Brief Courses Descriptions for Mechanical Engineering Program's Curriculum

Study Plan 2021-2022

Engineering Workshop I (620171):

Development of basic skills in fields of hand filing, turning, welding, piping and plumbing, carpentry, sand casting, glass works, sheet metal fabrication, and metal forming.

Engineering Workshop II (620172):

Household electric circuits, florescent lamps circuits, parallel and series circuits, switches and fuses installations, electronic welding, electronic devices maintenance and circuit boards design.

Statics (620211):

Study of force vectors, equilibrium of a particle, moment of a force, equilibrium of a rigid body, internal normal and shear forces, bending moment, moment of inertia and the centroid.

Dynamics (620212):

Study of plane motion and force systems on particle, system of particles and rigid bodies. It will be an overview of the application of Newton's Laws to rectilinear and curvilinear motions. Work-energy principle, and impulse-momentum, will also be studied for particle and for rigid body.

Strength of materials (620213):

Study of stress, strain relation when a loads (axial, torsion, bending and buckling loads) are applied to a static solid bodies such as beams. mechanical properties of materials, pure bending, analysis and design of beam for bending, shear stress in beams, transformation of stress and strain, deflection of beams, columns, energy methods.

Mechanical Drawing (620232):

This course Introduce a knowledge to mechanical engineering drawing; sketching, assembly drawing, theory of orthographic projection, pictorial drawing; isometric and Oblique drawings, Sections, working drawing, dimensioning. Applications Covers Subjects Related to Mechanical Engineering Areas. The course employs Pro-Engineer software in doing exercises.

Material Science (620274):

The course provide a fundamental understanding of materials, its structures on different levels (from crystal cell to macrostructure), phase transformations and how it influences its mechanical, electrical, optical and magnetic properties from common science perspective. This course will introduce the various properties and structures of materials and lay a strong foundation for further study of engineering and its related disciplines. Material failure, mechanical properties of materials, and heat treatment process will also be studied.

Applied Engineering Mathematics (620301):

First order differential equations, second order and higher order types and solution with applications , linear algebra and vector calculus, partial differential equations types and solution with applications , complex numbers , analysis with applications .

Finite Element Method (620302):

Finite element method development and its applications in mechanical systems such as mechanics of solids, heat transfer and dynamical systems.

Strength of material lab. (620314):

This laboratory serves mainly the determination of some material properties such as strain, stress, yield stress, ultimate stress, and failure stress. Destructive testing of materials (DT), micro and macro examination of materials and phase diagrams for steel are also included.

Fluid Mechanics I (620320):

The course is a requirement for Mechanical Engineering students. At completing this course, the student should be able to understand fluid properties, Hydrostatics, Principle of floating objects, Buoyancy principle, Fluid in motion, Bernoulli equation, One dimensional Euler's equation, Free and forced vortices, Rotational flow equation and pressure variation, Control volume approach, Reynolds transport theorem, Continuity equation, Impulse-Momentum principles, Energy equation, Hydraulic and energy grade lines.

Thermodynamics I (620323):

The course is a requirement for Mechanical Engineering students. At completing this course, the student should be able to understand Basic concepts in engineering thermodynamics, Properties and behavior of pure substance and ideal gas laws, First law, Energy analysis of a closed system, Mass and energy analysis of control volumes Second law of thermodynamics and their application.

Theory of Machines (620333):

Simple mechanisms, velocity and acceleration analyses in mechanisms, force analysis in simple mechanisms, theory of gearing, gear trains, balancing of rotating masses, belt drive, and cams.

Engineering Measurements (620344):

This course is divided into three main parts: the starting part is a statistical concepts and calculations for theoretical and experimental data. The middle part concerns with the main basic circuit used to convert measured value to electrical signal and the last part includes the measuring instrument needed by mechanical engineer to measure a main physical variable such as flow, pressure, temperature, linear and angular velocities, forces and torques.

Engineering measurements lab. (620345):

The purpose of this laboratory is to provide students with the required skills and knowledge in using measurement tools in order to perform experiments such as; linear measurement, angular measurement, speed measurement, temperature measurement, strain gauge and Wheatstone Bridge circuit, and illumination measurement.

Mechanical vibrations (620414):

Study of oscillatory motion, derivation of governing equations of motion for undamped and damped vibratory systems in free and forced motions, basics of vibration isolation, free and forced vibrations of multi degrees of freedom systems, vibration absorbers, and vibration of one dimensional continuous systems.

Heat transfer I (620420):

Introduction to modes of heat transfer; One-dimensional steady-state conduction; Un-steady state conduction, Lumped heat capacity systems; Introduction to convection; Hydro-dynamic and thermal boundary layers; Laminar and turbulent boundary layers, Convection in external and internal flows; Empirical relations for forced convection heat transfer; Heat exchangers.

Thermal lab. (620427):

To provide students with the necessary skills to conduct experiments on conduction, convection, collection of data, perform analysis and interpret results to draw valid conclusions through standard test procedures. To determine thermal properties and performance of radiation heat transfer, heat exchanger, condensation, and boiling.

Fluid mechanics II (620428):

The course is a requirement for Mechanical engineering students. At completing this course, the student should be able to understand Viscous flow equations of motion, Description Couette and Hell-Shaw flows, Laminar and turbulent flow boundary layers over flat plates, laminar and turbulent flow in conduits, friction factor, Darcy-Weisback equation and Moody diagrams, , Drag and lift forces, Compressible flow, normal and oblique shock waves, significance of the Mach number, Laval nozzle, and Isentropic flow through varying area channels, Flow measurements of

pressure, velocity and mass flow rates. Orifice and Venturi meter, Thrust and efficiency of a propeller, axial and radial pumps, axial and radial turbines, and specific speed.

Fluid mechanics lab. (620429):

This course is designed for mechanical and civil engineering students in their third year. The course intends to give students a fluid properties Density and Viscosity, Center of pressure on submerged plan surface, Impact of water jet, Pipe flow Characteristics Of Centrifugal Pump(single ,series ,parallel), Pump Cavitation.

Machine Design I (620434):

This course involves an introduction to design process, Design considerations, Tolerances, Fits and surface finish, Selection of materials, Mechanical properties of engineering materials, Stress analysis of machine elements, deflection equations, and failure of machine elements under static loads, Fatigue analysis, shaft design, limits and fits.

Machine Design II (620435):

This course involves design of mechanical engineering elements which include, design of permanent joints, welding and adhesive bonding . Design of mechanical springs, ball bearing, journal bearings, gear design especially spur gear, helical and bevel gear, clutches brakes, flywheel an belts.

Exercises in Machine Design (620436)

This course involves design of mechanical engineering elements which include, static failure analysis, dynamic failure analysis, shaft design, design of permanent joints, welding and adhesive bonding design. Design of mechanical springs, ball bearing, journal bearings, gear design especially spur gear, helical and bevel gear, flywheel an belts.

Reverse Engineering (620437):

The course is a requirement for level 4 of mechanical engineering students. It Introduces students to ReverseEngineering Methodology and the application of these methodologies through practical projects. It also introduces students to Fusion 360 software.

Automatic Control (620443):

In automatic control course we will model physical system mathematically, transfer it into block diagrams or signal flow graphs and control the system using controller such as PID and phase-lead and phase lag controllers based on time response requirements such as steady state error, settling time, maximum overshot and stability.

Production Processes (620477):

This course provides the students with the needed material for understanding the principles of Manufacturing Processes, Materials Properties Fundamentals of Metal Casting and metal for casting, mechanical properties of materials, bulk deformation processes in metal working, sheet metal, working familiar with machine operations.

Internal combustion engine lab. (620520):

The course is a requirement for Mechanical engineering students. At completing this course, the student should be able to understand the introduction to internal combustion engines: Classifications, parts, combustion, applications.

Design of Sanitary Systems (620523)

This course introduces knowledge and awareness for mechanical engineering students of the importance of mechanical systems design and its applications in practice. To present Basic definitions and terms of buildings and their mechanical systems economics, cold water supply, plumping materials and fittings, hot water supply, heating and cooling systems system, pipe sizing, fir fighting network and systems, ventilation system and finally to develop an intuitive understanding of mechanical systems.

Internal combustion engines (620529):

This course presents the concepts and theories of operation of internal combustion engines based upon the fundamental engineering sciences of thermodynamics, gas dynamics, heat transfer and mechanics. Discussing the design and operating characteristics of conventional spark-ignition (gasoline), compression-ignition (diesel). Thermodynamic ideal cycles are analyzed and compared to actual cycles. Fuel and air induction and exhaust processes are examined. Pollutant formation is discussed and engine operating characteristics are assessed.

Mechanical vibration lab. (620415):

The purpose of this laboratory is to provide students with the required skills and knowledge by using mechanical vibrations concepts to perform experiments such as; Mass-spring system, Simple and compound pendulums, Mass moment of inertia (Bifilar suspension), Transverse vibration, Forced vibration with negligible damping, and Undamped vibration absorber.

Engineering project I (620440):

The course is a requirement for level 4 of mechanical engineering students. It is the first part of a two semesters project, It introduces the basic principles and analysis of scientific research and technical report writing. It is mainly focused on literature review and design aspects. Presentation in front of audience and the project supervisor is required for assessment and evaluation.

Control systems lab. (620457):

This course includes performing experiments in servo control valve and open loop position control; Position control (PID); Speed control (PID); Pressure control (PID); MATLAB/ Simulink applications; LABVIEW applications.

Engineering training (620499):

Field training which the mechanical engineering students should undergo in reputable factories or companies in the private or public sectors inside or outside Jordan.

Computer aided design CAD-CAM (620538):

Provide students with an introduction and basic concepts of Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) and their relationship to machine control and product development. The CAD/CAM management is addressed by explaining the production planning and control concepts to give the student a complete system overview of manufacturing facility. The course also include an introduction to Fusion 360 software.

Engineering project II (620540):

The course is a requirement for level 5 for all mechanical engineering students. It is the second part of a two semesters project. It introduces the student to conduct some aspects of scientific research which include, objective statement, design steps, scheduling, prototyping, simulation and testing, verifying and final product. Presentation in front of audience and the project supervisor is required for assessment and evaluation.

Calculus I (250101)

The course deals with the following main topics: differentiation of algebraic and transcendental functions, an introduction to analytic geometry, applications of differentiation, and a brief introduction to integration.

Calculus II (250102)

This course introduces advanced principles of calculus to form the foundation needed for student's advancement. The module deals with the following main topics: Techniques of Integration, Sequences and Series, and Conic Sections and Polar Coordinates.

Calculus III (250102)

This course introduces advanced principles of calculus to form the foundation needed for student's advancement. The module deals with the following main topics: Multidimensional analytic geometry, functions of several variables, vector-valued functions, partial derivatives, Gradient, maxima-minima problems and applications, double and triple integrals; potential fields; flux; Green's divergence and Stokes' theorems.

Engineering Analysis I (650260)

The course aims to provide students with the ability to understand and deal with first, second, and higher order differential equations as well as power series methods and Laplace transform.

Engineering Analysis II (610262)

This course introduces students to the various numerical methods used for solving mathematical problems such as: non-Linear equations, systems of linear equations, numerical integration and differentiation, solution of differential equations, and curve fitting techniques.

General Physics I (211101)

This module is a first year physics course which will introduce the students majoring in engineering or physics and other sciences to the basic language and ideas of physics that occur in all branches of science and technology. In addition it provides them with a clear and logical presentation of the basic concepts and principles of physics, and to strengthen their understanding through a broad range of interesting applications to the real world. The course is a survey of the concepts, principles, methods and major findings of classical Physics. Primarily, it covers Newtonian mechanics, with topics include: Vectors, kinematics and dynamics of a single particle in one, two and three dimensions, Circular motion, Newton's laws of motion, Work, energy and power, Conservation of energy, Linear momentum, Rotational motion, Angular momentum; general rotation, and Static Equilibrium; Elasticity and Fracture.

General Physics II (211102)

This module is a first year physics course which will introduce the students majoring in engineering or physics and other sciences to the basic language and ideas of physics that occur in all branches of science and technology. In addition it provides them with a clear and logical presentation of the basic concepts and principles of physics, and to strengthen their understanding through a broad range of interesting applications to the real world. The course is a survey of the concepts, principles, methods and major findings of classical Physics. Primarily, it covers Electricity and magnetism in general, with topics that include: Charge and matter, Electric filed, Gausses Law, Electric Potential, Capacitance and dielectrics, Current and resistance, Direct current circuits, Magnetic field, Faraday's Law of Induction, Sources of the magnetic field, Electromagnetic waves.

General Chemistry 1 (212101)

This course introduces the fundamental theories of chemistry and covers atomic nature of matter, stoichiometry, periodic table, aqueous solution and concentrations, oxidation – reduction reaction, atomic structure, chemical bonding, law of gases , acids and bases.

Programming Language (610263)

The course is a requirement for all engineering students. It introduces the basic principles of structuredprogramming. Students will learn and practice the application of these programming principles to solveengineering problems using the C++ programming language.

Engineering Skills (640253)

This course provides an introduction to engineering problem solving skills, engineering design, technical report writing, oral communication, engineering ethics, and project management.

Entrepreneurship (610550)

The course is a requirement for level 5 Engineering students. It introduces the students to the concept of entrepreneurship and how it is related to engineering practices, also it includes the fundamentals of engineering economy.