Çankaya University Mechatronics Engineering Department Course Catalogue

MUST COURSES

1. YEAR

1. SEMESTER

CENG 161 Introduction to Computer Science + Laboratory (3-2) 4 (5 ECTS)

Introduction to computer systems; hardware and software organization. Operating systems. User interface, Windows environment. Programming methodology, languages, syntax and semantics and language processors. Basic elements of programming and data types. JAVA programming language will be used for practical work. Program implementation and debugging.

ENG 121 Academic English I (2-2) 3 (4 ECTS)

ENG 121 is a compulsory course for sophomore students who have enrolled in this course after the placement test given by the Foreign Languages Unit. Students who qualify in the test are exempted from this course. ENG 121 provides a solid foundation for our students' academic studies and future careers. It is a theme-based course integrating the four language skills (reading, writing, listening and speaking) required for academic studies in English. In addition to improving higher level academic language skills, the course aims at employing critical thinking skills through challenging tasks that guide students in comprehending, evaluating, and synthesizing information, ideas and judgments. The content of the course, which provides an appropriate context to teach academic language skills, covers various global issues from different disciplines, and makes students acquainted with the most frequently used language structures and functions relevant to their undergraduate studies.

MATH 157 Calculus for Engineering I (4-0) 4 (5 ECTS)

To teach basic preliminaries on functions and inequalities, to teach limits and continuity, to teach derivatives and its applications, to teach definite integral and some methods of integration. This course covers these topics: real numbers and the real line, intervals, absolute value, Equations, and inequalities involving absolute value, Graphs of Quadratic Equations, circles, parabolas, shifting a graph, ellipses, and hyperbolas. Functions, domain and range, graphs, even and odd functions, combining functions, composite functions, piecewise defined functions. Trigonometric functions, identities, graphs of trigonometric functions. Transcendental functions. Limits and Continuity. Limits at infinity and infinite limits. Differentiation, Applications of Derivatives, Integration, Applications of Definite Integral, Techniques of Integration, Improper Integrals

PHYS 131 Physics I (3-2) 4 (6 ECTS)

To teach fundamental laws of classical mechanics and waves. This course covers these topics: measurement, units, motion along a straight line, vectors, motion in two and three dimensions, circular motion, force, Newton's laws, frictional force, work, kinetic energy and power, potential energy, conservation of energy, systems of particles, center of mass, impulse and momentum, elastic and inelastic collisions, rotation, torque, rolling, angular momentum, static equilibrium, oscillations, simple harmonic motion, pendulum, waves, wave equation, resonance, sound waves, interference, Doppler effect.

TURK 101 Turkish I (2-0) 2 (3 ECTS)

The course will cover the following: teaching students the structure and usage features of the mother tongue; having students acquire the ability to use Turkish appropriately as a written or oral communication tool; developing students' creative thinking, criticizing, researching, questioning and constructive structure of the outstanding works of art in Turkish Literature; providing the language as complete and cooperated in education and making students aware of their mother tongue during the university period.

MECE 101 Computational Tools for Mechatronics Engineering (1-0) 1 (1 ECTS)

Variable definition, vector definition, matrix definition; Basic mathematical and logical operators, special operators; conditional statements; Loops; Drawing of 2D and 3D curves, surface drawings; Function definition and calling; Basic definitions about SIMULINK.

MECE 113 Computer Aided Engineering Drawing - I (2-2) 3 (6 ECTS)

Engineering drawing is the language of the engineers and technicians. Therefore, it is the intent of this course to equip students with the fundamentals of this unique language and to give them the skills necessary to prepare complete, concise, and accurate communications through engineering drawings using AutoCAD.

2. SEMESTER

CENG 162 Computer Programming I + Laboratory (3-2) 4 (5 ECTS)

Object-oriented design concepts, features and problems of complex systems, evolution the object-oriented model, foundations and elements of the object-oriented model, classes and objects, relationships among classes, relationships among objects, interplay of classes and objects, approaches to identifying classes and objects, object-oriented design methodologies, GUI programming, event driven programming and applets.

MECE 114 Computer Aided Engineering Drawing – II (2-2) 3 (4 ECTS)

The course covers following topics; threaded fasteners and gears, surface quality and tolerances, general concepts in solid modelling, transferring solid models to drafting detailing, assembly modelling and assembling parts, surface modelling.

ENG 122 Academic English II (2-2) 3 (4 ECTS)

ENG 122 is a compulsory course for sophomore students who have enrolled in this course after the placement test given by the Foreign Languages Unit. Students who qualify in the test are exempted from this course. ENG 122 offers theme-based instruction through further study of academic language skills with an integrated methodology. In addition to improving the skills covered in the previous English courses, ENG 122 helps enhance students' level of critical thinking skills that will be necessary for them throughout their academic lives by engaging them in global topics. The students having accomplished this course will become entirely autonomous learners equipped with problem solving skills needed for academic demands of university study.

MATH 158 Calculus for Engineering II (4-0) 4 (5 ECTS)

To teach sequences and series, some of the convergence tests, Power Series, and applications. To teach the fundamental ideas of the differential and integral calculus of functions of several variables. This course covers these topics: Sequences, Infinite Series, Alternating Series, Power Series. Taylor and Maclaurin Series. Vectors, Lines and Planes in Space. Vector Valued Functions, Functions of Several Variables. Partial Derivatives, Directional Derivatives. Extreme Values; Lagrange Multipliers. Double Integrals; Polar Coordinates, Triple Integrals; Cylindrical and Spherical Coordinates; Substitution.

PHYS 132 Physics II (3-2) 4 (6 ECTS)

The General Physics for Engineering II course is a standard freshman course for engineering students. This course covers these topics: Electric charge, electric fields, Gauss' law, electric potential, capacitance, current, resistance and circuits, magnetic fields, magnetic fields due to currents, induction and inductance, electromagnetic oscillations and alternating current, Maxwell's equations, electromagnetic waves, mirrors and lenses, interference, diffraction, semi-conductors, diodes, transistors.

TURK 102 Turkish II (2-0) 2 (3 ECTS)

The course will cover the following: teaching the structure and features of Turkish with examples; teaching the ways of using and reaching knowledge; making students acquire the ability of thinking, planning, observing in a written form during the university period by selecting a qualified novel, poem, story of Turkish literature. This course aims at making students acquire the ability of scientific, criticizing, questioning, interpreting, creating, constructing the ability of thinking.

MECE 104 Fundamentals of Mechatronics Engineering (2-0) 2 (2 ECTS)

Introduction to Mechatronics Engineering: History, development and tools of Mechatronics Engineering; Basic Concepts in Mechatronics Engineering; Mechanical Engineering: history, sub-disciplines, related disciplines, mechanical quantities and definitions, dimensions and units; Electrical and Electronics Engineering: history, sub-disciplines, related disciplines, electrical quantities and definitions, electrical units; Robotics: Fundamentals of programming VAL3 for the robot arm; Control Engineering: Definition of Control Engineering, Control Engineering components, Sensors, Actuators, controllers; Engineering Ethics; Error Analysis: Preliminary definition of error analysis, reporting and use of uncertainties; Error Analysis: Preliminary definition of error analysis, reporting and use of uncertainties; Production processes; Introduction to Electrical and Electronics Laboratory: Devices, kit, circuit components, resistance reading; Factory visit.

ESR 101 Ethical Principals and Social Responsibility (1-0) 1 (1 ECTS)

Deciding what constitutes an ethical issue is often difficult because what constitutes good ethical behavior has never been clearly defined. The scope of this course is then to present useful ethical theories to university students who are going to be practitioners in various fields in the near future, and to improve their skills both in analyzing concrete moral issues and deciding upon strategies for solving moral dilemmas. On the other hand, in spite of the blurry situation, today's managers need to create an ethically healthy environment for their employees. How managers can create a healthy environment and help employees to make the right decisions through ethically ambiguous situations is one of other main concerns of this course. The course is designed not only for business students but also for engineering, law, art and sciences and other prospective students. For this reason, case studies that excel on various kinds of problems should be analyzed in class discussions. To present ethical-dilemma exercises in each chapter will allow the students to think through ethical issues and assess how they would handle them.

2. YEAR

3. SEMESTER

MECE 203 Statics (3-0) 3 (6 ECTS)

The course covers the following topics; statics of particles: forces in plane, forces in space, equilibrium, moment of a force, moment of a couple, equivalent systems of forces on rigid bodies, equilibrium in two dimensions, equilibrium in three dimensions, distributed forces: centroids and center of gravity, analysis of structures: trusses and beams, Shear force and bending moment diagrams by method of sections and by method of integration, Area moment and centroid; moments and product of inertia; principal directions, method of virtual work.

MECE 210 Manufacturing Processes (3-2) 4 (5 ECTS)

This course is designed to provide students with an introduction of a number of manufacturing processes. It is an overview course discussing a wide variety of manufacturing processes with less detail. Instead, the principles behind the processes will be discussed. Special emphasis will be given to some common methods in manufacturing industry including metal cutting, numerical control, casting, forming, and shaping processes.

MECE 311 Probability and Random Processes (3-0) 3 (4 ECTS)

Overview of Probability Theory; Probability, Sample Spaces and Event Counting Techniques, Permutations and Combinations; Conditional Probability, Expected Value, Variance, Standard Deviation, Independence; Probability Sample Questions, Random Variables, Discrete Random Variables, Prob. Distributions and Expected Value of Discrete Random Variables.; Binomial Probability Distribution, Continuous Random Variables, PDF, CDF; Normal Distribution, Joint Probability Distributions; Central Limit Theorem, Covariance and Correlation; Random processes, Random processes; Probability Engineering Problems.

MECE 233 Electrical Circuit Analysis + Laboratory (3-2) 4 (4 ECTS)

Based on the basic components of analogue circuits, it is aimed that the students have the ability of electrical circuit analysis procedure. Mainly DC analysis concepts and methods (circuit analysis methods, circuit theorems, circuit simplification methods, RC, RL, RLC, LC circuits) are explained, some of the AC analysis concepts (waveforms, basic input functions) are also mentioned.

MECE 223 Digital Design I+ Laboratory. (3-2) 4 (4 ECTS)

Number Systems, Number Codes and Recorders; Boolean Algebra, Other Logic Functions: NAND, NOR, XOR; Simplification with Karnaugh Maps; NAND and XOR Applications, Circuit Analysis Procedure, Combination Design Procedure; Binary Adders and Subtractors; Magnitude Comparators and Multiplexers; Resuscitation; Encoders and decoders; Sequential Circuits: Sliders; Sequential Circuits: Flip Flops, Analyzing Sequential Circuits; Finite State Machine Design Procedure; Shift typing, counters; Memory and Programmable Logic; Resuscitation.

MATH 254 Introduction to Differential Equations (4-0) 4 (4 ECTS)
Solutions, Existence and uniqueness theorem, exact equations, separable equations, linear equations, Bernoulli's equations; Homogeneous equations, finding the integral factor, special transformations (equations that can be converted to homogeneous equations); Higher order linear ordinary differential equations: basic theory of higher order linear equations, order reduction method; Homogeneous equations with constant coefficients, method of indeterminate coefficients; Method of change of parameters; Cauchy-Euler equations; Laplace transforms: Basic properties of Laplace transforms, Convolution; Inverse Laplace transform; Solving differential equations by Laplace transform; Laplace transform of piecewise defined and unit step functions; Series solutions of ordinary differential equations, Power series solutions (ordinary point); Power series solutions (regular singular point); Fourier analysis: Odd and even functions, periodic functions; Fourier sine and cosine series of functions in any period, wave equation.

ENG 221 Advanced Writing Skills (2-0) 2 (3 ECTS)
Before writing: Preparation for writing; The structure of the paragraph; writing paragraphs; The structure of the composition; Preparing the draft of the composition. In-class practice: Drafting; Introduction and conclusion sections; Integrity and cohesion in composition; Integrity and cohesion in composition; In-class practice: Essay writing; Elements to be considered while writing the essay during the exam; In-class practice: Essay writing; Have students give feedback on each other's compositions.

4. SEMESTER

MECE 202 Strength of Materials (3-0) 3 (5 ECTS)

The course covers the following topics: stress and strain concepts, axial load, statically indeterminate axially loaded members, thermal stress, torsion, angle of twist, statically indeterminate torque-loaded members, bending, eccentric axial loading of beams, transverse shear, shear flow in build-up members, combined loadings, stress and strain transformation, deflection of beams and shafts, statically indeterminate beams, and shafts.

MECE 206 Dynamics (3-0) 3 (4 ECTS)

The course covers the following topics; kinematics of particles, velocity and acceleration in rectangular, cylindrical, spherical and normal and tangential coordinates, rectilinear motion, relative motion, kinetics of particles; newton's law of motion, equation of motion, work, impulse, momentum, principle of work and energy, principle of impulse and momentum, angular momentum, angular impulse and momentum principle, kinetics of systems of particles, planar kinematics of rigid bodies, instantaneous center of rotation, planar kinetics of rigid bodies, three dimensional kinematics of rigid bodies, three dimensional kinetics of rigid bodies.

MECE 246 Fundamentals of Electronics + Laboratory (3-2) 4 (5 ECTS)

Basic semiconductor physics, diodes and diode circuits, bipolar junction transistors, biasing the BJTs, small signal operations, Field effect transistors, biasing the FETs, small signal operations, frequency responses of the small signal amplifiers.

ENG 222 Academic Presentation Skills (2-0) 2 (3 ECTS)

Course introduction; Introduction part of the presentation, Student presentations (introductory part); Development section/Use of visuals; Student presentations (development section); Student presentations (development section); Conclusion part/Question-answer part; Student presentations/Conclusion; Student presentations, Student presentations; Student presentations, Student presentations; Student presentations, Student presentations.

MECE 232 Advanced Electrical Circuit Analysis + Laboratory (3-2) 4 (4 ECTS)

This course mainly introduces the student to concepts of analyzing AC circuits (Steady state and sinusoidal steady state analysis methods, Laplace transform, filters, bode plots, convolution integral). Some circuit representation techniques (Two ports) and new circuit elements (Transformers and coupled inductor, 3 Phase circuits) are also covered.

MATH 253 Vector Calculus and Linear Algebra (4-0) 4 (4 ECTS)

This course covers these topics: Triple Integrals in Cylindrical and Spherical Coordinates, Substitutions in Multiple Integrals Line Integrals, Vector Fields, Work, Path Independence, Potential Functions and Conservative Fields Green's Theorem, Surface Area and Surface Integrals, Parametrized Surfaces, Stoke's Theorem, Divergence Theorem, Systems of linear equations, matrices, determinants, Vectors in 2-space and 3-space Real Vector Spaces, Subspaces, Linear Independence Basis and Dimension, Change of Basis Row Space, Rank and Nullity Inner Product Spaces, Gram-Schmidt Process, Orthogonal Matrices Eigenvalues and Eigenvectors Diagonalization.

MECE 218 Principles of Signals and Systems + Laboratory (3-2) 4 (5 ECTS)
Representation of signals in the frequency domain; Continuous and discrete time signals, Signal characteristics and models; Signal models (Sine Signals, Exponential Signals, Dampening and growth signals); Convulsion, Recitation; Continuous time Fourier Transform; Discrete-time Fourier Transform; Fourier Transform theorem; Modulation and Demodulation; Impulse sequences, periodic signals, and sampling; Laplace transform and Z transform; Communication systems applications.

3. YEAR

5. SEMESTER

MECE 307 Machine Elements - I (3-0) 3 (5 ECTS)

The course covers the following topics: stress analysis, design criteria for static strength, design criteria for fatigue strength, permanent joints, welded, soldered, adhesive bonded and riveted joints, nonpermanent joints, bolted joints, power screws, keys, pins knuckles and press fitted, tight fitted and conical fitted connections, shafts and axles, springs.

MSE 235 Materials Science for Electronic Engineers (3-0) 3 (4 ECTS)

This course covers the fundamental concepts that determine the electrical, optical, and magnetic properties of metals, semiconductors, and insulators. Materials are presented in a logical order from the simple to the more complex: atoms – molecules – crystals (solids); and then the roles of bonding, structure (atomic, crystalline, defect, energy band) and composition in influencing and controlling physical properties are discussed. Particular attention is given to the characteristics of semiconductors. Significant effort will be made to link the materials to their applications. For instance, Light emitting diodes are used as examples of light absorption and emission.

MECE 347 Electronics + Laboratory (3-2) 4 (6 ECTS)

After having a detailed frequency analysis of amplifiers, applications of the analog integrated circuits, mainly operational amplifiers (op-amps) and others are taught in this course. Designing active filters, constructing oscillator, voltage-controlled oscillator, FM modulator, demodulator circuits, analog to digital, digital to analog converters, designing and analyzing power amplifiers are among the subjects of this course.

MECE 301 Theory of Machines I (3-0) 3 (4 ECTS)

Fundamentals of Kinematics: Degrees of freedom of joints and mechanisms, special cases; Fundamentals of Kinematics: Grubler's equation, kinematic counting, classification; Position Analysis Using Loop Closure Equations; Position Analysis Using Loop Closure Equations; Velocity Analysis and Singular Positions; Velocity Analysis and Singular Positions; Acceleration Analysis; Four Link Mechanisms: Grashof's rule, transfer angle, coupler position synthesis; Gear Sets; Gear Sets; Vector Static Force Analysis; Vectorial Dynamic Force Analysis; Vectorial Dynamic Force Analysis

MECE 200 Summer Training I (0 – 0) 0 (5 ECTS)

Learns the production processes used in the production of mechatronic products; Learns the importance of engineering drawings and production techniques; Learn how to do a cost analysis for a product; To recognize the organizational structures in companies.

6. SEMESTER

MECE 388 Automatic Control Systems + Laboratory (2-2) 3 (5 ECTS)
Introduction to the Feedback Loop, Basic Modeling Concepts; Modeling: Linear Systems - Block Diagrams; Modeling: Nonlinear Systems and Linearization - Block Diagram Simplifications; Modeling: State Space and Frequency Domain Representation; System Analysis: Denominators and Denominators of Transfer Functions; System Analysis: Stability Definitions and Criteria; System Analysis: Dynamic Behavior and Performance Criteria; Control Loop Analysis: Nyquist Diagram; Control Locus Analysis: Root Locus; Control Loop Analysis: Bode Plot; Control Loop Synthesis: PID Control Using Root Locus; Control Loop Synthesis: PID Control using Bode Plot; Control Loop Synthesis: State Feedback Control - Controllability; Control Loop Synthesis: State Observer Design – Observability.

MECE 215 Fundamentals of Thermal Systems (3-0) 3 (4 ECTS)
Basic Concepts of Thermodynamics: System Concept; Description, condition and process of features; Definition of specific volume, pressure, temperature; Introductory concepts: Definitions of energy, work, power; Expansion, compression work; Internal energy, energy transfer with heat; First Law of Thermodynamics for Closed Systems and Loops: First law for closed systems (control mass); First law for cycles, (Power, cooling, heat pump)Evaluating Properties: Pure substance; phases and phase diagram drawing of pure substances (eg water); evaluation of properties from vapor and liquid tables; the concept of enthalpy; specific heats; Ideal gas relationship, evaluation of properties Using ideal gas tables, Polytrophic process definition; First Law of Thermodynamics for Control Volumes (Control volumes(CV)): Conservation of mass and conservation of energy for CV Stationary State CVs, Simple applications of the First Law: Nozzle, diffuser, turbine, compressors and pumps Second Law of Thermodynamics: expressions, Irreversible / reversible process; Carnot Cycle, Definition of Entropy (simply), CVs and cycles for systems, Entropy Change, Isentropic Processes, pictures for isentropic processes, definition of isentropic efficiency; Fundamentals of Power Systems: Ideal Simple Rankine Cycle, Vapor Compression Cooling and Heat Pump Systems (Drawing and Basic Concepts-Simple Cycle Analysis); Fundamentals of Power Systems: Gas power systems: Internal Combustion Engines (shape and basic concepts), Simple gas turbine analysis Introduction to fluid mechanics - Basic Concepts: Pressure variation with depth, pressure measurement; Fluid Statics: Hydrostatic Force on a Plane Surface (pressure prism method), Buoyancy Bernoulli and Energy Equations: Definition of viscosity and shear stress; Definition of Bernoulli's Equation; Applications of Bernoulli's Equation Internal and External Flow: Extended Bernoulli Equation (pipe flow head loss-Type I), Illustrations of pipe flow, external flow only, friction and lift definition, some important dimensionless numbers (Re, Eu)Heat Transfer Input-Conduction and Fourier's law, Newton's law of cooling (convection), Stefan – Boltzmann's law (thermal radiation) Conduction: Steady state conduction along a plane wall; Circuit simulation; Applications of plane wall Heat Transfer-Convection-Compound convection-conduction analysis-simple circuit simulation, Fin definition and drawing of finned surfaces; some important dimensionless numbers (Pr, Nu), the definition of forced and free convection and the representation of the effects on the convection coefficient.

MECE 308 Mechatronics System Design I (3-0) 3 (5 ECTS)
Roller bearing; Roller Bearings, Gear General; Gear-General; Spur and helical gears, Spur, and helical gears; Bevel and worm gears, Clutches, Brakes; Clutches, Brakes; Gearbox Design, Gearbox Design; Optimization in machine design, Optimization in machine design; Optimization in machine design

MECE 302 Sensors and Measurement + Laboratory + Lab (3-2) 4 (7 ECTS)
Introduction to measurement systems: measurement system components and applications; static and dynamic characteristics of instruments and signals; Fourier analysis, sampling and aliasing, filtering, analog-to-digital conversion; statistical analysis, measurement noise, measurement errors and uncertainty analysis; selected sensor technologies: temperature sensors, strain, and force sensors; acceleration sensors, fiber optic sensors, vibration sensors, pressure sensors, flow sensors.

MECE 336 Microprocessors I + Laboratory (3-2) 4 (5 ECTS)
Introduction to Microprocessors and Microcontrollers; Microprocessor architecture and instruction set; Basic commands; I/O ports; Hours and Delays; Logic Operations; Adding and subtracting; 16bit addition and subtraction; Input / Output and Device Interface; Parallel I/O; Serial I/O; A/D and D/A Conversion; Programmable Timer Subsystem; Recitation

MECE 240 Electromechanical Energy Conversion (3-0) 3 (4 ECTS)
Energy technology and resources: Fossil fuels, nuclear, solar, and other types of energy. Three phase systems and magnetic circuits. Transformers: Ideal and physical models and equivalent circuit, and transformer testing. Electromechanical energy conversion. Efficiency and process performance. Sensors and actuators: Relays, stepper, and positioning systems. Synchronous reluctance machines. Direct current (DC) machines. Symmetrical alternating current (AC) synchronous machines. Symmetrical AC induction machines.

4. YEAR

7. SEMESTER

IE 345 Engineering Economy (3-0) 3 (4 ECTS)
This course highlights the importance of economic principles in engineering applications, especially in project evaluation procedures. Basics of economic evaluation of engineering decisions such as time value of money, inflation, depreciation and income taxes and related techniques are given.

MECE 309 Mechatronics System Design II (3-0) 3 (5 ECTS)
Mechatronics System Design Process: Overview and Architecture; Mechatronics System Design Process: Examples; For Mechatronic Systems, Sensors; Input Signal Conditions: Analog to Digital Conversion; Input Signal Conditions: Analog and Digital Filters; Actuators for Mechatronic Systems; Actuators for Mechatronic Systems; Output Signal Conditioning; Modeling and Control of Mechatronic Systems; Microcontrollers: Arithmetic, Data Types and Programming Languages; Microcontrollers: Program Structures for Embedded Systems; Microcontrollers: Peripherals; Power supplies, Batteries, Voltage Regulation, Examples of Digital and Analog Circuits.; Project Management, Prototyping and Troubleshooting.

MECE 401 Introduction to Robotics (3-2) 4 (5 ECTS)
Robot types and their characteristics. Forms and characteristics of robot elements. Position and orientation of rigid body. Denavit-Hartenberg convention. Kinematics and inverse kinematics. Modelling of robot dynamics. Lagrange-Euler and Newton-Euler methods. Trajectory planning. Interpolation methods. Hierarchical robot control. Algorithms for control of coordinates of robot joint servosystems (posit ion, speed, torque, and force). Artificial intelligence for robots.

MECE 407 Innovative Engineering Analysis and Design (1-2) 2 (3 ECTS)
In this course, students conduct an elementary independent project under the supervision of staff members with the aim of integrating and applying the knowledge gained throughout the coursework to an actual problem. Specifically, the project work includes the conceptual project definition, the solution methodology, the system design in simulation/hardware, the design verification and validation and the project documentation and presentation.

HIST 201 Principles of Kemal Atatürk (2-0) 2 (3 ECTS)
HIST 201 is a course aimed at teaching students about and strengthening their knowledge on the Turkish War of Liberation, Atatürk's reforms and principles, and Atatürk's thoughts. Additionally, this course also aims at making students have greater interest in historical texts, an ability to analyze historic events from a multidimensional perspective and have a grasp of Turkish modernization in terms of political, economic, social, and cultural areas.

MECE 300 Summer Training II (0-0) 0 (5 ECTS)
Students will learn about research and development, design, and process planning processes in a company; Learns the importance of process planning and input-output processes; Learns the components of the process lines and control systems used in production. To recognize the organizational structures in companies.

8. SEMESTER

HIST 202 Principles of Kemal Atatürk II (2-0) 2 (3 ECTS)
The course aims at explaining Lausanne Treaty, and the political, social, cultural, and economic developments in the newly independent Republic of Turkey. In addition to these, the principles of Atatürk and his reforms and their impact on the Turkish transformation are studied.

IE 446 Project Engineering Management (3-0) 3 (4 ECTS)
The role of projects in organization is getting more important as they become the major tool for reaching strategic goals. This module provides an integrative view of project management. Topics include project selection, project organization, budgeting and cost estimation, progress and performance measurement and evaluation, and project auditing. Project planning and control techniques, such as CPM and PERT, are also covered. After project management issues, project planning and control issues such as general review of CPM and PERT models to cover cases with certainty and uncertainty of activity durations; project crashing and PERT/Cost analysis; GANTT charts and resource balancing decisions; control, revision, and verification of projects; computer applications are discussed.

MECE 408 Innovative Engineering Design and Implementation (1-2) 2 (3 ECTS)
Design: Software / Hardware Development; Design: Software / Hardware Development; Design: Software / Hardware Development; Design: Software / Hardware Development; Design: Software / Hardware Development; Design: Software / Hardware Development; Project Presentation, System integration and testing; Integrate and test the system, Integrate, and test the system; Design Verification / Project Report; Project Report; Project Report; Project Presentation

TECHNICAL ELLECTIVE COURSES

MECE 441 Control System Design + Laboratory (2-2) 3 (5 ECTS)
Introduction to this course by explaining control analysis and design. The overall design process will be explained in detail, as well as the technical details of the problems, to be checked. Topics address the control problem and modeling of the system by defining key constraints. The design of the PID controller will be taught. For single-input, single-output systems, the model will be explained on the techniques. Placing an introduction to MIMO system analysis and control design.

MECE 475 Introduction to Optics (3-0) 3 (5 ECTS)
Introduction: history of light, positives and photons, duration of use; Geometric optics: Huygens fundamental principle, Fermat spaces, critical and reflection, optics, Gaussian optics, Newton's equations, longitudinal growth, Nodal points, Gaussian reduction; Fundamentals of geometric optics: Thick and thin screens, vertex, thin lenses, image conjugate, afocal optics, paraxial optics, paraxial optics scans, vision and obscurers, main beams at the edge, field of view, small and F-numbers, Telecentricity, focusing; Optical systems: parity and plane mirrors, prism systems, lenses, focusing lenses, Kepler telescope, Field lenses, Attached systems, Microscope and lighting systems; In terms of degradation: Chromatic effects; Dispersion, Chromatic aberration, Single chromatic aberration; rays and wavefronts; Distortion design: Curvature and environment, non-spherical and unaffected, Coma, astigmatism, decay; Wave equations: one-dimensional wave equation, harmonic waves, plane waves, harmonic waves as a complex function, spherical waves, EM waves, light polarization; Company of light: Two beam interference, Young's double slit experiment, Newton's rings; Diffraction: Fresnel diffraction, Fresnel Kirchhoff Diffraction integral, Fresnel diffraction from circular aperture, Fresnel region; Diffraction, quadratic and diffraction, resolution; Holography, Hologram fundamentals, White light hologram, Applications; Modulation of light, non-uniform environments, Secondary harmonic generation, Electro-optical effect, Faraday effect, optical conjugate; Modulation of light: Spatial light modulator, applications; Fourier optics.

MECE 480 Digital Control Theory and Applications (2-2) 3 (5 ECTS)
Introduction: Digital Control Loop; Discrete Time Modeling: Discretization and z-Transform; Discrete Time Modeling: z-Transfer Function; Discrete Time Analysis: Dynamic Behavior of Discrete Time Systems; Discrete Time Analysis: Stability - Root Locus; Digital Controller Synthesis: Root Locus; Digital Controller Synthesis: Pole Arrangement; Digital Controller Synthesis: State Feedback; Digital Controller Synthesis: State Observer and Disruptors; Digital Controller Synthesis: Control Loop with Multiple Sampling Times; Digital Controller Application: Practical Factors; Semi-Continuous Control: Approximate Representation of Continuous Time Controllers in Discrete Time; Semi-Continuous Control: Approximate Representation of a Digital Control Loop in Continuous Time; Semi-Continuous Control: Application Example

MECE 491 Biomechatronic (3-0) 3 (5 ECTS)
Introduction to Biomechatronic; Transducers and Transducers, Actuators; Feedback and Control Systems, Signal Processing; Active and Passive Prosthetic Limbs; Image Based Motion Measurement System Design; Portable Motion Measurement System Design; Semi-Active Knee Prosthesis Design; Knee Prosthesis Control; Hearing Aid and Implant; Sensory Substitution and Vision Prostheses; Heart Replacement; Respirators.

MECE 492 Measurement Techniques in Mechatronics Engineering (3-0) 3 (5 ECTS)
Introduction to measurement techniques; Measurement, identification, examination, and evaluation; Measurement of human movement, Signal processing; Kinematic Analysis, Portable measurement systems; The science of measuring the human body; Kinetics: Forces and Moments of Force; Mechanical Work, Energy and Power; Three-dimensional kinematics and kinetics; Synthesis of human movement; Muscle mechanics; Electromyography to study muscle movements; Biomechanical movement associations

MECE 493 Biomedical Instrumentation (3-0) 3 (5 ECTS)
Basic concepts of medical instrumentation; Basic sensors and working principles, Amplifiers, and signal processing; Source of Biopotentials, Source of Biopotentials; Biopotential electrodes; Biopotential amplifiers; blood pressure and tone; Measurement of blood flow and volume; Measurement of the respiratory system; Chemical biosensors; Clinical laboratory instrumentation; Medical imaging systems; electrical safety

MECE 494 Autonomous Mobile Robots (3-0) 3 (5 ECTS)
Entrance; Motion, Mobile Robots with Legs; Wheeled Mobile Robots, Airborne Robots; Mobile Robot Kinematics, Mobile Robot Maneuverability, Workspace and Motion Control; Perception, Fundamentals of computer vision; Fundamentals of image processing and feature extraction; Location recognition and feature extraction based on distance data; Positioning the mobile robot; Probabilistic Map Based Positioning; Other examples of positioning systems. Autonomous map creation; Planning and Guidance, Path Planning; Obstacle avoidance, Routing architectures