# DEPARTMENT OF MECHATRONICS ENGINEERING

# COURSE CONTENTS AND LEARNING OUTCOMES

# CONTENTS

# ➔ 1. SEMESTER ➔

## ATA101 ATATURK'S PRINCIPLES AND REVOLUTION HISTORY I

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 2 | C |

**Objective**

At the end of this course, students will be able to learn the concepts of Atatürk's Principles and History of Turkish Revolution, the Ottoman Modernization process, New Ottomans, I. and II. Constitutional Monarchy Periods, parallel developments in Europe (such as Industrial Revolution and French Revolution), the First World War and its consequences, Mondros Armistice and the subsequent developments, Congress within the scope of the National Struggle, the last Ottoman Mebusan Assembly decisions, Parliamentary Period, Fronts and Mudanya Armistice Agreement, followed by the National Policy and the 1923 Lausanne Peace Treaty will be able to interpret and interpret.

**Course Content**

Concepts, definitions, course methods and definition of resources, Industrial Revolution and French Revolution, The Distribution of the Ottoman Empire (XIX. Century), Tanzimat and Islahat Edict, I. and II. Constitutional Monarchy, Tripoli and Balkan Wars, World War I, Mondros Armistice Treaty, Wilson Principles, Paris Conference, Mustafa Kemal Pasha's Visit to Samsun and the Situation in Anatolia, Amasya Circular, National Congresses, Opening of the Last Ottoman Mebusan Assembly, TBMM Establishment and Internal Rebellions, Organization Law, Establishment of Regular Army, I. and II. İnönü and Kütahya-Eskişehir and Sakarya Square Battles, the Great Attack, the agreements during the War of Independence, the Lausanne Treaty, Abolition of the Sultanate, the period is examined under the main headings.

**Learning Outcomes**

1. To understand and evaluate the process of transition from Empire to National State
2. Mustafa Kemal Atatürk "Exiting Turkey on the level of contemporary civilization" to understand the words.
3. To gain the ability to evaluate current issues in the light of historical information
4. To have knowledge about social policy, political science and international relations
5. Gaining the ability to acquire and analyze information from different sources

## PHY101 PHYSICS I

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 2 | 4 | 6 | C |

**Objective**

To teach the students the mechanics which is one of the basic subjects of engineering.

**Course Content**

What is physics? Coordinate Systems, Measurement and Unit Systems, Vector and Scalar Quantities, Basic Operations with Vector Quantities, Average and Instantaneous Velocity, Acceleration, Uniform Linear Motion, Constant Acceleration Motion, Free Fall, Horizontal and Inclined Throw Motion, Newton's Laws of Motion, Work, Power, Energy, Conservation of Energy, Thrust, Momentum and Collisions, Circular Motion, Angular Momentum, Rotational Kinematics and Rotational Dynamics, Angular Momentum and Torque

**Learning Outcomes**

1. To be able to understand the difference and relationship between kinematics and dynamics which are sub-branches of mechanics and to gain the ability to solve related questions
2. To be able to write motion in one and two dimensions and related kinematic equations
3. To have knowledge about rotation kinematics and rotation dynamics

## ENG103 ENGLISH I

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 2 | C |

**Objective**

This course includes activities for the development of vocabulary, grammar and communicative skills to help students communicate at an advanced level. These activities are covered in various fields such as talents, dates, health problems, recipes, leisure activities, biographical information, telephone conversations. In order to provide the students with information about different cultures, the facts of various cultures are also included in the course content.

**Course Content**

Basic English 3 lessons, free time activities, basic level telephone conversations and messaging, ordering, telling past events, place-directions, writing daily letters, comparing objects and people, talking about personal experiences, understanding signs and rules, technical vocabulary, future plans covering various topics of daily language such as mention.

**Learning Outcomes**

1. Recognize and analyze grammar structures
2. Students will be able to understand grammatical structures in texts
3. To be able to understand the words in the context in which they are used
4. To be able to write basic paragraphs on various subjects
5. Understand and note the main lines of the text
6. Students will be able to express themselves at basic level in various dialogues.
7. Can use the daily language in the patterns learned

## CHE103 CHEMISTRY

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | C |

**Objective**

To teach students theoretically the chemistry course which is related to many other fields of science and many other fields of human interest.

**Course Content**

Matter and Properties, Atomic structure and properties, Periodic table and properties, Chemical reactions and calculations , Gases, Liquids, Aqueous solutions and mixtures, Solids, Chemical kinetics, Chemical equilibrium, Acids and bases Thermodynamics, Electrochemistry.

**Learning Outcomes**

1. Comprehends matter and its properties.
2. Understands the structure of the atom and the systematic of the periodic table.
3. Understands and applies chemical bonding depending on the electron arrangement of atoms.
4. Comprehends and applies chemical reactions and calculations.
5. Comprehend and apply the distinguishing properties of gases, liquids and solids.
6. Understands and applies the properties of solutions such as boiling and freezing points, vapor pressure.
7. Understands and applies the reaction rate expression.
8. Understands the formation of reactions with the help of chemical equilibrium and kinetics.
9. Understands and applies the terms of chemical reaction heat or energy.
10. Understands the basic knowledge of electrochemistry.

## MATH101 CALCULUS I

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 5 | 0 | 5 | 7 | C |

**Objective**

1. To teach the concepts of limit, continuity, derivative in one variable functions
2. To provide the ability to use derivative and integral concepts in practice.
3. Ability to use mathematical knowledge to solve engineering problems.

**Course Content**

Univariate Functions, Limit and Continuity, Derivative, Applications of Derivative, Curve Plotting, Asymptotes, Integral , Fundamental Theorem of Integral Calculus, Applications of Integral, Polar Coordinates, Transcendent Functions, Integral Techniques, Uncertainty Forms, L Hopital Rule

**Learning Outcomes**

1. To be able to use the concepts of limit and continuity and derivative in one variable functions
2. To be able to draw graphs of functions with asymptote, critical point, decreasing / increasing and concavity
3. To be able to establish and solve maximum and minimum problems
4. Integral account Esab is able to calculate the definite integral using the Fundamental Theorem
5. To be able to solve area, volume and arc length by using integral
6. To be able to apply transcendant functions and to apply integration techniques
7. To be able to calculate limit with the help of L Hopital rule

## MCT111 INTRODUCTION TO MECHATRONICS AND ETHICS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 4 | C |

**Objective**

The aim of this course is to explain the basic concepts of mechatronics engineering, application examples and the importance of interdisciplinary engineering.

**Course Content**

Introduce mechatronic system elements and explain their usage in mechatronic design with examples,

**Learning Outcomes**

1. Explains the basic properties of mechatronic systems.
2. Explains the sensor and actuator systems at a basic level.
3. Explains the working principles of mechatronic system control systems.
4. Explains the basic issues related to engineering ethics

## MCT141 INTRODUCTION TO PROGRAMMING

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 4 | C |

**Objective**

To reach the level of knowledge that will be able to master C programming language and develop practical applications.

**Course Content**

History and development of programming languages, algorithm development, intermediate programming languages, basic structure of C language, variables, operators, comparison and loop statements, functions, arrays.

**Learning Outcomes**

1. Write C programs.
2. Form an algorithm.
3. Establish a loop.
4. Form functions.
5. Do programming in different areas.

## TUR 101 TURKISH LANGUAGE I

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 2 | C |

**Objective**

1. To improve national language awareness,
2. To gain information about the history, structure and characteristics of Turkish language,
3. To be able to use the language correctly and effectively in oral and written forms, to gain the ability to express the thought with the most accurate expression.
4. To gain information about Turkish poetry

**Course Content**

Language Concept, Language-Thought Relationship, Language-Culture Relationship, World Languages (in terms of Origin and Structure), Place of Turkish Language among World Languages, Historical Development of Turkish Language, Structure of Turkish Language, Expressive Power of Turkish Language, Current Turkish Language, Writing Rules, Correct Expression, Language of Science and Turkish as a Language of Science, Turkish Poetry and Poetry Language.

**Learning Outcomes**

Upon successful completion of this course, students will be able to;

1. To be able to evaluate the concept of language in relation to thought, culture and society,
2. Comprehend the place of Turkish language among world languages,
3. To have information about the structure, characteristics and history of Turkish language,
4. Students will be able to express the language verbally and in writing.
5. Has knowledge about poetry and Turkish poetry.

# ➔ 2. SEMESTER ➔

## ATA102 ATATURK'S PRINCIPLES AND REVOLUTION HISTORY II

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 2 | C |

**Objective**

At the end of this course, students will be able to understand the political revolutions in Turkish political life after the National Struggle (abolition of the sultanate, the proclamation of the republic and the abolition of the caliphate), and the revolutions in law, education, economy, social and cultural fields; Explain and interpret the principles of Atatürk.

**Course Content**

Explain the National Struggle in the fields of education, culture, social and economic life, Atatürk's life, the strategy of the Turkish Revolution, the revolutions in the political, social and cultural and legal fields and the process of these revolutions. Domestic and foreign political events in the period of Atatürk Atatürk's efforts for world peace. Ataturk's Principles and countries in which to warn youth against internal and external threats and to provide information about Turkey's geopolitical position.

**Learning Outcomes**

1. To understand and evaluate the process of transition from Empire to National State
2. Mustafa Kemal Atatürk "Exiting Turkey on the level of contemporary civilization" to understand the words.
3. To gain the ability to evaluate current issues in the light of historical information
4. To have knowledge about social policy, political science and international relations
5. Gaining the ability to acquire and analyze information from different sources

## PHY102 PHYSICS II

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 2 | 4 | 6 | C |

**Objective**

Electrical and magnetic subjects, which are the basic subjects of engineering, are taught to the students.

**Course Content**

Electrical Conductivity of Materials, Coulomb's Law, Electric Fields and Gauss's Law, Electrical Potential and Potential Energy, Obtaining Electrical Field from Electrical Potential, Capacitors, Capacitors Loading and Discharging Capacitors, Electric Current, Potential Difference, Resistors, Ohm's Law, Potential Difference, Resistors, Ohm's Law, Kirchoff's Rules, Magnetic Fields, Magnetic Force, Biot-Savart Law, Magnetic Induction, Maxwell Equations, Alternating Current Circuits

**Learning Outcomes**

1. To be able to understand Coulomb Law, electrical field, electrical potential and potential energy issues and to gain the ability to solve related questions
2. To be able to understand the charge and discharge of capacitors , to develop the ability to solve the questions about series and parallel connection of resistors, to apply Kirchoff's rules to mixed circuits
3. To understand the concepts of magnetic fields, magnetic force and magnetic induction.
4. To learn Maxwell's equations and to be able to relate to engineering applications.
5. To learn alternating current circuits
6. Electrical and magnetism based experiments

## ENG104 ENGLISH II

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 2 | C |

**Objective**

The aim of this course is to provide the basic English language skills required in the academic field. The aim of this course is to develop fluent speaking skills by communicating with classmates in pairs and groups and to improve the vocabulary that students can use in daily life. Students taking this course also have the opportunity to examine the differences between the users of the target language and their own culture by using textbooks and materials.

**Course Content**

Students who pass this level can be considered as post-beginner level of English proficiency. At this level, students take courses such as writing, reading, listening and speaking. At this level, students are expected to be able to use the basic structures of language, use a wide range of vocabulary, and speak using communication strategies appropriate to various social settings. Students taking this course gain the ability to write essays or articles in different types. At this level, students can express themselves with richer language structures, using less simple language structures and developing greater flexibility. At this level, students are able to understand long speeches and lessons in English, even if they contain complex language elements, provided that the subject is familiar. Read and understand articles or reports on current issues. They can also participate in active discussion environments to express their thoughts and views, and can also express an actual issue by defending its advantages and disadvantages.

**Learning Outcomes**

1. Recognize and analyze grammar structures
2. Students will be able to understand grammatical structures in texts
3. To be able to understand the words in the context in which they are used
4. To be able to write basic paragraphs on various subjects
5. Understand and note the main lines of the text
6. Students will be able to express themselves at basic level in various dialogues.
7. Can use the daily language in the patterns learned Expressing past habits

## MATH102 CALCULUS II

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 5 | 0 | 5 | 7 | C |

**Objective**

1. To teach the concepts of convergence in generalized integrals, series and series and their applications.
2. To provide the ability to use the concepts of partial derivative and integral in multivariable functions.
3. To gain the ability to use mathematical knowledge to solve engineering problems.

**Course Content**

Generalized integrals, Infinite sequences and series, Vectors in space, Vector-valued functions, Multivariable functions and partial derivatives, Multiple Integrals.

**Learning Outcomes**

1. Convergence of generalized integrals, sequences and series; find the convergence radius of power series.
2. Open a function to Taylor Series and find the margin of error.
3. Calculates the vector and scalar product of vectors in three-dimensional space ; write line, plane and quadric surface equations.
4. Uses the concepts of limit, continuity, and integral for vector-valued functions .
5. Uses the concepts of limit, continuity in multivariable functions; partial derivative calculations; tangent plane, find derivative according to direction
6. Solves the problems of extremum with the second derivative test and Lagrange multiplier method.
7. Solves multiple integrals; use multiple integrals for calculating area and volume.

## MCT100 LINEAR ALGEBRA

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | C |

**Objective**

1. To teach the solution methods of systems of linear equations.
2. To provide the ability to use the concepts of matrix and determinant in practice.
3. To gain the ability of using linear algebra knowledge to solve engineering problems.

**Course Content**

Matrices and Systems of Equations, Systems of Linear Equations, Line Form, Matrix Algebra, Elementary Matrices, Determinants, Determinant of a Matrix, Properties of Determinant, Cramer's Rule, Vector Spaces, Definition of Vector Space, Subspaces , Linear Independence, Base and Size, Change of Bases, Row Space and Column Space. Linear Transformations, Matrix Representations of Linear Transformations, Orthogonality , scalar multiplication, Orthogonal Subspace , Inner product spaces, orthonormal sets, Gram- Schmidt method, Eigenvalues and Eigenvectors , Diagonalization .

**Learning Outcomes**

1. Students will be able to find solutions of systems of linear equations. Arithmetic operations with matrices . can find the inverse of the matrix.
2. Students will be able to calculate determinant. Solve linear systems using Cramer rule.
3. Students learn the concepts of linear dependence, vector spaces, base, dimension and rank .
4. Students can convert a base to orthonormal basis with the Gram- Schmidt method .
5. Students will be able to find eigenvalues and eigenvectors of matrices .

## MCT142 ADVANCED PROGRAMMING

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 2 | 3 | 7 | C |

**Objective**

To reach the level of knowledge that will dominate Matlab programming language and develop practical applications.

**Course Content**

History and development of programming languages, algorithm development, basic structure of Matlab language, variables, operators, comparison and loop statements, functions, arrays.

**Learning Outcomes**

1. Students write programs with Matlab .
2. They form an algorithm.
3. Establish a loop.
4. They form functions.
5. Obtains program results graphically.

## TUR 102 TURKISH LANGUAGE II

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 2 | C |

**Objective**

1. To improve written and oral expression,
2. To develop scientific expression and to gain the ability to produce scientific text,
3. To gain information about literary genres and to gain the ability to examine these genres.

**Course Content**

Written Expression, Method and Plan in Written Expression, Written Expression Application, Scientific Texts (Article-Report-Criticism), Official Texts (Petition, Curriculum Vitae), Literary Genres, Essay, Column, Travel Writing, Biography, Story, Novel, Oral Literature , Oral Expression and Communication

**Learning Outcomes**

Upon successful completion of this course, students will be able to;

1. Students will be able to express their thoughts orally and in writing within a plan,
2. Can create scientific and official texts,
3. To be able to evaluate literary genres,
4. Be able to make prepared / unprepared speech.

# ➔ 3. SEMESTER ➔

## MCT213 TECHNICAL LANGUAGE SKILLS I

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 2 | C |

**Objective**

To prepare students to meet the various demands required of them while completing in the field of their studies and while hunting for a suitable job after graduating.

**Course Content**

This course equip students with necessary language skills for effective social & business communication as well as in meeting future occupational demands.

**Learning Outcomes**

1 Interact competently in English in a variety of social academic and work-place situtaions.
2 Understands text beyond the literal level and respond critically to them
3 Write and make presentations accurately and appropriately for academic and occupational purposes.

## MCT201 DIFFERENTIAL EQUATIONS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 4 | 0 | 4 | 6 | C |

**Objective**

The aim of this course is to teach ordinary differential equations (ODE) and their solution methods. Since differential equations express the relationships between changing differential quantities, the subjects given in the course can be applied to all engineering fields.

**Course Content**

Basic concepts and classification of differential equations, First order equations and engineering applications, Second and higher order differential equations and engineering applications, Variable coefficient equations, Systems of linear equations: Scalar and matrix methods, Laplace transformation, Engineering applications, Introduction to numerical solution of differential equations.

**Learning Outcomes**

1. Have knowledge about differential equations terminology.
2. Determines whether a function is the solution of a differential equation
3. Solve ordinary differential equations and systems of differential equations.
4. Obtains and solves differential equations representing system behavior by applying the laws of physics to engineering problems.

## MCT211 COMPUTER AIDED TECHNICAL DRAWING

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 2 | 3 | 4 | C |

**Objective**

To be able to draw manufacturing pictures and assembly pictures of machine parts, to add tolerance information to pictures, to make machine designs, to read drawn pictures and to use computer effectively in these activities. To gain the ability to use computer-aided drawing programs.

**Course Content**

Basic drawing on techniques used in engineering drawing endorses the principle of topics using Autodesk Fusion 360 will be discussed. Two-dimensional and three-dimensional technical drawing rules and techniques will be taught. Mechanical part drawing and multi-part mechanical assembly drawing techniques will be shown.

**Learning Outcomes**

1. Draws a detailed technical drawing of a machine part.
2. Knows the dimension and dimension in detail picture.
3. Draws the assembly image.
4. Uses the computer effectively in drawings.
5. Reads a technical drawing correctly.

## MCT221 STATICS AND STRENGTH OF MATERIALS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 4 | 0 | 4 | 6 | C |

**Objective**

The aim of this course is to improve the ability of solving any problem in engineering students in a simple and logical manner and applying a few well understood basic principles to the solution of the problem.

**Course Content**

Section Effects / Uniaxial Stress State / Biaxial and Triaxial Stress State / Shear Force / Inertia Moments of Planar Sections / Bending / Torsion / Vector Systems / Basic Principles of Statics / Plane / Friction / Center of Mass / Carrier Systems /

**Learning Outcomes**

1. Ability to use mathematics, science and basic engineering knowledge
2. Ability to design and conduct experiments, analyze and interpret the results and use modern tools and equipment, transfer of corporate data into practice
3. Obtain information about the force and moment balance of a particle and solve related problems.
4. Obtain information about force and moment balance of rigid body and solve related problems.
5. To learn about the basic issues of statics

## MCT223 ENGINEERING MATERIALS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | C |

**Objective**

Engineering materials, crystal and amorphous structures and mechanical properties.

**Course Content**

Classification of materials, atomic structures and bonds, crystal structures, number and coordination of crystalline solids, packaging, crystal defects, solid solutions and composition determination, amorphous materials, engineering materials (iron-steel, non - ferrous , alloys, ceramics, polymers and composites ), mechanical properties of materials properties (tensile and hardness), deformation mechanisms of materials

**Learning Outcomes**

1. Understands the types of engineering materials
2. To comprehend atom and interatomic bond types
3. Draws the crystal structure of materials, comprehends the number of coordination and calculates the crystallographic density of crystal structures
4. Draws planes and directions in crystal structures, calculates plane and direction densities
5. Understands the crystal structure defects and calculates the problems related to defects
6. Understands the difference between amorphous materials and crystal-amorphous structure
7. Understands the mechanical properties of engineering materials and calculates related problems

## MCT225 MEASUREMENT TECHNIQUES

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 3 | C |

**Objective**

1. To give basic concepts of measuring problems.
2. Developing teamwork skills.
3. To learn and apply the working, calibration and usage principles of measuring systems
4. Designing measurement systems and demonstrating their applications.
5. To use various measurement methods.

**Course Content**

Introduction to Measurement Techniques and Definitions / Metrology and Calibration / Turkish Standards Related to Measurement Techniques; Introduction to Other Foreign Standards, Norms and Rules / Analysis of Experimental Findings / Dimension, Angle and Area Measurement / Pressure Measurement / Temperature Measurement / Flow Measurement / Level Measurement / Measurement of Thermophysical Properties / Force, Torque and Shaft Power Measurement / Basic Physical Properties of Sensors and Sensors Electrical Measurements in Mechanical Engineering /

**Learning Outcomes**

1. At the end of this course; Knowledge and skills necessary to use experimental methods and data analysis techniques in engineering applications,
2. Ability to actively participate in team work
3. Taking responsibility and principle
4. Ability to make effective written and oral presentations
5. To have knowledge about new methods and data processing techniques besides classical measurement methods ,
6. An ability to use computer software ( spreadsheet- type data evaluation tools) in data analysis and presentation

## MCT231 CIRCUIT ANALYSIS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 5 | C |

**Objective**

To recognize basic circuit variables and elements, to understand circuit theorems and laws, to be able to analyze basic electrical circuits.

**Course Content**

Basic concepts (load and current, voltage, power and energy, circuit elements), basic laws ( Ohm's Law, knot, branch and environment concepts, Kirchhoff's laws, series resistance and voltage division, parallel resistance and current division, Star-delta transformations) , analysis methods (knot voltages method, node voltage method when dependent and independent voltage sources, circumferential currents method, comparison of methods with dependent and independent current sources, comparison of methods), circuit theorems ( linearity property, superposition , source transformation, Thevenin's theorem, Norton's theorem, Maximum power transfer), İşlemsil amplifiers ( operational amplifier, ideal operational amplifier, an inverting amplifier, inverting amplifier, the collector amplifiers, Differential amplifiers, cascaded operational amplifiers, the operational amplifiers analysis), the capacitor and inductor ( the capacitor in series and parallel capacitor , inductor , series and parallel inductor ), first order circuits (non-welded RC circuits, non-welded RL circuits, singularity functions, unit step response of RC circuit, unit step response of RL circuit, first order operational amplifier circuits).

**Learning Outcomes**

1. Recognizes electrical circuit elements and writes definition relations.
2. Defines the relations between load, current, voltage, power and energy.
3. Apply basic laws in electrical circuits.
4. Analyze electrical circuits using analysis methods and circuit theorems.

## ➔ 4. SEMESTER ←

## MCT200 OCCUPATIONAL HEALTH AND SAFETY

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 3 | C |

**Objective**

To gain necessary information related to occupational accident, fire, first aid, occupational diseases, occupational safety legislation and occupational safety laws.

**Course Content**

Importance of Occupational Health and Safety; to teach the basic concepts related to the problems encountered and the precautions to be taken and security law.

**Learning Outcomes**

Knows the economic dimension of accidents and how to interpret.

## MCT214 TECHNICAL LANGUAGE SKILLS II

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 2 | C |

**Objective**

This is a follow-up of the Technical Language Skills I subject with more emphasis on the academic aspect as well as introducing the occupational components to the students.

**Course Content**

This course equips students with necessary language skills for effective social & business communication as well as in meeting future occupational demands.

**Learning Outcomes**

1 Interact competently in English in a variety of social academic and work-place situtaions.
2 Understands text beyond the literal level and respond critically to them
3 Write and make presentations accurately and appropriately for academic and occupational purposes.

## MCT202 STATISTICS AND PROBABILITY

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 5 | C |

**Objective**

To teach basic statistics and probability.

**Course Content**

Descriptive statistical measures, probability and probability operations, discrete and continuous probability distributions

**Learning Outcomes**

1. Analytical and non-analytical mean methods can be calculated and interpreted.
2. Dispersion measures can be calculated and interpreted.
3. Asymmetry and kurtosis measurements can be calculated and interpreted.
4. Basic probability and probability operations are known.
5. Discrete and continuous probability distributions are known.
6. Basic statistics of numerical data can be calculated and interpreted.

## MCT220 MANUFACTURING TECHNOLOGIES

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 4 | 0 | 4 | 5 | C |

**Objective**

To teach the principles and some application properties of casting, welding, machining and plastic forming methods commonly used in industry.

**Course Content**

Classification of manufacturing processes; , casting, welding, plastic forming and machining

**Learning Outcomes**

1. Classify production methods
2. Machining theory, cutting tools, chip formation, cutting fluids, machinability , tool life, machining operations and machine tools in the right is familiar with.
3. Recognizes the concepts of welding technique and the relationships between them.
4. To be able to compare casting methods from various angles and to define casting errors, causes and precautions.
5. Knows the principles of mass shaping and hair styling and styling methods.

## MCT222 ENGINEERING DYNAMICS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 5 | C |

**Objective**

To develop the basic concepts of kinematic principles applied to particles and rigid bodies in engineering dynamics. Engineering dynamics will be structured into minds through problem solving of engineering application scenarios. Specifically, a particle (particle) kinematics , kinetics of a particle with force and acceleration, kinetics of a particle with work and energy, kinetics of a particle with impulse and momentum, likewise planar kinematics and kinetics of rigid bodies.

**Course Content**

General principles, force vectors, particle balance, force system components, rigid body balance, structural analysis, internal forces, friction, center of gravity and geometric center, moments of inertia, virtual work, particle kinematics, planar kinetics of rigid body, three dimensional kinematics of rigid body .

**Learning Outcomes**

1. Learning Unit Systems , Vector , Moment and Forces
2. Learning Free Body Diagram and Internal Forces in Building Elements.
3. Learning of Friction Effect, Learning Center of Gravity and Geometric Center and Learning Moment of Inertia of an Object.
4. Students will learn the principle of virtual business.
5. To learn particle kinematics.
6. Students will learn planar kinetics of rigid bodies.
7. To learn three-dimensional kinematics and kinetics of rigid bodies.

## MCT230 ELECTROMECHANICAL SYSTEMS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 5 | C |

**Objective**

To give the students basic knowledge about electromechanical systems and energy conversion systems

**Course Content**

Introduction to Rotating Electrical Machines / Direct Current Machine Structure, Types and Operating Modes / Motor and Genarator Operating Modes / Mathematical Model / Structure and Operation of Asynchronous Motors / Single Phase and Multi Phase Asynchronous Motors / Mathematical Model / Synchronous Motors Structure and Operation / Synchronous Generators Structure and Operation.

**Learning Outcomes**

1. To have knowledge about the basic principles of electromechanical energy conversion
2. Magnetization, magnetic permeability, magnetic flux density, magnetic field intensity, magnetic susceptibility
3. To have information about the classification of magnetic materials, Faraday 's Law of Induction and magnetic circuits
4. Synchronous and asynchronous electric motors and transformers to know the working principle and system
5. To have the ability of electromechanical system design

## MCT232 ELECTRONIC CIRCUITS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 2 | 3 | 5 | C |

**Objective**

To introduce the basic electronic circuit elements (Diodes, Transistors , Amplifiers) and to gain the ability to analyze, design and simulate electronic circuits

**Course Content**

Semi general characteristics and energy levels of conductive materials and doped pn junction . Ideal diode and basic structure characteristics. DC or static resistance, AC or dynamic resistance average AC resistance. Diode models of equivalent circuits . Occlusion time, temperature effects, diode information pages. Series parallel diode circuits. Diode logic gates, rectifiers, clipping circuits, clamping circuits. Transistor structure, working principle. Common base, common emitter , common collector circuits. DC circuit analysis of transistor circuits. AC circuit analysis of transistor circuits . Transistor models and hybrid parameters. Operational amplifiers, inverting and non-inverting amplifier circuits.

**Learning Outcomes**

1. To have knowledge about diode structure and working principle
2. To have information about structure and working principle of Zener diode
3. To have knowledge about BJT structure and working principle.
4. To be able to make DC and AC analysis of BJT circuits
5. Computational about Amplifier Circuits of blg to have

# ➔ 5. SEMESTER ➔

## MCT301 MATHEMATICAL METHODS IN ENGINEERING I

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 5 | C |

**Objective**

The aim of this course is to give information about advanced mathematics concepts in addition to basic mathematics knowledge in engineering education.

**Course Content**

Vector differential and integral calculus: Vector algebra , gradient, divergence , rotational , curvilinear integral, Green's theorem in plane , Divergence theorem, Stokes theorem. Linear vector spaces: Linear vector spaces, linear operators, finite dimensional vector spaces, matrix algebra , similarity transformations, eigenvalues and eigenvectors of a matrix. Orthogonal functions: Function spaces, orthogonal polynomials , Legendre polynomials , spherical harmonics , Hermite polynomials , Laguerre polynomials , Bessel functions. Complex Functions: Complex numbers, complex functions, derivatives of complex functions, analytic function concept, Cauchy-Riemann conditions, Complex integral, Cauchy theorem, Cauchy integral formulas, Series expansion of complex functions, Laurent series, Residue theorem and applications, Multiple functions and Riemann surfaces . Differential equations: Series method, power series method, Frobenius method, Legendre differential equation, Bessel differential equation, Hermite differential equation, Systems of linear equations

**Learning Outcomes**

1. Students will learn basic and advanced mathematical knowledge and culture.
2. Students will learn analytical thinking and evaluation.
3. Students will learn the ability to analyze and evaluate engineering problems.
4. Students learn vector algebra in advanced level
5. Students learn complex analysis

## MCT303 NUMERICAL ANALYSIS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 5 | C |

**Objective**

1 Giving language, logic and mathematics of numerical methods used in engineering and science
2 Science, industry and society is very wide in an area consisting of problems to solve numerical methods how to do is to teach .

**Course Content**

Definition of Numerical Methods and explanation of their use especially in engineering applications . Error analysis in numerical methods , analytical solutions , system solutions of linear and nonlinear equations , approximation methods , interpolation , linear regression, numerical integration

**Learning Outcomes**

1. Understand the basics of numerical methods.
2. Will be able to use numerical methods to analyze a problem in engineering.
3. Will be able to choose the right solution method for a specific subject.

## MCT305 ENTREPRENEURSHIP AND ENGINEERING ETHICS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 0 | 2 | 3 | C |

**Objective**

The aim of this course is to teach the students basic concepts, principles and methods related to entrepreneurship and business management, and solutions to problems encountered in this process . In addition, basic concepts of engineering ethics and methods of recognition and identification of ethical conflict resolution methods are taught.

**Course Content**

The concept and emergence of entrepreneurship, Economic and social importance of entrepreneurship, Reasons of success and failure of entrepreneurs, Importance of generating business ideas and preparation of business plans

**Learning Outcomes**

1. To be able to interpret the concept of entrepreneurship and the importance of entrepreneurship
2. To be able to analyze the reasons of success and failure of entrepreneurs
3. To be able to develop the skill of preparing business plan according to business ideas
4. To be able to develop solutions to problems encountered in terms of management and organization function in enterprises
5. To be able to develop solutions to problems encountered in terms of finance function in enterprises
6. To be able to develop solutions to problems encountered in terms of production and marketing functions

## MCT313 INTRODUCTION TO MICROCONTROLLERS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 2 | 3 | 4 | C |

**Objective**

To teach the hardware and software fundamentals of microprocessor systems and based on PIC 16F8XX series microcontroller which is actively used in the market; microprocessor system design and software to provide students with theoretical and practical

**Course Content**

Microprocessors, microcontrollers , DSPs Introduction and microcomputer / microprocessor architectures and components (Harvard, Von Neuman , Memory, ...) / microcontroller basics, various microcontroller families and PIC to the microcontroller input / PIC 16F8XX hardware features and functional studies of family / PIC software development platforms and PIC Introduction to assembly programming / PIC Assembly commands and examples of instruction sets / PIC Assembly basic input output and interrupt programming / Introduction to PIC -C programming and CCS C compiler / Standard C and basic CCS C functions; software development / Input - output, interrupt programming; sample programs / Timer and counter programming, Hold, grab and PWM programming / ADC (Analog Digital Converter) programming, Built-in EEPROM operations / Microcontroller communication structures and PSP module programming / RS232, I2C and SPI communications and programming

**Learning Outcomes**

1. Identify the differences between microprocessors, microcontrollers, DSPs and microcomputers and assimilate the basic concepts
2. Explains the features, structure, operation, memory and I / O structure of a microcontroller.
3. Classify the PIC family of microcontrollers and assimilate the basic features
4. Writing and Compiling Programs with CCS C
5. To simulate the application with Proteus.
6. Implement an application with PIC microcontroller

## MCT321 MECHANICAL SYSTEM DESIGN

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 4 | 0 | 4 | 5 | C |

**Objective**

The aim of this course is to make geometric calculations of mechanical system elements, selection of standard parts, drawing of construction drawings, analysis, design, shaping of mechanical systems, and gaining the necessary knowledge and skills for drawing assembly drawings.

**Course Content**

Basic principles of mechanical system design, forming criteria and errors, shaft bearing systems, belt pulley, gear and chain mechanisms design and drawing

**Learning Outcomes**

1. To be able to recognize and analyze mechanical systems
2. Bolts, nuts, sealing element, bearing and so on . select elements from standard tables and catalogs
3. To be able to draw construction drawings of mechanical system elements and assembly drawings of mechanical systems
4. To be able to design these systems by taking measurements over existing mechanical systems

## MCT323 FLUID MECHANICS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | C |

**Objective**

1. One-dimensional subsonic and supersonic ideal gas flows to gain all the basic information.
2. To gain the basic knowledge of isantropic flow in convergent- divergent and other nozzles .
3. To gain the ability to solve the problems of vertical and reflected shock waves.
4. Long- short , insulated and uninsulated fixed cross-section pipes with friction or heat conduction flow problems to gain the ability to solve.
5. To comprehend the basic knowledge of two-dimensional compressible supersonic flows.

**Course Content**

Fundamentals of fluid mechanics and thermodynamics. Introduction to compressible flows. Isantropic flow. Normal shock waves; moving and reflected shock waves. Frictional flow in fixed section ducts ; Fanno line, suffocation due to rubbing effect. Heat conduction flow in fixed section channels ; Rayleigh line. Drowning due to heat conduction. Isotherm frictional flow in uninsulated channels. Two dimensional supersonic steady flows; oblique shock waves. Prandtl Meyer stream.

**Learning Outcomes**

1. Formulate and solve one-dimensional and permanent compressible flow problems.
2. To be able to solve isantropic steady flows of ideal gases in convergent and divergent nozzles .
3. To be able to calculate the pressure, density and temperature changes during the vertical shock wave and in reflected shock states.
4. To be able to solve adiabatic frictional flow ( Fanno ) problems in fixed long channels .
5. Solving frictional flow problems in non-insulated ducts (isotherm).
6. Solving heat conduction frictionless flow ( Rayleigh ) problems in short ducts with fixed cross-sections .
7. Solve problems of supersonic flow with curved shock waves around wedge-shaped bodies and concave corners.
8. To be able to determine the changes caused by Prandtl-Meyer expansion waves in flow conditions.

## MCT341 SYSTEM DYNAMICS AND MODELLING

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | C |

**Objective**

To teach the basic concepts of System Dynamics and Automatic Control

**Course Content**

Introduction, Laplace Transforms, System Dynamics, Transfer Functions, Mathematical Models, Transient Response, Control Elements, Closed Loop Control, Stability

**Learning Outcomes**

1. Solve differential equations using Laplace transforms
2. Make mathematical models of various physical systems
3. Creates the transfer function and block diagram of a physical system
4. Interpret transient and continuous regime response
5. Knows the working principles of control organs
6. Interpret the stability of the control system using stability criteria,

# ➔ 6. SEMESTER ➔

## MCT302 MATHEMATICAL METHODS IN ENGINEERING II

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 5 | C |

**Objective**

The aim of this course is to give information about advanced mathematics concepts in addition to basic mathematics knowledge in engineering education

**Course Content**

Fourier and Laplace transforms: Fourier series Fourier transform, Parseval theorem, Fourier transform calculation methods, inverse Fourier transform, in differential equations Fourier transform, Laplace transform, Laplace transform calculation methods, inverse Laplace transform, Bromwich integral of differential equations of Laplace transform. Partial differential equations: solutions of hyperbolic, parabolic and elliptic equations, Separation of variables , Laplace equation, Dirichlet problem, Heat diffusion equation, Heat dissipation in a bar, Neumann problem, wave equation, Laplace transform method. Tensors : Cartesian space tensors , tensor algebra , metric tensor , coordinate transformations

**Learning Outcomes**

1. Students will learn basic and advanced mathematical knowledge and culture
2. Students will learn analytical thinking and evaluation
3. Students will learn the ability to analyze and evaluate engineering problems
4. Students learn to solve differential equations with integral transformations
5. Students learn about partial differential equations

## MCT310 PNEUMATICS AND HYDRAULICS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | C |

**Objective**

To know and apply hydraulic and pneumatic systems to be used in mechatronic systems as fluid pressure

**Course Content**

Basic properties of pressurized fluid, preparation of compressed air, compressors, types and basic properties, air drying methods, gas theories, hydraulic power transmission, basic properties of hydraulic pumps and motors

**Learning Outcomes**

1. Explain how a circuit works by drawing a simple pneumatic or hydraulic circuit diagram
2. Design and draw the pneumatic or hydraulic circuit diagram including the basic elements such as compressor, conditioner, discharge valves, directional control valves and pneumatic & hydraulic piston or motor
3. To know the application methods of electropneumatic and electrohydraulic circuits in different mechatronic system designs.

## MCT314 SENSING AND DATA COLLECTION

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 2 | 3 | 4 | C |

**Objective**

To introduce the elements of measurement chain to students To provide knowledge about sampling, resolution and sensitivity. To be able to establish experimental setup, data acquisition, modern signal processing skills.

**Course Content**

Introduction to data acquisition and signal processing. Signal types. Elements of measurement chain. Sampling theory. Resolution and precision . Time domain signal processing: statistical analysis, isolation , convolution and digital filtering. Signal processing in frequency domain: Fourier series, frequency resolution and windowing , mirroring , autospectrum , cross-spectrum, coherence , transfer function (Frequency Response Function).

**Learning Outcomes**

1. Will be able to set up a test set for any measurement process
2. Select the appropriate equipment for digital measurements and set up an experiment set
3. Determine the appropriate sampling time for digital measurements and obtain reliable data at an optimal optimum size
4. Ability to interpret digital data, comment on the original signal

## MCT320 FUNDAMENTALS OF THERMODYNAMICS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 5 | C |

**Objective**

To teach the operation of electrical machines, extraction of equivalent circuits, moment and power calculations.

**Course Content**

Basic concepts of thermodynamics, temperature and pressure measurement methods. O. Law of thermodynamics, pure matter and phase changes, Perfect gas equation, Heat and work relations, First law analysis of closed and open systems. Thermodynamics II. Law and Entropy.

**Learning Outcomes**

1. Finds physical quantities related to heat and motion. Thermodynamics "0" th law uses the temperature and thermal equilibrium relationship.
2. Relate phase change and matter properties.
3. Applies pressure, temperature and specific volume relations for gases.
4. Determine and calculate state magnitudes
5. Determine properties with perfect gas equation
6. Calculates the work done in case of perfect gas changes
7. Determine the heat and work relations for the cycle in closed systems
8. Calculate heat and work relations, mass and energy balances.
9. Apply the I law of thermodynamics to closed systems
10. Apply the first law of thermodynamics to cycle
11. Apply the I law of thermodynamics to open systems and make system analysis
12. Define the law of thermodynamics II, apply it to a cycle, calculate cycle efficiency
13. Applies the law of thermodynamics II to heat pumps and calculates the efficiency coefficients.
14. Define and determine entropy and entropy change
15. Demonstrate the principle of entropy and increase of entropy and apply them to thermodynamic systems.

## MCT330 ELECTRICAL MACHINES

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | C |

**Objective**

To teach the operation of electrical machines, extraction of equivalent circuits, moment and power calculations.

**Course Content**

Magnetic circuits, formation of force and moment in magnetic field systems, dynamic equations in electromechanical energy conversion, basic concepts of rotary machines, general structures and differences of AC and DC machines, formation of magnetic fields in rotary machines, induction of voltage and moment in a conductor shunt - compound structure, armature reaction and commutation , structure of 3-phase asynchronous machines, equivalent circuit, obtaining torque and power expressions, general structure and operation of synchronous machines, general structure and operation of transformers

**Learning Outcomes**

1. To learn the formation of force and moment in magnetic circuits, magnetic field systems
2. To learn dynamic equations in electromechanical energy conversion.
3. To learn the basic concepts of rotary machines
4. To learn the general structures and differences of AC and DC machines
5. To learn the formation of magnetic fields in rotary machines,
6. To learn voltage and torque induction in a conductor
7. To learn the structure of DC machines (series- shunt - compunt )
8. To understand the armature reaction and commutation events
9. Learning the structure, equivalent circuit, moment and power expressions of 3-phase asynchronous machines
10. To learn the general structure and operation of synchronous machines.
11. To learn the general structure and operation of transformers

## MCT342 CONTROL SYSTEMS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | C |

**Objective**

The aim of this course is to introduce students Automatic Control systems, stability and industrial applications of these systems.

**Course Content**

Introduction to Control Systems, Open-Closed Loop, Forward-Feedback control systems, Routh Hurwitz Stability Analysis, Block diagram of control systems, Signal flow diagrams, Transfer functions, Mason gain formula for signal flow diagrams, Mathematical models of control systems, Stability of linear feedback systems , Routh-Hurwitz stability criterion, Nyquist stability criterion, Bode diagram, Stability applications of control systems.

**Learning Outcomes**

1. Knows open-loop and closed-loop control systems.
2. Analyze block diagrams, transfer functions and signal flow diagrams.
3. Form mathematical models of physical systems.
4. Analyze Routh - Hurwitz and Nyquist stability criteria.
5. Students will be able to draw root locus and analyze stability.
6. Analyze time and frequency responses of control systems.

# ➔ 7. SEMESTER ➔

## MCT401 INTERDISCIPLINARY DESIGN PROJECT

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 1 | 4 | 3 | 4 | C |

**Objective**

To transform the student's knowledge into practice and to gain the ability to design interdisciplinary by using the theoretical knowledge acquired.

**Course Content**

The students will make a practical study and present a report on a topic determined by their advisors in groups from different disciplines.

**Learning Outcomes**

1. Gains the ability to bring solutions to existing engineering problems.
2. Gains the ability to select, use and develop modern engineering tools.
3. Gains the ability to work in interdisciplinary fields.

## MCT411 MECHATRONICS SYSTEM DESIGN

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 2 | 2 | 3 | 7 | C |

**Objective**

Mechatronics undergraduate program students to transfer the basic principles and concepts of mechatronic system design and use these principles and concepts in a project work. After explaining the basic principles and concepts to the students for the first four weeks, the project teams will be formed so that the students will realize a mechatronic system design project based on teamwork.

**Course Content**

Basic principles and concepts in mechatronic system design. Selection of projects and division of students into project teams. Project work. Project presentations.

**Learning Outcomes**

1. To gain the practical knowledge and skills necessary for designing a mechatronic system
2. To learn how to integrate actuators, sensors and processors and to create interfaces and design intelligent / programmable systems through programming.
3. Gaining knowledge and skills about project management and project management.

## MCT413 ROBOT TECHNIQUE

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 2 | 4 | 7 | C |

**Objective**

To give information about the basic concepts of robotics and the fundamentals of kinematic and dynamic analysis of robot arm and robot control.

**Course Content**

Introduction, Classification of Robots, Robot Arm Kinematics, Robot Arm Dynamics, Trajectory Planning, Robot Control, Robot Sensors , Programming in Robots.

**Learning Outcomes**

1. Explain the basic information about robotics
2. Interpret robot kinematics and dynamics
3. Compares robot control algorithms

# ➔ 8. SEMESTER ➔

## MCT400 DIPLOMA THESIS / PROJECT

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 1 | 6 | 4 | 9 | C |

**Objective**

1. To provide students with the opportunity to have experience at all levels of design within the framework of an engineering problem.
2. Developing students' creativity and instilling team awareness.
3. To contribute to their professional and ethical development.
4. To give students oral and written presentation experience.

**Learning Outcomes**

1. To have knowledge about design methodology.
2. To have experience in problem definition, accessing and using information, creating alternative concepts, choosing and developing concepts, reaching solutions, presenting the results through the open-ended design project.
3. Gain experience in teamwork by working in groups.
4. To gain practical experience in terms of professional ethics.

**Course Content**

Design is defined as the iterative decision-making process in the creation of a system, a component thereof or a process to meet a specific need . This course includes all the steps from the selection of a suitable project to the completion of Mechatronics Engineering students to gain a comprehensive design experience by using the knowledge gained during their undergraduate education. In this course, the design of a machine, a system or a process is handled within the scope of open-ended projects and the problem is solved with the help of teams formed between the students.

## MCT402 ACADEMIC ENGLISH

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 1 | 2 | 2 | 2 | C |

**Objective**

To provide the students with the ability to analyze the grammatical structure of English technical texts that may be encountered in the field of engineering accurately and to translate the words into our language by giving the correct meanings in their own subject integrity.

**Learning Outcomes**

1. Students will be able to translate technical texts in the field of engineering.
2. To learn the translation method of noun phrases in technical texts.
3. To learn the translation method of adjective clauses in technical texts.
4. To learn the translation method of "of" structured clauses in technical texts.
5. Learning the translation method of envelope clauses in technical texts.

**Course Content**

Sentence structures encountered during the translation of technical English texts, phrases, quantifiers, passive tenses, modes, causative sentence structures, verb derived structures, mediums, narration. Translating sample texts containing technical subjects in the field of engineering into Turkish..

## MCT404 SUMMER TRAINING

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 0 | 0 | 0 | 3 | C |

**Objective**

The Objective is to improve the theoretical knowledge of the students in practice.

**Learning Outcomes**

Apply the acquired theoretical knowledge in an industrial environment under the supervision of an engineer with at least five years of professional experience.

**Course Content**

Students will be able to learn about Control and Automation related topics such as automation technologies, robotics, computer aided manufacturing, flexible production systems, serial production lines, controllers, mechatronic systems, the use of sensors and actuators, and high and low voltage transformations, circuit design, power and control panels, plumbing etc. Electrical - Electronics and Plumbing related issues and production methods such as raw material production, full or semi-finished product production, casting, joining techniques, machining / chip manufacturing techniques and forming, and office management, human resource management, sales / marketing, purchasing It increases professional awareness by contributing to the place of internship in Business / Organization related subjects such as recruitment, contracting, engineering economics, work-flow, procurement and logistics.

## MCT410 COMPUTER AIDED MANUFACTURING

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 3 | C |

**Objective**

To obtain necessary knowledge and skills about software, methods and tools used in computer aided manufacturing.

**Learning Outcomes**

1. Knows computer aided manufacturing equipment.
2. Define the flow of solid modeling manufacturing process.
3. Use computer aided manufacturing software.
4. Recognize the place of computer aided manufacturing in the manufacturing system.

**Course Content**

Computers, CNC Machines, G and M Codes and Computer Aided Manufacturing Methods

# ➔ ELECTIVE DEPARTMENT COURSES ➔

## MCT350 PROGRAMMABLE LOGIC CONTROLLERS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

The aim of this course is to gain knowledge about the hardware of PLC and to gain competencies of programming PLC with ladder diagram.

**Course Content**

PLC's Basic Technology, PLC equipment, PLC programming, Basic Level Commands, Timers & Counters, High Level Commands, High Speed Counter.

**Learning Outcomes**

1. PLC input and output operations.
2. Write programs using basic level commands.
3. Use timer and counter features of PLC .
4. Write programs using high level commands.
5. It can use PLC's high speed counter feature.

## MCT352 COLLABORATIVE ROBOTIC SYSTEMS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

Historically, robots have been designed as heavy industrial machines for repetitive work such as welding, painting and machining. These industrial robots are typically not designed for human interaction and can only be operated by a trained specialist in a controlled factory environment. Recent advances in robotics technology have enabled people to interact more securely and allow robots to become part of our workplaces, hospitals, and homes. This course focuses on the discussion of new generation robots that focus specifically on the development, production and effects of self-driving tools on minimally invasive surgery.

**Course Content**

1. Intro
2. Progress in self-driving vehicles
3. Safe, Cheap and Smart: Common Robots in Production
4. Personalized Medical Robots

**Learning Outcomes**

Participants in this course will gain insight into the potential applications of a new generation of technology called collaborative robotics.

## MCT450 ROBOTIC WELDING TECHNOLOGIES

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

Nowadays, robots, which are rapidly used in many industries, have found application in welding and joining technologies to increase productivity, reduce production costs, increase production as well as improve quality and provide more humane working conditions. In this course, it is aimed to introduce industrial robots, welding and non-welding insoluble joining methods and robotic applications of these methods.

**Learning Outcomes**

1. Students who pass the course will be able to: Know the factors that affect the choice of robotics in industry.
2. Gains knowledge of robot geometry, robot elements and how robots are programmed.
3. Students will have general theoretical knowledge about non-insoluble joining methods (riveting, bonding, soldering).
4. Gains knowledge of robots used in riveting, bonding and soldering applications in industry.
5. Gains theoretical knowledge about welded joints.
6. Gains knowledge of robots used in industrial welded jointing applications (point resistance, under- gas ( MIG-MAG , TIG ), laser, etc.)

**Course Content**

Industrial Robots - Robot Geometry and Elements - Programming of Robot - Non - Soluble Joining Methods (Rivet, Bonding, Soldering) - Welded Joining - Robotic Applications

## MCT451 INDUSTRIAL APPLICATIONS OF MANUFACTURING TECHNOLOGIES

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

To have the necessary information on the manufacturing methods, depending on this information appropriate production method According to the, determination of the appropriate machine tool, selecting appropriate processing parameters and the chosen method of production an understanding of the suitability

**Course Content**

The basic principles of the manufacturing method, the types of non-conventional manufacturing processes, the machine tools and equipment used in such methods, components and geometries are employed in these methods, the determination of the processing parameters in implementing the method of the industrial application of these methods and problems that may arise in this embodiment.

**Learning Outcomes**

1. Students will be able to define and group production methods.
2. Students understand the use of non-traditional production methods and in which situations the necessity of industrial applications.
3. Students gain knowledge about the advantages and disadvantages of any production method and gain the ability to think about the stages in the industrial application of non-traditional production method.
4. Students gain the ability to find and solve problems that may arise in terms of material-processing method in industrial use of production methods and to think about the realization of production .

## MCT452 EMBEDDED SYSTEM DESIGN

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

Embedded system consists of computer and peripherals which are specially designed and programmed for problem solving and are the result of integrated implementation of hardware and software technologies . In this context, it is aimed to give information about embedded system technologies which are widely used in industry, 8051 microcontroller based experiment sets and ARM processor sets and embedded system operating systems programming and design.

**Learning Outcomes**

1. Microprocessor, microprocessor system, reinforces the definitions of microcontroller .
2. Learn the concept of embedded system.
3. Learn about embedded system operating systems.
4. They will learn the concepts of distributed storage and security.

**Course Content**

To teach the basic structure of embedded systems, to provide methods to solve embedded system problems, real-time operating systems, microcontroller circuits, embedded system development techniques, communication protocols, data acquisition, sensor signal processing and control, programming methods for embedded systems, data paths and applications, peripherals and applications.

## MCT453 OBJECT ORIENTED PROGRAMMING

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

To provide students with practical programming and object oriented design methodology using C # programming language .

**Course Content**

Basic concepts of object design principles, C # program structure, Standard library, Functions loading and templates, Data abstraction principles, classes, constructors and destructors, inheritance, protected members, polymorphism .

**Learning Outcomes**

1. Understand the basic principles of object-oriented programming.
2. Create a C # program.
3. In practice, they apply the reuse feature of C # programming language.
4. They create complex software systems based on object-oriented approach.
5. Gain the habit of working as an element of software development team.

## MCT454 INDUSTRIAL APPLICATIONS OF POWER ELECTRONICS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

Gaining basic knowledge about static industrial applications of power electronics and analysis and design skills

**Learning Outcomes**

1. Knowledge of Basic Mathematics, Science and Electrical Engineering
2. Design, Conduct, Analyze and Interpret Results of a Desired Electrical Engineering Experiment
3. Ability to design a desired electrical engineering circuit, system or process

**Course Content**

G Operating Principle, Characteristics and Types of Uninterruptible Power Supplies ( UPS ) / Investigation of Various Uninterruptible Power Supplies / Design of Uninterruptible Power Supplies / Operating Principle, Characteristics and Types of Switched Power Supplies ( SMPS ) / Design of Various Switched Power Supplies / Resonant Design Operating Principles, Characteristics and Types of Power Supplies ( RMPS ) / Examination of Various Series Resonant Power Supplies / Operating Principle, Characteristics and Types of Induction Heating (IH) / Examination of Various Induction Heating Systems / Operating Principle, Characteristics and Types of Electronic Ballasts ( EB ) / Inspection of Various Electronic Ballasts / Inspection of Basic Power Factor Correction ( PFC ) Circuits / Inspection of Basic Active Filter (AF) Circuits

## MCT455/MCT462 FINITE ELEMENT ANALYSIS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

1. Basic principles of finite element method
2. Understanding the difference of different element types and designing element network.
3. Application of displacement and force boundary conditions and the convergence of solution.
4. Understanding and reporting finite element results.
5. To be able to use the finite element method as a tool for the solution of engineering problems.

**Learning Outcomes**

1. Have knowledge about the basic principles and applications of finite element method
2. Gain knowledge and ability to choose appropriate finite element and network, apply load and boundary conditions
3. Gain the ability to formulate and solve engineering problems using finite element method
4. Be able to use the finite element method for design purposes.

**Course Content**

Fundamentals of Finite Element Method (SEM), Direct approach, Arc and bar elements, Beam elements, Finite element formulation of continuous systems , Two-dimensional stress and strain elements, Finite element and interpolation functions, Element formulation in natural coordinates , Numerical integration , Applications

## MCT456 SENSOR TECHNIQUE

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

In this course, it is aimed to gain knowledge and skills of using all kinds of sensors in related circuits.

**Learning Outcomes**

1. Recognizes temperature and humidity sensors, makes the installation.
2. Recognizes and installs speed, vibration and acceleration sensors.
3. Recognizes position sensors, makes the installation.
4. Recognizes approach sensors, makes the installation.
5. Recognizes pressure, flow and level sensors, makes the installation.

**Course Content**

Sensors, temperature sensors, humidity sensors, speed sensors, vibration sensors, acceleration sensors, position sensors, proximity sensors, pressure sensors, flow sensors, level sensors, impact sensors

## MCT457 MACHINE LEARNING

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

The Objective is to teach the theoretical issues related to Machine Learning with application examples in different fields.

**Learning Outcomes**

Introduction, Decision Trees, Sample Based Learning, Bayesian Learning, Logistic Regression, Neural Networks, Support Vector Machines, Model Selection, Feature Selection, Clustering, k-mean, Maximum Expectation, Gauss Mix Model, Community Learning, Competitive Learning, Deep Learning, Reward-Punishment Learning

**Course Content**

1. The student understands the basics of machine learning.
2. The student learns learning algorithms with well-known instructors , non- instructors and semi-instructors .
3. Students will be able to apply machine learning techniques to real world problems.
4. The student prepares a project on machine learning, writes a report and makes a presentation in the classroom.
5. For a given problem parameter, the student will be able to demonstrate the advantages and disadvantages of different machine learning methods.

## MCT458/MCT465 BIOMECHATRONICS SYSTEMS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

To learn the applications of mechatronics in medicine and the system element and control methods used.

**Course Content**

1. Explain the mechatronic systems and their elements used in medicine.
2. Explain the basic biomedical devices.
3. Explain medical robot types and control techniques.
4. Explain biological sensors and working principles .
5. Defines the actuators used in biomechanical systems and explains the working principles with real application examples.
6. Design biomechanical system

**Learning Outcomes**

Biomechatronic design principles, Anatomy, Neurobiological control structures, biomechatronic biological applications of sensors , biomechatronic mechanical applications of sensors , controllers, and biomechatronic actuators in applications, biological signal processing techniques, human -machinery and brain-computer interface design, biomedical devices, artificial organs, medical robots , Rehabilitation robots, Auxiliary robots, Control techniques in medical robots

## MCT459 POWER ELECTRONICS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

The aim of this course is to examine the operation of the elements used in power electronics and to design application circuits using these elements.

**Course Content**

Power Calculation Methods; Semiconductor Power Switches; AC- DC Converters; Free-Pass Diodes; Commutation ; Regulators; Linear DC-DC Converters; Non-Isolated Switched DC-DC Converters; Transformer Modeling; Isolated DC-DC Converters

**Learning Outcomes**

1. Students will be able to learn power calculation methods.
2. Students will be able to learn power electronics circuit elements.
3. Students will be able to analyze power electronics circuits.
4. Students will be able to analyze and design AC- DC power converters.
5. Students will be able to analyze and design DC-DC power converters.

## MCT460 SUPERCONDUCTOR TECHNOLOGIES

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

To give general information about superconducting materials and technologies.

**Learning Outcomes**

1. To have information about the concept and history of superconductivity .
2. To learn the theories and equations of superconductivity
3. To have knowledge about superconducting technologies

**Course Content**

1. Introduction to superconductivity , history and application areas
2. Diamagnetism , Critical temperature, Critical magnetic fields, London penetration depth, Equivalent distance
3. Type I Superconductors ,
4. Type II (High Temperature) Superconductors , Meissner Effect,
5. Permanent currents, Specific heat, Energy range
6. BCS Theory, Cooper Pairs, Energy Range measurements
7. Flux Quantization , Josephson Tunneling
8. London Equations,
9. Ginzburg-Landau Theory.
10. Interlayer Theory
11. Superconducting technologies ( SQUIDs and detectors, Microwave applications, Electrical power applications, superconducting cables and tapes, Medical applications, etc. )

## MCT461/MCT464 DIGITAL IMAGE PROCESSING

| Theoric | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | S |

**The Objective**

The Objective is to teach basic image processing methods and algorithms.

**Learning Outcomes of the Course**

1. The student learns the basic concepts of image processing.
2. The student learns the basic concepts of image processing such as hardware, software, digitization, optimization, coding, segmentation , feature understanding.
3. Students learn how to apply their knowledge to real examples that require image processing.
4. Students will be able to analyze and program image processing algorithms.
5. The student prepares a project about image processing, writes a report and makes a presentation in the classroom.

**Content of the Course**

Digital Image Basics, Image Enhancement Techniques, Filters in Spatial Domains , Color Image Processing, Image Segmentation , Morphological Image Processing, Texture Analysis, Image Representation and Identification, Image Compression, Motion Analysis, Pattern Recognition, Deep Learning for Image Processing Applications

## MCT463 ROBOTIC GRIPPER SYSTEMS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

General characteristics of robotic grippers, types of engineering applications related to different application methods to gain students.

**Course Content**

Definition and history of robotic grippers. Classification of retainers. Holders according to their structure. Holder designs and working principles. Restraint load and force analysis. Holder design and application.

**Learning Outcomes**

1. Definition and history of robotic grippers.
2. Classification of retainers.
3. Holder Structures.
4. Holder designs and working principles.
5. Purpose-designed Gripper design and application.

## MME357 NANOMATERIALS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

It is aimed to introduce nano - technology and current nano -scale production technologies to undergraduate students undergoing basic engineering education .

**Course Content**

An introduction to the concept of nano- technology and the fundamentals of top-down and bottom-up production will be explained.

**Learning Outcomes**

1. To learn nano technology at undergraduate level and to learn the basic differences between traditional materials and nano- structured materials
2. Top-Down, Bottom-up production to learn the differences
3. Learning to characterize nano materials
4. To learn structural, electrical and mechanical properties of thin films.

## IND475 ECONOMICS OF TECHNOLOGY

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

The aim of this course is to teach innovation and technology economics at undergraduate level.

**Course Content**

I. & II. Industrial Revolution and ICT Revolution / Market Structure: Imperfect Competition / Solow Model / Romer Model / Lucas Model / Stimulated Technological Development / Technological Diffusion / Suitable Technologies / Direction of Technological Change / National Science and Technology Policies / Sustainable Growth and Technological Change

**Learning Outcomes**

1. Students will be able to analyze the nature and resources of innovations .
2. Students will be able to analyze the impact of innovations on growth and development.
3. Students will gain the ability to analyze innovative growth processes.

## CVL453 GEOGRAPHICAL INFORMATION SYSTEMS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

The aim of this course is to give basic information about GIS concepts, location data and verbal data usage, questioning and interpretation.

**Course Content**

Basic definitions of GIS , application areas (engineering, architecture), basic components of GIS , database management, verbal and graphical data structures, data collection methods, GIS application stages, system analysis, geographic information system design, inquiry and analysis, web based geographic information systems.

**Learning Outcomes**

1. The student expresses the basic concepts of geographic information systems
2. The student uses various techniques and tools related to geographic information systems.
3. The student develops an application for spatial problems through geographic information systems.

## EEE463 ELECTRIC POWER GENERATION

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

To learn the basic concepts of electrical energy production and different production technologies; Turkey and to have an idea about the amount of electrical energy production and economy in the world

**Course Content**

The principle of obtaining electrical energy and introducing the methods used, power plants and types. selection methods of suitable power plant, alternative energy sources, cogeneration , parallel operation, active and reactive load adjustment, power plant economy, recognition of electrical energy transmission and distribution networks and types, characteristics and applications of overhead and cable line conductors. Be energized analysis on 1/1000 scale map of the earth, the removal of determining the path of the medium-voltage power transmission line, and transmission line sections, the location of the medium voltage direct plotting of the detection and power line transformers Drawings. medium voltage, voltage drop and casualty calculations, discovery of the transactions and writing the opinion report

**Learning Outcomes**

1. To be able to recognize the basic concepts of electrical networks and facilities, to understand the types and properties of the network
2. To be able to explain the precautions taken against the danger of life and fire caused by electrical energy
3. To be able to recognize the materials used in electrical networks and facilities
4. To be able to comprehend basic hand skills

## MEC461 SOLAR ENERGY

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

To comprehend the importance of solar energy, which is one of the renewable energy sources, to recognize and understand the operation of solar power generation and water heating systems. To be able to use the calculation methods used in the selection and sizing of solar power generation and water heating systems. To learn the methods of calculating the solar radiation and to be able to dimension the systems.

**Course Content**

Solar energy, application areas, photovoltaic batteries, water and building heating, electricity generation and other uses.

**Learning Outcomes**

1. To understand the importance and place of solar energy in renewable energy sources, to learn solar angles.
2. Learns the arrival and calculation of solar radiation
3. Learns solar collectors
4. Learns solar water heating systems
5. Learns solar cells and electricity generation systems
6. Learns system calculations

## CMP363 MOBILE SOFTWARE DEVELOPMENT

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

The aim of this course is to introduce the platforms and operating systems used in mobile systems, the existing services and to give the necessary trainings to develop applications on these structures.

**Course Content**

Mobile devices, mobile platforms, operating systems used from mobile systems, application development programs, user interface development for mobile systems, data storage methods for mobile systems, services used in mobile systems.

**Learning Outcomes**

1. Knows the basic concepts of mobile devices, mobile platforms and mobile operating systems.
2. Knows the basic features of Java programming language, can develop applications.
3. Knows program development tools and features for mobile systems.
4. Knows program development tools and features for mobile systems.

## MME350 COMPOSITE MATERIALS

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Dersin Amacı**

1- To give the students the basic and importance of composite materials
2- To teach students how to use
3- To teach the necessary production techniques of composite materials.

**Dersin İçeriği**

1- Description, importance, usage places, benefits of composite materials
2- Fiber Reinforced Composite Materials
3- Particle reinforced composites
4- Layered Composites
5- Bonding Theories
6- Micromechanical Properties of Composites
7- Production Methods of Composite Materials

**Dersin Öğrenme Çıktıları**

At the end of this course, students

1- Gains the ability to learn composite materials and other related subjects.
2- Learns where composite materials are used.
3- Learns the production and use of composite materials in industry.

## IND494 SUSTAINABILITY IN ENGINEERING

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

The objectives of this course are; to teach the concept of system and its analysis in relation to environmental management and to introduce the concept of sustainability and subspecialties of sustainability.

**Course Content**

1. Introduction to Sustainability,
2. Sustainability Indicators,
3. Sustainability in Industry,
4. Ecodesign,
5. Urban Sustainability,
6. Natural Resource Management,
7. Ecosystem Management

**Learning Outcomes**

1. Have knowledge to examine environmental problems from a system perspective.
2. Develop the ability of problem solving and solving by perceiving the general framework of the analysis of environmental systems.

## CVL484 PROJECT PLANNING AND MANAGEMENT

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

Project management and key management issues affecting project success; project management functions; to give information about time management, cost analysis and linear programming and optimization related to project management.

**Course Content**

Introduction to project management; General information about project management knowledge areas; Project integration management; Project scope management, Project time management, Project cost management, Project quality management; Project human resource management; Project communication management; Project risk management; Project supply management; Project planning based on cost and time; planning methods; Gantt and bar diagrams; Networks; (CPM and PERT), Arrow and priority systems; Resource assignment; Time and cost optimization; Probabilistic and deterministic networks; Computer applications (PRIMAVERA, MSP)

**Learning Outcomes**

1. Students will develop their skills in expressing themselves by learning assessment methods such as report preparation, teamwork, oral presentation.
2. Students learn the project management knowledge areas and use the solutions and methods taught in these knowledge areas despite possible problems.
3. Students learn planning methods that can be used in project time management.
4. Students will learn how to plan, monitor and control the time of projects.
5. Students learn the software used to realize the time management of projects with their applications.

## EEE460 RENEWABLE ENERGY PRODUCTION TECHNOLOGIES

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

To have an idea about biomass, solar, wind, hydrogen, fuel cells and all other renewable energy technologies, to examine the advantages of renewable energy technologies against fossil fuels and their negative effects, to have knowledge about legal legislation and environmental law related to renewable energy technologies.

**Course Content**

Environmental pollution from fossil fuels, biomass energy, solar, wind and hydrogen energy, fuel cells, other renewable energy systems such as hydraulics and geothermal, their production and applications, legal regulations and environmental law on renewable energies.

**Learning Outcomes**

1. Students will be able to recognize all renewable energy systems that can be an alternative to fossil fuels.
2. Students will learn the historical development of renewable energy technologies.
3. Students will learn production methods of renewable energy systems.
4. Students will have knowledge about the applications and legal regulations of renewable energy systems.
5. Students will be able to make economic comparisons of renewable energy systems.

## MEC492 SURFACE TREATMENT

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

To teach the surface structure of metallic materials and to evaluate the changes on the surface of the parts. To teach new surface treatments. Evaluating the contribution and differences of new and conventional surface treatments to metallic surfaces, to ensure that metal parts can be used for a longer period of time. Producing new and superior surface material.

**Course Content**

Definition of surface, properties of metal surface. Methods of preparing metal surface before surface treatment. Surface modification methods. Processes without changing the chemical composition of the surface; Mechanical processes, thermal surface hardening processes. Processes by changing the chemical composition of the surface; Conversion coatings, thermoreactive diffusion processes, surface alloying, ion grafting. Anodic oxidation. Laser surface treatment. Surface coating methods; Metal coating with hot dipping, galvanizing. Coatings made by spraying method; Hot metal spraying method; Plasma spraying, HVOF, D-gun. Coatings made by cold gas spraying. Coatings with and without current in solution; Electrolytic copper plating, electroless nickel plating, sol-gel method. Coatings made from vapor phase; Chemical vapor deposition method and coating properties. Physical vapor deposition method and coating properties. Expected properties of coating materials and methods of measuring these properties. Problems caused by defective surface treatment.

**Learning Outcomes**

1. Learns the processes that can be done to make the surface of metallic materials resistant to environment and conditions by using science and engineering knowledge.
2. Recognize newly developed surface treatments and gain research skills.
3. Learns to change the surface properties in accordance with the purpose for different applications.

## CMP364 DATA MINING

| Theoretical | Application | Credit | ECTS | Status |
|---|---|---|---|---|
| 3 | 0 | 3 | 4 | E |

**Objective**

Data mining is the job of accessing and mining information from large-scale data. In other words, it is searched by using computer programs for the predictions about the future from big data stacks. Other uses that are equivalent to the term data mining have been introduced into the literature. Knowledge mining from databases, knowledge extraction, data and pattern analysis, and data archeology. The most common use among them is Knowledge Discovery From Databases (KDD). Alternatively, data mining is actually considered part of the information discovery process.

**Course Content**

Data Mining Concepts, Data Preparation Techniques, Statistical Learning Theory (Naive Bayes), Clustering Methods (K-Means, Hierarchical), Decision Trees and Decision Rules, Association Rules

**Learning Outcomes**

1. 1. Students will gain the knowledge and skills to learn and apply the basic concepts of Data Mining.
2. 2. Students will learn the methods of data preprocessing.
3. 3. Students will learn data reduction methods.
4. 4. Students will learn the classification and clustering methods with and without trainers.
5. 5. Students will learn about the rules of association.