forces that are exerted on them. The study of fluid mechanics has numerous engineering applications. Fluids interact with structures such as high-rise buildings, dams, and bridges and the static and dynamic loads imposed by the fluids must be considered in the design and construction of these structures. Cars, aircraft, and ships all move through fluids.			

Module 14

Code	Course/Module Title	ECTS	Semester
ME202	Thermodynamics I	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**

2	2	63	62
Description			
Introduction - Concept and definitions Pressure, temperature and its measurement Properties of pure substance (water and ideal gases – air). Work and heat: work for different process. The First Law of Thermodynamics –[closed system (control mass) and open system (control volume)] - The classical second law of thermodynamics (heat engine , Carnot cycle) . Entropy, Clausius inequality.			

Module 15

Code	**Course/Module Title**	**ECTS**	**Semester**
ME203	Mechanics of Materials I	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
The study of mechanics of materials is the study of the behavior of solid bodies under load. The way in which they react to applied forces, the deflections resulting and the stresses and strains set up within the bodies are all considered in an attempt to provide sufficient knowledge to enable any component to be designed such that it will not fail within its service life. Typical components considered in detail in this volume include beams, shafts, cylinders, struts, diaphragms and springs and, in most simple loading cases.			

Module 16

Code	**Course/Module Title**	**ECTS**	**Semester**
ME204	Engineering Mathematics	8	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	107
Description			
Function of two or more variables: Limits & Continuity, Partial derivatives, Second order partial derivatives, Chain rule for functions of two or three variables, Maxima and minima and saddle point, Multiple integral: Double integral, Properties of double integral, Double integral over regions, Iterated or revised integrals-finding the limits, Definition of differential equations + Classification of differential equations (ordinary and partial, order, degree, linear and non-linear) + Solutions of differential equation (general and particular solution) + Formation of differential equation, First Order Ordinary Differential Equations - Separable Equations + Linear Equations.			

Module 17

Code	Course/Module Title	ECTS	Semester
ME205	Computer Programming II	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
MATLAB for Engineers introduces students to the MATLAB coding language. Developed out of Holly Moore's experience teaching MATLAB and other languages, the text meets students at their level of mathematical and computer sophistication. Starting with basic algebra, the course shows how MATLAB can be used to solve a wide range of engineering problems.			

Module 18

Code	Course/Module Title	ECTS	Semester
ME206	English language	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	33	17
Description			
Overview of academic essays: Independent, dependent, and integrated essays, structure of academic essays, identifying topic sentence and thesis statement of academic essays, identifying the main ideas of academic essays, identifying the supporting details, essay outlines using idea maps, responding to essay questions by making personal notes. Writing a thesis statement or topic sentence, writing main ideas and supporting details using personal thoughts. Building an idea map of an essay question, transition words and sentence starters. Writing a whole essay: Introduction, body, and conclusion paragraphs.			

Module 19

Code	Course/Module Title	ECTS	Semester
ME251	Fluid Mechanics II	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
Fluid flows are important in many scientific and technological problems including atmospheric and oceanic circulation, energy production by chemical or nuclear combustion in engines and			

stars, energy utilization in vehicles, buildings and industrial processes, and biological processes such as the flow of blood. Considerable progress has been made in the mathematical modelling of fluid flows and this has greatly improved our understanding of these problems, but there is still much to discover. This course introduces students to the mathematical description of fluid flows and the solution of some important flow problems.

Module 20

Code	Course/Module Title	ECTS	Semester
ME252	Thermodynamics II	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	22
Description			
Entropy in reversible and irreversible processes, Entropy in irreversible processes with heat transfer. Power cycle: Vapor power cycle (Rankine cycle, modified Rankine cycle- reheat cycle and regenerative cycle) Air standard power cycle: Gas turbine cycle- Brayton cycle- reciprocating engine cycle (Otto cycle, Diesel cycle, and Dual cycle).			

Module 21

Code	Course/Module Title	ECTS	Semester
ME253	Mechanics of Materials II	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
The study of mechanics of materials is the study of the behavior of solid bodies under load. The way in which they react to applied forces, the deflections resulting and the stresses and strains set up within the bodies are all considered in an attempt to provide sufficient knowledge to enable any component to be designed such that it will not fail within its service life. Typical components considered in detail in this volume include beams, shafts, cylinders, struts, diaphragms and springs and, in most simple loading cases.			

Module 22

Code	Course/Module Title	ECTS	Semester
ME254	Mechanical Engineering Laboratory I	3	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**

-	3	48	27
Description			
Students are highly encouraged to maintain a separate lab notebook for recording any observations, results, or comments while performing the experiments. Laboratory experiments in this semester are; center of pressure, flow measurements, strut loading, fly wheel, Engine models, Tensile test, Hardness test, pope-Belt friction, Air-compressor, Impact test, flow models, universal beam.			

Module 23

Code	Course/Module Title	ECTS	Semester
ME255	Mechanical Drawing	7	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	4	78	97
Description			
This is a beginning drawing course. Students are introduced to fundamental knowledge and skills such as line work, lettering, scale use, and sketching, multi-view drawings, sectional views, with the basics of manual drafting techniques and the use of drafting equipment. Demonstrate the creation of 3D geometry using software (AutoCAD). Demonstrate the techniques of specifying threads and fasteners. Describe the theory and techniques for creating detail and assembly drawings of complex machines. Present a model for the design process (problem identification, ideation, analysis and refinement, decision and implementation) from conception through working drawings.			

Module 24

Code	Course/Module Title	ECTS	Semester
ME256	Metallurgy	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
Structures of metals and alloys. Crystallization, solidification and cooling curves. Construction of basic thermal equilibrium diagrams using cooling curves. Basic thermal equilibrium diagrams. Selected special binary alloy systems. Iron-carbon equilibrium diagram. Steel portion. Composition/ Microstructures/ Mechanical properties/ Applications. Basic heat-treatments of steels. T.T.T. curves. Heat treatment based on T. T. T. curves. Alloy steels/ Types/ Applications. Heat-treatment of non-ferrous alloys (precipitation hardening). Principles of bearing materials. Corrosion principles.			

Module 25

Code	Course/Module Title	ECTS	Semester
ME301	Theory of Machines	8	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	107
Description			
This course is intended to cover the essential theories and techniques of kinematics, kinetics and dynamics analysis of machines and mechanisms. Balancing of rotating masses: introduction, Static balance, dynamic balance, balancing of rotating masses in same plane, balancing of rotating masses in different planes, Graphical Method, Analytical Method, Dynamic Forces in Bearings. Balancing of reciprocating masses: introduction, reciprocating Masses, Methods for solving problems. Friction and wear: introduction to wear and friction (Tribology), Types of wear and Friction, Applications of friction in engineering. Clutches systems: introduction, principle of Clutch, Types of Clutches, positive and Friction Clutches, Types of Friction Clutches: Plate or Disc Friction Clutches, (Single and Multi-Disc Clutches, Cone or Conical Friction Clutches, Centrifugal Friction Clutches. Brakes systems: Introduction, Types of Brakes, Application of Brakes in Machines, Method of Analysis. Belts, ropes, and chain drives: Introduction, Definition and Applications, Types, Flat, Rope and V-Belts Drives, Force Analysis, power transmitted, Efficiency, Slips. Gyroscopes: gyroscopes application: ships, airplanes, etc. Gyroscope motion, Gyroscope couple analysis. Turning moment diagrams and flywheels: introduction and definitions, Crank effort diagrams, Fluctuation of speed, Fluctuation of energy. Governors: Introduction, Types of Governors, Dead Weight Governors and Spring-loaded governors: Watt governor, Porter governor, Hartnell governor, Proell governor, Complete forces analysis, Controlling force and stability, Sensitivity and insensitivity of governors. Tooth gears: introduction, Types of Gears, Applications, Force analysis in spur gear. Cams: Introduction, Types of desired motion, method of analysis and designing of cams. Universal joints, complete analysis.			

Module 26

Code	Course/Module Title	ECTS	Semester
ME302	Conductive Heat Transfer	4	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	52
Description			
Fundamental principles and theory of heat transfer by conduction, convection, and radiation. Design aspects of hear transfer are introduced through the assignments of open-ended problems and design projects. State-of-the art software programs are introduced to solve the design problems and projects. Engineering applications and techniques, such as hear transfer from extended surfaces, and designs of heat exchangers.			

Module 27

Code	Course/Module Title	ECTS	Semester
ME303	Engineering & Numerical Analyses	8	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	107
Description			
The subject covers different analytical topics (Laplace transformation, Fourier series, special functions, PDE's, Complex number). The numerical topics covers (solution of equation by iteration, Solution of system of linear equations. Numerical integration, Numerical Differentiation, Solution of first order ODE). The objective of the course is study of advanced methods in mathematics for solution of engineering problems, also studying of some numerical methods.			

Module 28

Code	Course/Module Title	ECTS	Semester
ME304	Combustion and Pollution	4	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	52
Description			
An introduction to internal combustion engines, type of internal combustion engines, Mixture of ideal gases and properties, combustion definition and types (complete, incomplete and stoichiometric combustion), calculation of air-fuel ratio from combustion equations, exhaust gases (volumetric and gravimetric analysis, wet and dry analysis, 1st law of thermodynamic applied to combustion processes for calculation the amount heat released during combustion, adiabatic flame temperature calculation, second law of thermodynamic applied to combustion processes, dissociation and chemical equilibrium, criteria performance of internal combustion engines (spark ignition and diesel engines) which involve determination of thermal efficiency, specific fuel consumption, mean effective pressure and power out. And finally exhaust emission from internal combustion engines, methods are used to reduce emission and after treatment method such as catalytic convertor.			

Module 29

Code	Course/Module Title	ECTS	Semester
ME305	Gas Dynamics	4	5

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	52
Description			
Gas dynamics, compressible fluid flow, Isentropic flow with variable area, Stationary normal shock wave, Nozzles and diffusers, Constant area adiabatic flow (Fanno flow), Constant area flow with heat transfer (Raleigh flow), compressible flow under constant temperature, Oblique shock wave, Prandtl – Mager wave.			

Module 30

Code	Course/Module Title	ECTS	Semester
ME306	English language	2	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	33	17
Description			
This Intermediate English course is designed to help students learn the skills involved in the writing process, applied grammar, and reading comprehension, and apply these skills to everyday English. Students will gain initial competence in writing a variety of sentence types, paragraphs, and a very basic essay, as well as in reading proficiently at an intermediate level in an academic setting. Students will gain confidence, acquire knowledge, think critically, and upgrade their skills in the three content areas to increase their success in future college courses.			

Module 31

Code	Course/Module Title	ECTS	Semester
ME351	Machine Element Design	8	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	3	108	92
Description			
Students who study design of machine elements will be able to: know the principles of design of machine elements, estimate the required properties of the material used in machine elements design, classify, calculate and analyze the stresses induced in machine elements, define type of failure resulted in machine elements, design of shafts, design of keys and coupling. design of belts, design of chain, design and selection of bearings, design of welded, riveted and bolted joints, design of power screws, design of springs, design of pressure vessels			

Module 32

Code	Course/Module Title	ECTS	Semester
ME352	Convective and Radiative Heat Transfer	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	52
Description			
Fundamental principles and theory of heat transfer by conduction, convection, and radiation. Design aspects of hear transfer are introduced through the assignments of open-ended problems and design projects. State-of-the art software programs are introduced to solve the design problems and projects. Engineering applications and techniques, such as hear transfer from extended surfaces, and designs of heat exchangers.			

Module 33

Code	Course/Module Title	ECTS	Semester
ME353	Manufacturing Processes II	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
The fundamental goal of manufacturing process is to produce a product that has a useful form. Manufacturing process is one of the important steps in production process. It mainly concerns with the change of form of material or dimensions of the part being produced. Transportation, handling or storage of parts does not come under steps of manufacturing process, because these steps are not involved with the change of form of material or dimensions of the part being produced. The geometry of the finished product must have certain tolerances, that it must meet in order to be acceptable and being useful. The three different types of functions that involve in manufacturing process are as follows: To change the physical properties of the raw material. To change the shape and size of the work piece. To produce required dimensional accuracy (tolerances) and surface finish. The different types of manufacturing process that are classified based on nature of work are shown below. Forming processes involves the following: drawing, forging, rolling, extrusion Metal working processes involves the following: Rolling, forging, extrusion, wire drawing Machining Processes involves the following: Turning, drilling, milling, grinding Joining processes involves the following: Fusion Welding, Arc Welding Casting Processes involves the following: Sand Casting, Permanent mould casting, die casting, Centrifugal casting.			

Module 34

Code	Course/Module Title	ECTS	Semester
ME354	Industrial Engineering	5	6

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	62
Description			
Industrial management (Definitions, Terms and concepts), Organization and organizational structures, Functional description, Management levels and skills, Production and operations management, Break- Even Analysis, Competitive Priorities, Administrative correspondences, Economic and Technical feasibility, Total quality management, Maintenance and repair, Industrial safety and occupational health.			

Module 35

Code	Course/Module Title	ECTS	Semester
ME355	Mechanical Engineering Laboratory II	3	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
-	3	48	27
Description			
Centrifugal Force Measurement Experiment, Dynamic Balancing Experiment, Pelton Turbine Experiment, Centrifugal Pump Performance Experiment, Forced Convection from a Cylinder in Cross Flow Experiment, The Conduction Analogue Experiment, Determination of Thermal Conductivity of Metals Experiment, Gyroscopic Effect Experiment, The Hartnell Governor Experiment, Study of the Spark Ignition Engine Experiment, Forced Convection from a Tube Bank in Cross Flow Experiment			

Module 36

Code	Course/Module Title	ECTS	Semester
ME356	Internal Combustion Engine	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	52
Description			
Air Stander cycles, Air – fuel cycles, Actual cycle, Spark ignition engines, Diesel engine, Dual engines, Gas turbine cycle and modification, Jet- Propulsion, Turbo – Propeller, Turbo – jet, Ram – jet, Rockets, Single stage and multi stage, Fuel injection.			

Module 37

Code	Course/Module Title	ECTS	Semester
ME401	Design of Machines System	8	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	3	108	92
Description			
An introduction to the fundamental of Mechanical engineering, type of Machine loads and their various stresses generated on the machine members, introduction to clutches, their purpose, how they work, in general and, developing a mathematical set of equations to calculate the outline dimensions of a friction type of clutches, whether they are of single disk or multiple disk clutch, introduction to brakes, their purpose, and how they work, in general. The development of mathematical set of equations to calculate the outline dimensions of a friction type of brakes and their torque capacity, whether they are of internal or external drum brakes. Introduction to Gears, which include the Classifications of gears, Gear theory, Gear ratio. Spur gear Design aspects of gears using Lewis's formula of design for bending stress and for contact stress. Design aspects using AGMA design formulas for bending and contact stresses. Introduction to Hydraulic and pneumatic Power. Introducing the various parts of a hydraulic and pneumatic circuit, Pumps (gear, piston and vane). Valves (Directional, Flow and Pressure). Actuators, Piping. Design of power screws. Design of a small mechanical machine (As an example, Conveyor belt, Hoist, Lift, Toggle Mechanism of injection molding machine, Hydraulic press). Introduction of Machine design using computers, Auto Desk INVENTOR program is used in the design of shaft, bearings, gears and fasteners of a design example of a gear box, throughout the course Excel is used as a calculator to recalculate the results of tutorial example but for different scenarios, to get a broad picture.			

Module 38

Code	Course/Module Title	ECTS	Semester
ME402	Air-conditioning and Refrigeration	8	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	3	108	92
Description			
Defining air conditioning and several basic terms, effect of surrounding air on human body, moist air properties, psychrometric chart, calculating moist air properties based on perfect gas formulations, Human thermal comfort, selecting indoor and outdoor design conditions, Psychrometry and psychrometric basic processes, sensible and latent heat, air mixing and basic air conditioning cycles, Heat transfer through building envelope, solar energy basics, solar heat gain, calculating the shading area on a window, heating and cooling load calculation, Ventilation and infiltration, ducting system, types of air conditioning system, controls. Defining refrigeration, principle of obtaining refrigeration effect, Vapor Compression (V.C.) refrigeration, advanced V.C. refrigeration cycles, basic and auxiliary components of			

refrigeration system, controls on V.C. refrigeration system. Description of sorption refrigeration system, Description of modern air conditioning and refrigeration systems (VRV).
Defining air conditioning and several basic terms, effect of surrounding air on human body, moist air properties, psychrometric chart, calculating moist air properties based on perfect gas formulations, Human thermal comfort, selecting indoor and outdoor design conditions, Psychrometry and psychrometric basic processes, sensible and latent heat, air mixing and basic air conditioning cycles, Heat transfer through building envelope, solar energy basics, solar heat gain, calculating the shading area on a window, heating and cooling load calculation, Ventilation and infiltration, ducting system, types of air conditioning system, controls. Defining refrigeration, principle of obtaining refrigeration effect, Vapor Compression (V.C.) refrigeration, advanced V.C. refrigeration cycles, basic and auxiliary components of refrigeration system, controls on V.C. refrigeration system. Description of sorption refrigeration system, Description of modern air conditioning and refrigeration systems (VRV).

Module 39

Code	Course/Module Title	ECTS	Semester
ME403	Control and measurements	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	87
Description			

The subject of control and measurements is instructed to the final year, (4th year), in the department of mechanical engineering. The major part of the subject is the so-called classical control, which comprises basics but essential to this wide multi-display field. Classical control starts by establishing transfer function for components or sub-systems. In other words, modeling of different components or sub-systems is performed using the first principles. Most of the engineering relationships are non-linear, then linearization is needed so that the linear control theory can be applied. Modeling of mechanical, thermal, fluidic and electrical components are represented by blocks so that subsystem or complete control system's block diagrams are established. Field controlled DC motors and armature-controlled DC motor driving mechanical subsystem are represented by block diagrams. Other actuators such as hydraulic is presented too. Prior to introducing the feed-back control, the block diagram algebra is to be studied for block diagram reduction. For different application, a complete control system is constructed with their block diagram. Steady-state operation is found useful to realize the feedback principles and to estimate some of system parameters.
A review of Laplaces transform is given for different function including those normally used in control systems. Reference to different inputs is to be determined for different cases. RouthHurwitz stability criterion is applied to characteristic equation of systems. The principle of root locus and their plot are given for feedback control systems. An introduction to polar plot and frequency response are given. As far as, the measurement part is considered it is given in such a way to serve the construction of a complete control system, as the feedback sensors is a subsystem appears as a part of the complete control system. This is because the measurement is a very wide subject. Different measuring devices and sensors for temperature, pressure, flow rate, speed, force …etc., are covered in addition to those given through different control system with different applications.

Module 40

Code	Course/Module Title	ECTS	Semester
ME404	Electric Machines	4	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	52
Description			
Motors (D.C. & A.C.), transformers, resistance, power transmission, circuit barkers, amplifiers, measurement devices, lab. Work			

Module 41

Code	Course/Module Title	ECTS	Semester
ME405	English Language	2	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	33	17
Description			
This course provides students with practical skills for effective communication in English. During this term, six units of the textbook are covered in addition to supplemental material provided by the instructor as homework to improve listening skills. In the beginning of each unit there are reading tasks accompanied with listening audios to emphasize on specific verb tenses and grammar skills used on daily basis in real life situations. In addition, informal conversations are included from the textbook to enhance students speaking abilities for off-campus scenarios. Reading comprehension activities are performed in class to encourage students' involvement in group discussions. In the end of each unit there are writing improvement tasks to increase cohesion of written work by students.			

Module 42

Code	Course/Module Title	ECTS	Semester
ME406	Engineering Project I	2	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	33	17
Description			
In this module, students will first select an appropriate project from those presented by tutors.			

The student must then write an introduction to the project, gather the necessary information for a literature review, and work on the theoretical portion of the project.

Module 43

Code	Course/Module Title	ECTS	Semester
ME451	Engineering Materials	7	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	82
Description			
In this course student will study the metallic materials which include binary and ternary equilibrium diagrams, strengthening mechanism, ferrous alloys, non-ferrous alloys, failure theories, fatigue and creep. The second category non-metallic materials: polymers, ceramics, composites and Nanomaterials as related to their atomic structure mechanical properties, manufacturing & usage.			

Module 44

Code	Course/Module Title	ECTS	Semester
ME452	Mechanical Vibration	7	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	82
Description			
This course provides a brief review of fundamentals of dynamics and general information about vibratory systems (components and physical effects). Free vibration of single degree Of freedom system, Free damped vibration, Viscous damping, friction damping, Structural damping, Forced vibration, Rotating unbalance, base excitation, Vibration isolation, Vibration measuring, system, Free and forced vibration of two degree of freedom system, Transient vibration , Vibration of continuous system , Approximation methods 1- Raleigh, 2- Raleigh + Ritz for continuous system, using defined deflection curves, vibrational modeling of Mechanical systems.			

Module 45

Code	Course/Module Title	ECTS	Semester
ME453	Power Plant and Renewable Energy	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**

3	2	78	72
Description			
Provides the student with an introduction to power plant, the major types systems and components that make up a power plant. Students learn how electric power is produced and distributed and learn the load curve how to calculate different factors (load, diversity, used and demand factor … etc.), what the thermodynamic cycles used in power plant and specific attention is given to regeneration (close and open feedwater heater), cogeneration, binary and combined cycle, how boilers, turbines, and condensers operate. This course covers, boiler and heat recovery steam turbine types with their components (economizer, super heater, preheater), also types of cooling towers and condensers. Allows students to study the major elements that make up gas and steam turbines. This course also covers the types and major component of hydroelectric and nuclear power plant.			

Module 46

Code	Course/Module Title	ECTS	Semester
ME454	Turbomachinery	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
Turbo machines, Introduction to rotating fluid machinery and similarity, Definition of efficiency (Pumps and Turbines), Water turbines, Pumps, Compressors, Gas turbine, wind tunnel.			

Module 47

Code	Course/Module Title	ECTS	Semester
ME455	Mechanical Engineering Laboratory III	3	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
-	3	48	27
Description			
In this year it will be carry out the following experiments. Types of non-return valve used in pneumatic control cercuits, Industrial robot application simulation of quality control, Forced Vibration of A Rigid Body - Spring System With Negligible Damping, Torsional oscillation of single rotor with viscose damping, Non distractive test Experimental Calculation Of the Coefficient of performance (COP), The hardenability of different types of steels.			

Module 48

Code	Course/Module Title	ECTS	Semester
ME456	Engineering Project II	3	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
-	2	33	17
Description			
This module is continuous to the first Engineering Project I, and the students will complete the project through identifying risks and potential failures, as well as developing precautions, evaluation of solution methods and selection of a suitable single method, project approval based on a commercial marketing statement, initialization of analytical model simulations. Based on the project concept, select an appropriate simulation tool. Learn how to use the simulation tool's key features. Carry out a model-based project and practical work based on simulation results. Collect and analyze experimental data, then compare it to simulated data. Create a report that includes conclusions and future work. Finally, display the conceptual design report.			

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