

# Eastern Mediterranean University

## Mechatronics Engineering Department

### Course Descriptions

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#### **MENG104 Engineering Graphics**

Principles of engineering graphics with the emphasis on laboratory use of AUTOCAD software. Plane Geometry, geometrical constructions, joining of arcs, Dimensioning principles, principles of orthographic projection, isometric and oblique drawing, principles of sectioning, reading engineering drawing from blueprints.

*Credits: ( 2 / 3 / 0 ) 3*

*Prerequisites: None*

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#### **MECT190 Introduction to Mechatronics Engineering**

This course aims to familiarize first year mechatronics engineering students by introducing them to the fundamentals of discipline; job opportunities for mechatronics engineers; basic study skills; an overview of fundamentals laws and principles of mechatronics engineering; introduction to problem layout and problem solving methods; simplified engineering modeling and analysis of mechatronics systems; collection, manipulation and presentation of engineering data; ethical issues; and the importance of computers and language skills for effective communication.

*Credits: ( 1 / 0 / 1 ) 1*

*Prerequisites: None*

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#### **MENG286 Material Science**

Crystal structure and crystal geometry phase diagrams of alloy systems, heat treatments applied to metallic materials and plain-carbonsteels. Mechanical properties of metals stress-strain in metals, tensile test, hardness and hardness testing, fatigue and fracture of metals, impact test, creep of metals and creep test. Strengthening and plastic deformation of metals. Mechanical properties of ceramics, glasses, polymers and composites. Corrosion of metals. Material selection based on mechanical properties.

*Credits: ( 3 / 1 / 0 ) 3*

*Prerequisites: CHEM101*

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#### **MENG222 Strength of Materials**

Definition of stress, strain. Hook's law. Constitutive relations for uniaxial stresses. Shearing stress and strain. Torsion of circular members. Thin walled pressure vessels. Relations between bending moment, shearing force and distributed loads. Bending of beams with symmetrical sections. Bending of composite beams.

*Credits: ( 4 / 1 / 0 ) 4*

*Prerequisites: MENG231 or CIVL211*

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**MENG231 Engineering Mechanics**

Review of vector algebra. Principle of mechanics. Static equilibrium of particles and rigid bodies. Distributed force systems. Elements of structures, beam, trusses, cables. Friction. Review of particle dynamics, force, energy and momentum methods. Planar kinematics and kinetics of rigid bodies. Energy methods. Particle and rigid body vibrations.

Credits: ( 3 / 0 / 1 ) 3

Prerequisites: MATH151 and PHYS101

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**MENG201 Mechanical Workshop Practice**

This is to be conducted in the Mechanical Engineering Department's workshops by all Mechatronics Engineering students who have completed a minimum of two semesters in the program. Students will perform various hand and machine tool operations under staff supervision. It includes introduction to engineering materials, and selected practices on laying-out and setting out a job, using measuring devices. At the end of the training students will be required to complete a report regarding their training.

Credits: ( 1 / 3 / 0 ) 2

Prerequisites: None

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**MENG244 Fundamentals of Thermodynamics**

Basic concepts of thermodynamics; Properties of pure substances; Energy transfer by heat, work and mass; The first law of thermodynamics; The second law of thermodynamics; Entropy; Power cycles; Refrigeration cycles.

Credits: ( 3 / 1 / 0 ) 3

Prerequisites: None

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**MENG364 Manufacturing Technology**

Fundamentals and principles of major manufacturing processes: casting, bulk deformation, sheet metalworking, powder metallurgy. Processing of polymers, ceramics, glass, rubber and composites. Metal cutting: cutting conditions, forces, temperatures, tool life, surface finish, coolants. Cutting tool materials. Principles, tools and process capabilities of basic machining operations: turning, milling, drilling, planning, shaping, boring, broaching. Gear manufacturing. Abrasive operations: grinding, finishing operations. Non-traditional processes. Basics of joining and assembling. Fusion and solid-state welding. Essentials of computer numerical control

Credits: ( 4 / 1 / 0 ) 4

Prerequisites: MENG286

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**MENG331 Dynamics of Machinery**

Mechanical vibrations: 2-D.O.F. vibrating systems, vibration measuring instruments, numerical methods for multi-degree of freedom systems, Dunkerley's equations, vibration of continuous systems, random vibrations. Balancing of machinery: rigid rotors, reciprocating machines, flywheels, planar linkages, balancing machines and instrumentation. Cam dynamics, gyroscope and governors

*Credits: ( 4 / 1 / 0 ) 4 Prerequisites: ( MENG231 or MENG233) and (MATH241 or MATH207)*

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**MECT363 Fundamentals of Programmable Logic Controller (PLC) Automation**

Fundamental topics of implementing Programmable Logic Controllers(PLC) in systems automation, basic PLC programming, integration of industrial sensors and actuators with PLCs, PLC timers and counters

*Credits: ( 3 / 1 / 0 ) 3 Prerequisites: None*

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**MECT375 Machine Elements**

The course covers fundamentals of machine design which include: general design rules, load analysis, materials selection, stress, strain and deflection anal mechatronics components, sensors, instrumentation analysis, failure theories, the concepts of reliability and safety, tolerances and fits; and introduces design guidelines, mathematical models and equations for: fasteners and power screws, springs, bearings, gears, shafts, clutches and brakes, and chain drives. Students will have an opportunity to work on a design project using learned knowledge.

*Credits: ( 3 / 0 / 1 ) 3 Prerequisites: MENG222*

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**MENG303 Principles of CAE**

Integration of computers into the design cycle. Interactive computer modeling and analysis. Geometrical modeling with wire frame, surface, and solid models. Finite element modeling and analysis. Curves and surfaces and CAD/CAM data exchange. The integration of CAD, CAE and CAM systems.

*Credits: ( 2 / 3 / 0 ) 3 Prerequisites: MENG104*

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**MECT410 Introduction to Capstone Design**

The course aims to prepare the senior year students for their capstone design projects, and to provide guidance with the selection of their project advisors, topics and teams. The students are introduced to the basic features of the Capstone Design process, elements of a Capstone Project Report and written oral presentation techniques.

*Credits: (1/0/1)1*

*Prerequisites:*

*None*

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**MECT400 Industrial Training**

This is a period comprising a minimum of 40 days' training to be completed in an industrial organization by all students who are effectively in their junior or senior year. Students should obtain approval of the Department before commencing training. Following this training, students will be required to write a formal report and give a short presentation before a committee regarding their training.

*Credits: (0/0/0)0*

*Prerequisites: MENG364*

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**MECT411 Capstone Team Project**

The purpose of the course is to develop an understanding of independent research through the study of a particular Mechatronics Engineering topic of interest. The special project is an exercise in the professional application of specialist skills and experience developed in Mechatronics Engineering program. Research topics, which may be principally experimental, theoretical or applied, will be chosen in consultation with a project supervisor.

*Credits: (1/4/0)3*

*Prerequisites: MECT410 and MECT400*

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**Course Descriptions – II – English : All compulsory courses offered by  
other academic units**

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**EENG112 Introduction to Programming**

High-level programming environments. Variables, expressions and assignments. Introducing C programming. Structured programming; sequential, selective and repetitive structures. Function definition and function calls. Prototypes and header files. Recursive functions. Arrays and pointers. Dynamic memory management. Parameter passing conventions. Multi dimensional arrays. Structures and unions. Conditional compilation, modular programming and multi-file programs. Exception handling. File processing. Formatted I/O. Random file access. Index structures and file organization.

*Credits: (4/1/0)4*

*Prerequisites: None*

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**ENGL191 Communication in English I**

ENGL191 is a first semester freshman academic English course. The purpose of this course is to consolidate and develop students' knowledge and awareness of academic discourse, language structures and lexis. The prime focus will be on the further development of writing, reading, speaking and listening skills in academic settings, and on improving study skills in general.

*Credits: (3/1/0)3*

*Prerequisites:*

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**MATH151 Calculus – I**

Limits and continuity. Derivatives. Rules of differentiation. Higher order derivatives. Chain rule. Related rates. Rolle's and the mean value theorem. Critical Points. Asymptotes. Curve sketching. Integrals. Fundamental Theorem. Techniques of integration. Definite integrals. Application to geometry and science. Indeterminate forms. L'Hospital's Rule. Improper integrals. Infinite series. Geometric series. Power series. Taylor series and binomial series

*Credits: (4/0/1)4*

*Prerequisites: None*

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**PHYS101 Physics I**

Families of physical quantities having different dimensions, units and rules of mathematics. Vector mathematics and calculus, their applications to motion. Newton's laws. Integrals of the second law, work-energy, impulse-momentum, conservation of energy and momentum, applications. Rotations. Static equilibrium.

*Credits: (4/1/0)4*

*Prerequisites: None*

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**CHEM101 General Chemistry**

Atoms, molecules and ions; Mass relations in chemistry, stoichiometry; Gases, the ideal gas law, partial pressures, mole fractions, kinetic theory of gases; Electronic structure and the periodic table; Thermo chemistry, calorimetry, enthalpy, the first law of thermodynamics; Liquids and Solids; Solutions; Acids and Bases; Organic Chemistry.

*Credits: (4/0/1)4*

*Prerequisites: None*

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**ENGL192 Communication in English II**

ENGL 192 is a second semester freshman academic English course. The purpose of this course is to further consolidate and develop students' knowledge and awareness of academic discourse, language structures and lexis. The prime focus will be on the further development of writing, reading, speaking and listening skills in academic settings, and on improving study skills in general.

*Credits: (3/1/0)3*

*Prerequisites:*

*ENGL191*

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**MATH152 Calculus-II**

Vectors in  $R^3$ . Lines and Planes. Functions of several variables. Limit and continuity. Partial differentiation. Chain rule. Tangent plane. Critical Points. Global and local extrema. Lagrange multipliers. Directional derivative. Gradient, Divergence and Curl. Multiple integrals with applications. Triple integrals with applications. Triple integral in cylindrical and spherical coordinates. Line, surface and volume integrals. Independence of path. Green's Theorem. Conservative vector fields. Divergence Theorem. Stokes' Theorem.

*Credits: (4/0/*

*1)4*

*Prerequisites: MATH151*

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**PHYS102 Physics-II**

Kinetic theory of ideal gases. Equipartition of energy. Heat, heat transfer and heat conduction. Laws of thermodynamics, applications to engine cycles. Coulombs law and electrostatic fields. Gauss's law. Electric potential. Magnetic field. Amperes law. Faradays law.

*Credits: (4/0/1)4*

*Prerequisites: PHYS101*

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**TUSL181 Turkish as a Second Language**

TUSL181 is a Basic Turkish course introducing the Turkish language. It incorporates all four language skills and provides an introduction to basic grammar structures. Students will be encouraged to develop their writing skills through a variety of tasks. The aim of this course is for students to be able to understand and communicate in everyday situations, both in the classroom and in a Turkish-speaking environment.

*Credits: ( 2 / 0 / 0 ) 2*

*Prerequisites: None*

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**HIST280 History of Turkish Reforms**

19. century state of the Ottoman Empire (Constitutional Period), Tripoli and the Balkan Wars, World War II and the results, the Guilds, the War of Independence, Cease Fire Ant., Lausanne, Ant.

*Credits: ( 2 / 0 / 0 ) 2*

*Prerequisites:*

*None*

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**INFE221 Electrical Circuits**

Circuit variables and circuit elements. Some circuit simplification techniques. Techniques of circuit analysis. The operational amplifiers. The natural and step response of RL and RC circuits. Natural and step responses of RLC circuits. Sinusoidal steady-state analysis. Introduction to the Laplace Transform. The Laplace Transform in circuit analysis.

*Credits: ( 4 / 0 / 1 ) 4*

*Prerequisite: Math151*

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**IENG355 Ethics in Engineering**

This course is designed to introduce moral rights and responsibilities of engineers in relation to society, employers, colleagues and clients. Analysis of ethical and value conflict in modern engineering practice. Importance of intellectual property rights and conflicting interests. Ethical aspects in engineering design, manufacturing, and operations. Cost-benefit-risk analysis and safety and occupational hazard considerations.

*Credits: ( 3 / 0 / 0 ) 3*

*Prerequisites: None*

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**EENG212 Algorithms and Data Structures**

Storage structures and memory allocations. Primitive data structures. Data abstraction and Abstract Data Types. Array and record structures. Sorting algorithms and quick sort. Linear & binary search. Complexity of algorithms. String processing. Stacks & queues; stack operations, implementation of recursion, polish notation and arithmetic expressions. Queues and implementation methods. Dequeues & priority queues. Linked storage representation and linked-lists. Doubly linked lists and circular lists. Binary trees. Tree traversal algorithms. Tree searching. General trees. Graphs; terminology, operations on graphs and traversing algorithms.

*Credits: (3 / 1 / 0) 3*

*Prerequisites:*

*EENG112*

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**MATH241 Ordinary Differential Equations and Linear Algebra**

Systems of linear equations, elementary row operations, echelon form, Gaussian elimination method; Matrices; Determinants, adjoint and inverse matrices, Cramer's rule; Vector spaces, linear independence, bases and dimension, eigenvalue problem. First-order differential equations, separable differential equations, change of variables, exact differential equations; Second-order differential equations, the method of undetermined coefficients, the variation of parameters method; General results of first-order linear systems, homogeneous constant coefficient vector differential equations, variations of parameters for linear systems; Laplace transform method.

*Credits: (4 / 0 / 1) 4*

*Prerequisites: MATH151*

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**ENGL201 Communication Skills-I**

ENGL 201 is a second year Mainstream Communication Skills course for students at the Faculty of Engineering. The course aims to introduce a range of skills, including effective written and oral communication, research skills and study skills. Throughout the course the students will be involved in project work intended to help them in their immediate and future academic and professional life. This will include library research, technical report writing and an oral presentation. By investigating a topic of their own choice, students will develop their understanding of independent research skills. During the report writing process, students will improve their writing and develop the ability to produce organized, cohesive work. The oral presentation aims to enhance spoken fluency and accuracy and provide training in the components of a good presentation.

*Credits:( 3 / 0 / 0 ) 3*

*Prerequisites: ENGL192*



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## **INFE242 Electronics**

Semiconductor devices, basic amplifier concepts, diodes, P-N junction diodes, Schottky diodes, Bipolar Junction Transistors (BJTs), Field-Effect Transistors: MOSFETs, JFETs, transistor biasing.

*Credits: (4 / 0 / 1) 4*

*Prerequisite: INFE221*

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## **EENG 226 Signals and Systems**

Continuous-time and discrete-time signals and systems. Linear time-invariant (LTI) systems: system properties, convolution sum and the convolution integral representation, system properties, LTI systems described by differential and difference equations. Fourier series: Representation of periodic continuous-time and discrete-time signals and filtering. Continuous time Fourier transform and its properties: Time and frequency shifting, conjugation, differentiation and integration, scaling, convolution, and the Parseval's relation. Representation of aperiodic signals and the Discrete-time Fourier transform. Properties of the discrete-time Fourier transform.

*Credits (4 / 0 / 1) 4*

*Prerequisites: INFE221*

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## **EENG 115 Introduction to Digital Logic Design**

Number systems, arithmetic operations, decimal codes, alphanumeric codes, Boolean algebra, Karnaugh maps, NAND and NOR gates, exclusive-OR gates, integrated circuits, combinational circuits, decoders, encoders, multiplexers, adders, subtractors, multipliers, sequential circuits, latches, flip-flops, sequential circuits analysis, registers, counters, RAM and ROM memories, programmable logic technologies (PLA, PLD, CPLD, FPGA).

*Credits: (3 / 1 / 0) 3*

*Prerequisites: None*

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## **EENG 320 Control Systems-I**

Introduction to control: open-loop and closed loop control. Modeling: transfer function, block diagram, signal flow graph, state equations. Feedback control system characteristics: sensitivity, disturbance rejection, steady-state error. Performance specifications: second-order system, dominant roots, steady-state error of feedback systems. Stability: Routh-Hurwitz criterion, relative stability. The root-locus method, Bode diagram, Nyquist stability criterion, gain margin and phase margin, Nichols chart.

*Credits: (4 / 0 / 1) 4*

*Prerequisites: EENG226*

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**EENG 410 Microprocessors-I**

Representation of numbers. Two's complement. Sign-magnitude notations. Fixed-length binary arithmetic. Floating-point arithmetic. Introductory microprocessor architecture. Instructions and micro-operations. Machine cycles. Instruction and data fetching. Addressing modes. Inherent, immediate, direct, relative and indexed addressing. Microprocessor interfacing. Data, address and control buses. Memory interfacing. Basic I/O interfacing.

*Credits: (4/0/1)4*      *Prerequisites: EENG115*

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**IENG420 Fundamentals of Engineering Economy**

An introduction to the basics of economic analysis for decisions in engineering design, in manufacturing, in manufacturing equipment, and in industrial projects. Time value of money. Cash flow analysis. Cost of capital. Return on investment. Elements of cost and cost estimation. Break-even analysis. Decision making among alternatives. Effects of depreciation. Taxes. Replacement analysis. Inflation.

*Credits: (3/0/0)3*      *Prerequisites: None*

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**MATH322 Probability and Statistical Methods**

Introduction to probability and statistics. Operations on sets. Counting problems. Conditional probability and total probability formula, Bayes' theorem. Introduction to random variables, density and distribution functions. Expectation, variance and covariance. Basic distributions. Joint density and distribution function. Descriptive statistics. Estimation of parameters, maximum likelihood estimator. Hypothesis testing.

*Credits: (3/0/1)3*      *Prerequisites: None*

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**EENG428 Introduction to Robotics**

Basic components of robot systems; coordinate frames, homogeneous transformations, kinematics for manipulator, inverse kinematics; manipulator dynamics, Jacobians: velocities and static forces, trajectory planning, Actuators, Sensors, Vision, Fuzzy logic control of manipulator and robotic programming.

*Credits: (4/0/0)4*      *Prerequisites: MATH241*