COURSE CONTENTS

F.Ü. ENGINEERING FACULTY

METALLURGY AND MATERIAL ENGINEERING DEPARTMENT

COURSE CONTENTS

1st semester

	T	U	K	AKTS
MAT-161 MATHEMATICS-I	**4**	**0**	**4**	**6**

Proof methods, Binomial formula, Real numbers, Trigonometry and Complex numbers, Matrices, Determinants and Linear equation systems, Linear equation systems and solution methods, Vectors and the characteristic vector of the matrix, Functions and types, Special functions, Elementary Elementary and Algebraic functions, Sequence of numbers and limit of a sequence, limit of a function and one-sided limits, derivative geometric meaning and properties, derivatives of basic elementary functions, derivatives of inverse, implicit and parametric functions, higher order derivative and differential, Leibniz rule, Applications of derivative; Tangent and normal equations, Taylor's formula and its application to approximate calculations, Interpolation, Calculation of indefinite shapes and L'Hospital rule, extremum and asymptotes of functions.

	T	U	K	AKTS
FİZ-111 PHYSICS-I	**4**	**0**	**4**	**5**

Vectors, Motion in One Dimension, Motion in Two-Dimension, Laws of Motion, Circular Motion, Other Applications of Newton's Laws, Potential Energy and Conservation of Energy, Linear Momentum, Rotation of a Rigid Body About a Fixed Axis, Rotational Motion, Angular Momentum and Torque, Static Equilibrium and Flexibility.

	T	U	K	AKTS
FİZ-105 PHYSICS LABORATORY	**0**	**2**	**1**	**2**

Login; Basic Laboratory Principles, Principles of Units, Physical Measurements and Errors, Introduction to Laboratory Equipment, Free Fall Experiment Simple Pendulum Friction Coefficient Centripetal Force Uniform Linear and Accelerated Motion Newton's II. Law of Motion Conservation of Energy Elastic Collision Inelastic Collision.

	T	U	K	AKTS
KİM-105 CHEMISTRY-I	**4**	**0**	**4**	**5**

Aims of chemistry, properties of matter, classification, SI (metric) units, size analysis, density and% composition; Atomic structure and theory, chemical elements, atomic weight, Avagadro's number and mole concept; Periodic table, compounds and formulas, chemical compounds and compounds, oxidation-reduction, inorganic compounds, stoichiometry; Chemical reactions in solution, concentrations, acid-base reactions, buffer solutions, titration; Chemical bonds, general properties of solids, types of solids, crystal shapes of solids; Properties of gases, gas laws, ideal gases, kinetic theory of gases, real gases; Some terms in thermochemistry, specific heat, reaction temperatures and their determination, laws of thermodynamics, reversible and irreversible work, Carnot machine; Electrical conductivity, standard electrode voltages, galvanic batteries, oxidation potentials, equilibrium equations in semi-cell reactions, commercial batteries, electrolysis; Corrosion, cathodic protection, damages of corrosion, benefits of corrosion and prevention of corrosion; The semiconductor properties of some elements are superconductors.

	T	U	K	AKTS
KİM-109 CHEMICAL LABORATORY-I	**0**	**2**	**1**	**2**

This course aims to give the student a practical experience on the basic laboratory techniques used in chemistry. For this reason, first of all, the students will be informed about the rules of working safely in the laboratory and the procedures that students should take against possible accidents. The materials available in the laboratory and where they are used will be explained. Measuring and weighing operations, solution types and methods of preparing these solutions, crystallization and distillation techniques from the purification of mixtures, determination of melting and freezing points of pure substances, examination of KMnO4 din reduction reaction in acidic medium by titration, determination of heat capacity of a metal by simple calorimetric method Determination of the formation eltalpy of magnesium oxide, determination of molecular weight of a pure substance by freezing point depression method. Experiments for determination of hydrate water in a substance containing crystal water and determination of acetic acid in vinegar titrimetrically will be performed by students.

	T	U	K	AKTS
MEM-113 INTRODUCTION TO METALLURGY AND MATERIAL ENGINEERING	**1**	**0**	**1**	**2**

Definition of metallurgy, its relationship with other engineering branches, Pre-production preparations, production techniques and applications, Pre-production preparations, production techniques and

applications, Metallurgy industry and its future in our country, Definition of materials science and material engineering, its relationship with other engineering branches, Material types and usage places, Shaping of materials, Advances in material science in today's world. Intellectual rights in general; the necessity of protecting intellectual rights; intellectual property and free competition relationship; types of intellectual property: intellectual and artistic works, patents and utility models.

	T	U	K	AKTS
YDİ-107 ENGLISH	**2**	**0**	**2**	**2**

The Simple Present Tense: The Verb TO BE, A and an, singular and plural nouns, The Simple Present Tense, Can and Can't, And, but and or, Possesive nouns, Count and Noncount Nouns, Adjectives, Any and Some There is and There are, Count and Non-count Nouns, Possessive Adjectives, Infinitives with like, want, I'd like, and need, Let's, The Present Progressive Tense, Qestions and sentences with THINK, The Simple Present Tense vs. The Present Progressive Tense, Imperatives.

	T	U	K	AKTS
MEM-101 TECHNICAL DRAWING	**1**	**2**	**2**	**6**

Principles of vertical projection, extraction of main views from three-dimensional objects, two-dimensional geometric drawings, principles and techniques of scale and dimensioning, tolerances, principles of sectioning, section views, extraction of perspective pictures from main views and fundamentals of perspective view, three-dimensional geometric drawings, removable and non-removable connectors.

	T	U	K	AKTS
YDİ-109 ADVANCED ENGLISH	**2**	**0**	**2**	**2**

1)Hello, My Name is Scott 2)Python Boy 3)Car-aoke 4)Mud Day 5)His Mustache Pays 6)Man Wants People to Laugh Review:Units 1-6 7)Tall Hair 8)Man Flies Like a Bird 9)32 Days With Scorpions 10)Reaching to the Sky 11)His Car Is His Kitchen 12)Kind Woman Is a Winner Review:Units 7-12 13)Students Study With Animals 14)A Wild Ride 15)53 and a Half Hot Dogs 16)Man Leaves Wife in the Atlantic 17)Leopard Man 18)Making an International Star Review:Units 13-18

2nd semester

	T	U	K	AKTS
MAT-162 MATHEMATICS-II	**4**	**0**	**4**	**6**

Indefinite integration methods, variable substitution method and its applications, Integration methods, partial integration method and its applications, Indefinite integrals and applications of irrational functions, Derivation of reduction formulas, Integrals of trigonometric and hyperbolic functions, Definite integral properties and calculation of the area of a plane shape, Rotational surface volume and arc length calculation, Generalized integrals, Limit in vector valued functions, derivative and integral, Space curves and their lengths, Multivariable functions; domain, limit, continuity and derivative, Partial derivative, Jakobien. Derivative of closed and resultant functions, Directional derivation, Gradient, divergence and rotation, Mean value theorem, Taylor's formula and Maclaurin.

	T	U	K	AKTS
FİZ-112 PHYSICS-II	**3**	**0**	**3**	**6**

Coulomb's Law, Electric Fields, Gauss's Law, Electric Potential, Capacitance and Dielectric, Current and Resistance, Direct Current Circuits, Magnetic Fields, Faraday's Law, Self-induction Electric fields, Gauss's law, Electric potential, Capacitance and Dilectrics, Current and Resistance, Direct current Circuits Properties of Electric Charges, insulators and conductors Colum's law, electric field, Electric field of continuous charge distribution Gauss's law, Electric flux, Application of Gauss's law to insulators Electrostatic equilibrium conductors, Experimental proof of Gauss and Ohm's law Potential difference and Electricity Potential, Pot in a uniform electric field. The difference is the electric field of point charge and the pot. difference., The pot formed by the continuous load distribution. difference. Obtaining an electric potential from an electric field, the potential of a charged conductor Definition of capacitance, Calculation of capacitance, Calculation of capacitor, Battery, Electric Current, Resistance and Ohm's Law, Superconductors Electrical Energy and Power, A Model for Electrical Conductivity Electromotive Force, Resistances in Series and Parallel Kirchhoff's Rules RC Circuits, Electrical Devices, Wheatsone Bridge, Potentiometer.

	T	U	K	AKTS
FİZ-106 PHYSICS LABORATORY-II	**0**	**2**	**1**	**3**

Login; Basic Laboratory Principles Introduction of Laboratory Equipment Reading Resistance Values Series Connected Resistance

Circuits Parallel Connected Resistance Circuits Ohm's law Kirchhoff's law and Wheatstone bridge Biot-Savart law Magnetic force Faraday induction law.

	T	U	K	AKTS
KİM-142 PHYSICO-CHEMISTRY	**3**	**0**	**3**	**3**

Electrochemistry, Thermodynamics of Electrochemistry and Solution of Problems, Writing of Battery Schemes in Electrochemistry, Electrolysis, Coating, Working Principle of Accumulators, Chemical Equilibrium, Investigation of Factors Affecting Chemical Equilibrium, Solution of Problems Related to Chemical Equilibrium, Chemical Kinetics (Reaction Rate) Methods), Chemical Kinetics Applications, Thermodynamics, Phases, Investigation of Colligative Properties.

	T	U	K	AKTS
MEM-132 ENGINEERING MECHANICS	**3**	**0**	**3**	**4**

Fundamentals of Mechanics, Vector Mathematics, Vector Magnitudes, Equivalent Force Systems, Equilibrium Equations, Introduction to Structural Mechanics (Truss, Beam, Chain and Cable Systems), Friction, Surface and Volume Properties (Weight m., Inertia Mom.vs.) (4, 5), Virtuel Work and Potential Energy, Particle Kinematics-Basic Relative Motion, Particle Dynamics, Energy and Momentum Methods for Particles, Kinematics of Rigid Bodies, Plane Motion of Rigid Bodies-Relative Motion, Energy and Impulse Momentum Methods for Rigid Bodies, Vibration.

	T	U	K	AKTS
MEM-102 COMPUTER AIDED TECHNICAL DRAWING	**1**	**2**	**2**	**6**

Introduction to computer aided technical drawing, Introducing a CAD package program and using this program, Introducing coordinate systems, Two-dimensional geometric drawings, Scale and dimensioning techniques, Tolerances, Sectional views, Perspective pictures and perspective extraction from views, Three dimensional geometric drawings.

	T	U	K	AKTS
YDİ-108 ENGLISH	**2**	**0**	**2**	**2**

The Simple Past Tense, Object Pronouns, The Simple Past Tense, Irregular Verbs, Verb Complementation, The Future Tense with

GOING TO, Adjective Review, Verb Review, Mid book Test, Talking About Routines and Frequency

	T	U	K	AKTS
YDİ-110 ADVANCED ENGLISH	**2**	**0**	**2**	**2**

1)Trouble at the Airport 2)Smart Guard 3)School Clothes 4)It's Hard to Stop 5)Stuck in the Mud 6)Cops on Wheels Review:1-6 7)Try a Little Kindness 8)Girls Save Falling Child 9)The Wedding Dress 10)A Worm a Day 11)Miracle Woman 12)Boy Genius Review:7-12 13)Fighting Crime with Books 14)Back in the Water Again 15)Cows Prefer Beethoven 16)A Cool Hotel 17)Small Woman Is Big Hero 18)The Smartest Home Review:13-18

3rd semester

	T	U	K	AKTS
MAT-271 DIFFERENTIAL EQUATIONS	**4**	**0**	**4**	**5**

Vector-Valued Functions, Multivariable Functions, Multiple Integrals Properties of vector-valued functions Limit and integral of vector-valued functions Norm of Vector-Valued Functions Space curves and their lengths Multivariable Functions, Limits and Continuity of Bivariate Functions Partial Derivatives, Chain Rule, Exact Differential, Derivative of Implicit Functions Derivative in any direction, Maximum and Minimum Problems Region transformations, Geometric Meaning of Partial Derivatives, Derivative under integral sign. Multiple integrals, Region transforms Applications of multiple integrals. Curvilinear integrals and vector fields, Fundamental theorems of curvilinear integrals. Green's Theorem.

	T	U	K	AKTS
MEM-203 METALLURGICAL THERMODYNAMICS-I	**3**	**0**	**3**	**5**

Basic Laws of Thermodynamics, Relationship of Thermodynamics with other sciences, Energy and equilibrium, Thermodynamic changes and equilibrium states, Heat of reaction, Hess's law, Heat balance, Calculation of flame temperature, Free energy equilibrium conditions, Free energy with four basic functions, Standard free energy, Fugacity, Activity.

	T	U	K	AKTS
MEM-209 MATERIAL SCIENCE-I	**3**	**0**	**3**	**5**

Atomic structure, Atomic bond and its properties, Amorphous and crystal structures, Short-distance arrangement, Long-distance arrangement, Unit cells, Points, directions and planes in unit cells (3,4), Allotropic transformations, Complex crystal structures, Lattice errors, Dislocations, Schmid's Law, Effect of Crystal Structure, Dislocation, Surface Defects, Atomic Motion in Materials, First and Second Fick Laws and Applications, Diffusion Types, Sintering and Powder Metallurgy, Diffusion in Ionic Compounds and Polymers, Hardening and Strengthening of Materials, Introduction to Mechanical Properties of Materials, Stress- Elongation diagram, Elastic and Plastic behavior.

	T	U	K	AKTS
MMÜ – 233 MECHANICS OF MATERIALS	**3**	**0**	**3**	**3**

Introduction to Strength, Principles of Strength, External and Internal Forces, Stress states, Uniaxial stress, Biaxial and triaxial stress states, special cases, Strain-stress and strain relations, Mechanical properties of solid bodies, Test methods, Basis of rod strength and NTM diagrams, Axial normal force state, Hyperstatic problems-effect of specific gravity, Shear force state, Wedge and rivet calculations, Torsion moment state, ring-section shafts, Torsion problems, Ring-section shafts, Compressed coil springs, Thin-walled open and closed Torsion of section bars-Torsion of profile section bars, Bending moment state, Simple and shear bending states, Examination of simple bending state, Applications of bending state, Examination of oblique bending state, Examination of shear bending state, various applications and problems related to shear bending.

	T	U	K	AKTS
BMÜ-213 ALGORITHM AND PROGRAMMING	**2**	**2**	**3**	**4**

C Programming language, Introduction to Algorithm and programming, Variables and constants, Arithmetic and logical operators, Input / output statements, Control statements, Loops, Arrays, Subprograms.

	T	U	K	AKTS
MEM-205 MEM MACHINE ELECTRIC	**2**	**0**	**2**	**2**

General machine knowledge; shafts, gear wheels, fasteners, reducers, gearboxes, internal combustion engines. Machining machines; milling, turning, shackle, grinding etc. General knowledge of electricity; Current (alternating and direct current), Ohm's law, power, energy concepts. Electric machines; HUNGRY. and DC. motors and their

characteristics, transformers, contactors, relays etc. Introduction of electronic circuit elements (resistor, capacitor, diode, transistor, triac, DIAC, thyristor, etc.).

	T	U	K	AKTS
AİT-201 ATATÜRK'S PRINCIPLES AND HISTORY OF REVOLUTION-I	**2**	**0**	**0**	**2**

The aim of Ataturk's Principles and History of Revolution and the concept of Revolution, Reform Movements in the Ottoman Empire, Reasons of its collapse, Intellectual movements in the early twentieth century and the disintegration of the Ottoman Empire, Balkan Wars, First World War, Mondros Armistice Agreement, Occupations and Reactions Exit to. First Step for the National Struggle, Organization through Congresses, Erzurum Congress, Other Local Congresses, Sivas Congress, National Forces Congress, Opening of the National Assembly, Pact-ı Milli, Opening of the Grand National Assembly, Management of the War of Independence, Domestic Revolts and Countermeasures, National Fronts, Political Events of 1920, San-Remo Conference, Treaty of Sèvres, Gümrü Peace Treaty, Sending a Turkish Delegation to Moscow, Stopping the Greek Attack and First İnönü Victory, Political Events.

	T	U	K	AKTS
TRD-209 TURKISH LANGUAGE-I	**2**	**0**	**2**	**2**

What is language ?, The place and importance of language as a social institution in the life of the nation and its relationship between language and culture, the place of the Turkish language among world languages, the development and historical periods of the Turkish language, the current state of the Turkish language, the areas of spreading, the sounds in Turkish, its classification, syllables. knowledge, sound events, sounds in Turkish, classification, syllable knowledge, sound events, vocabulary knowledge, noun and verb conjugation in Turkish, suffixes, spelling rules, punctuation marks and its application.

	T	U	K	AKTS
MEM-231 INTELLECTUAL AND INDUSTRIAL PROPERTY	**2**	**0**	**2**	**2**

The history of intellectual and industrial property rights, and its historical development in Turkey, types of intellectual property rights, qualifications, basic principles, main elements, international organizations and agreements, Geographical Indications, Trademarks, Brand kinds of signs that can be registered as a trademark, trademark registrations, Rights and limits provided by registration, Termination of trademark right, Patents, Types of patents, Patentability conditions,

right ownership, patent registration procedures, Patent-related legal transactions, Utility model certificate issuance conditions, Utility model registration procedures, Loss of utility model right, design types, design registration procedures, scope of the right provided by registration, protection of designs with other legislative obligations, Know-Hows, Trade secrets.

4th semester

	T	U	K	AKTS
İST-234 PROBABILITY AND STATISTICS	**3**	**0**	**3**	**4**

Counting Techniques, Probability Concept, Probability Function, Probability Density Function, Bernoulli, Binom, Poisson Distributions, Exponential, Gamma, Normal Density Functions, Multidimensional Random Variables, Estimator Concept and Properties, Maximum Likelihood Estimator, Hypothesis Test, Chi-Square Test, t Test, F Test, Correlation Theory.

	T	U	K	AKTS
MEM - 204 METALLURGICAL THERMODYNAMICS-II	**3**	**0**	**3**	**4**

Oxidation, Reduction, Solutions, Thermodirnamic property measurement technique, Chemical bonding in alloys, Chemical potential equilibrium conditions, Solvus curve equation, Application of free energy and phase base in metallurgy, Static examination of thermodynamics, Thermal capacity of solids and Surface thermodynamics.

	T	U	K	AKTS
MEM - 210 MATERIAL SCIENCE-II	**3**	**0**	**3**	**5**

Electrical conductivity, Band theory, Control of band structures and conductivity of metals, Superconductivity, Energy gaps, insulators and semiconductors, Intrinsic, Extrinsic semiconductors and their production, Ionic materials, Dielectric and magnetic properties, Pole pairs, Capacitors, Dielectric properties Piezoelectricity and polarization, Ferroelectricity, Magnetic pole pairs and moments, Permeability and Magnetic field, Interactions between magnetic pole pairs and their, Optical properties, Continuous propagation and radiation properties, Diffusion image, Photon-material interaction, Thermal properties, Thermal properties, Elastic behavior, Anelastic and Thermal elastic behavior, High strength materials, super alloys, Shape memory materials.

	T	U	K	AKTS
MEM-214 PHASE DIAGRAMS	**3**	**0**	**3**	**5**

E System, Definition of mixture and phase equilibrium, Thermodynamic principles Clasius clapeyron equation Phase rule Two-component systems, Alloys, solid solutions, constant temperature binary, Intermetallic compounds, stability, instability, spinoidal dissolution, Fe-C equilibrium diagram, Ternary equilibrium diagram.

	T	U	K	AKTS
MEM-220 ENERGY AND MATERIAL BALANCE	**3**	**0**	**3**	**4**

Metallurgical processes and examples of these processes, Stoichiometric principles, Charge calculations, Material and heat balance in metallurgical processes, Determination of reactions in metallurgical processes, Application of thermodynamic principles in metallurgical processes, Application of material balance in important metallurgical processes, Application of energy balance in important metallurgical processes, Iron and steel production, Iron application of material and energy balance in steel production, production of non-ferrous metals, application of material and energy balance in the production of non-ferrous metals.

	T	U	K	AKTS
AİT-202 ATATÜRK'S PRINCIPLES AND HISTORY OF REVOLUTION-II	**2**	**0**	**0**	**2**

The strategy of the Turkish revolution, the celebration of the Republican administration, the abolition of the caliphate, the Progressive Republican Party and the Takrir-i Sükun Period, the Turkish peace reform, education, culture, letters, history and language reforms Economic Revolution, Izmir Economy Congress, Encouragement-i Industry Law, Agriculture Field made innovations, multiparty pass to living and certain internal political events, social structure reforms, women's rights, hats, costume and dress reform, foreign policy of the Republic of Turkey, Republicanism, Nationalism, Populism, Secularism, Statism, Revolution, Politic events, Istanbul government Relations with, Military developments, Sakarya War and the Great Attack, Kars Treaty, Ankara Agreement, Mudanya Armistice for National Struggle in Education, Culture, Social and Economic Fields, Abolishment of Sultanate, Treaty of Lausanne.

	T	U	K	AKTS
TRD-210 TURKISH LANGUAGE-II	**2**	**0**	**2**	**2**

General information about composition, Types of oral and written composition and its application, Elements of the sentence, sentence analysis and application, Studies on expression and sentence errors,

Rules to be applied in the preparation of scientific articles, sample texts selected from Turkish and world literature, Sample texts selected from the history of thought.

	T	U	K	AKTS
MEM-212 PROFESSIONAL ENGLISH	**3**	**0**	**3**	**3**

Defining and exemplifying technical English terms related to metallurgy and materials engineering, General information about sentence structures, Paragraph structures, reading, summarizing, comprehension, writing, sentence structures, Reading and summarizing the meaning from the content, Practice: reading and taking notes, Application: reading and translation from appropriate professional texts.

5th semester

	T	U	K	AKTS
MEM-353 MECHANICAL BEHAVIOR OF MATERIALS	**2**	**2**	**3**	**4**

Properties of elastic and plastic behavior, description of flow, Important concepts in elastic and plastic behavior, Dislocations, twinning and their properties, Deformation in single and polycrystalline materials, Hardening mechanisms in crystal materials, Composite materials and their mechanical properties, Effect of high temperature on the mechanical properties of crystal materials, Fracture theories , fracture mechanisms, brittle and ductile fracture, effect of crystal structure on fracture and fracture in bcc, fcc, hcp structures, Fatigue and its properties, Fragility; metal embrittlement, hydrogen embrittlement, Stress corrosion damage, impulse atom embrittlement, radiation damage.

	T	U	K	AKTS
MEM-301 PHYSICAL METALLURGY	**3**	**0**	**3**	**4**

Fundamentals of alloying, Solid solution, intermetallic phases, regular structures, Nucleation and growth kinetics, Diffusion mechanism, Interphase, Controlled growth, Heterogeneous and homogeneous grain growth in solids and liquids, Recovery and recrystallization, Grain boundary segregation, Aging, Diffusionless transformation, Martensite transformations, shape memory materials.

	T	U	K	AKTS

MEM-311HEAT AND MASS TRANSFER **3 0 3 4**

Introduction to Fluid Mechanics, Statics of Fluids, Bernoulli, Energy and Momentum Equations, Flows in Tubes, Flows over Bodies, Basic Concepts in Thermodynamics and Heat Transfer, Heat Conduction Equation, Heat Conduction Coefficient, Steady Regime Heat Conduction, Transient Regime Heat Conduction, Heat Convection, Natural and Forced Convection, Heat Transfer by Radiation, Stefan-Boltzmann Law of Radiation, Introduction to Mass Transfer, Similarity Between Heat and Mass Transfer, Mass Diffusion in Stationary and Moving Media, Mass Convection, Instantaneous Heat and Mass Transfer.

	T	U	K	AKTS
MMÜ-303 NUMERICAL ANALYSIS	**1**	**2**	**2**	**3**

Introduction, Task of Numerical Analysis, Concept of Approach, Errors, Significant Household-Relative Error, Boundaries of Error, Numerical Stability, Finding Roots of Equations, Secant Method, General Iteration Forms, Special Forms of Iteration, Newton-Raphson Methods, Non-Linear Solution of Equation Currents, Linear Algebraic Equation Systems Introduction, Solving Linear Algebraic Equations, Gauss-Jordan Method, CHOLESKI Method, Iterations Siedel Method, Relativity Method, Jacobi Method, Finite Differences, Interpolations, Operations with Finite Differential Equations, Ordinary Differential Equations Solutions, Continuation Methods, Estimation-Correction Methods, Adams-Basforth Method, Milne Method, Numerical Solutions of Partial Differential Equations.

	T	U	K	AKTS
MEM-323 CHEMICAL METALLURGY	**3**	**0**	**3**	**4**

Metallurgical pretreatments, General character of PyroMetallurgical processes, Oxide, chlorite, Sulphite and carbide formation, Pressure-temperature relationship in metal compounds, Roasting, evaporation calcination, Mat and melt formation, Slag and melt formation, Melt formation and purification by reduction, HydroMetallurgy, ElectroMetallurgy.

	T	U	K	AKTS
MEM-351 MATERIAL CHARACTERIZATION	**2**	**2**	**3**	**5**

Preparation of metallographic samples, Theories of metallography, Metallographic analysis, Structural analysis in optical microscope, Examination of treated surfaces, Metallography of ferrous and metals, Metallography of ferrous metals, Metallography of non-ferrous metals, Material characterization in other optical systems.

	T	U	K	AKTS
MEM-393 VOCATIONAL PRACTICE-I	**0**	**2**	**0**	**4**

	T	U	K	AKTS
MEM-363 ECONOMIC METALLURGY	**2**	**0**	**2**	**3**

Explanation of the concepts of mines, minerals and ore, Exploration, examination and evaluation of mineral deposits, Metallurgical raw materials and products, economic examination of high-temperature metals, economic examination of low-temperature metals, economic examination of light metals, economic examination of noble metals, economic analysis of radioactive metals economical examination of alkali metals, economic examination of alkaline earth metals, economic examination of rare elements, economic examination of semi-metal elements, economic examination of non-metal elements.

	T	U	K	AKTS
MEM-361 PROFESSIONAL FOREIGN LANGUAGE				

Temperature measurement, metallography, mechanical testing, non-destructive testing etc., Periodic table and elements, atomic structure, crystal structure, grain structure etc., Hot working, cold working, shear, twinning etc., recrystallization, grain growth, annealing, quenching etc., Solid solution, ground and intermediate solid melts, intermetallics etc., systems such as balance, eutectic, peritectic, double and triple systems etc., Steel, cast iron, alloy steels, microstructures etc., Aluminum and its alloys, copper and alloys etc., corrosion, fatigue, creep, wear etc. texts containing terms (source etc.)

6th semester

	T	U	K	AKTS
MEM-334 PLASTIC FORMING	**3**	**0**	**3**	**5**

Basic principles of plastic forming, Stress-Elongation Relationship, Yield criteria, Strain hardening, Strain-temperature relationship, Rolling, Extrusion, Forging, Wire Drawing, Tube Drawing, Sheet Metal Drawing, Deep Drawing.

	T	U	K	AKTS
MEM-362 CASTING TECHNIQUES	**2**	**1**	**3**	**5**

Introduction to Manufacturing Procedures and casting, Mold Materials and Model Manufacturing, Static casting into sand mold, Pressure casting and casting machines, Semi-pressure casting, Metal mold casting, Centrifugal casting, Continuous casting, Precision casting, Casting of aluminum and copper alloys, Cast iron production.

	T	U	K	AKTS
MEM-362 CASTING TECHNIQUES	**2**	**2**	**3**	**5**

Principles of heat treatment of steels, stress relief annealing, Softening annealing, Normalization, Spheronization annealing, Quenching and environments, Critical cooling rate, Martensitic transformation and Isothermal transformation curves, Perlite and Beynite transformation, Transformations during continuous cooling, Hardening ability, Affecting quenching hardening Factors, Tempering, Martempering and Ostempering, Steel surface hardening processes, Flame hardening, Cementation, Nitruration, Carbonituration and Boronization, Induction, surface hardening with laser and electron bombardment, Heat treatment of stainless steels, Tool steels and cast irons, Non-ferrous materials, Aluminum and Heat treatment of copper alloys.

	T	U	K	AKTS
MEM-370 INSTRUMENTAL ANALYSIS METHODS	**3**	**0**	**3**	**5**

Undergraduate students will be informed about basic analysis methods and theories, working principles of various analysis devices, evaluation and interpretation of the results obtained.

	T	U	K	AKTS
MEM-393 VOCATIONAL PRACTICE-I	**0**	**2**	**0**	**5**

	T	U	K	AKTS
MEM-332 SURFACE TREATMENTS	**3**	**0**	**3**	**5**

Surface hardening methods and principles in metals, Coating with hard and soft materials by condensing the materials evaporated by thermal spraying, chemical (CVD) and plasma (PVD) methods on metal surfaces, Electroplating, hot dip methods, Coating resistant to damage such as corrosion, fatigue and wear types.

	T	U	K	AKTS
MEM-322 INTRODUCTION TO CERAMIC MATERIALS	**3**	**0**	**3**	**5**

Definition, Classification and Importance of Ceramics in Engineering, General atomic structure, bonds between atoms and Crystal structure, Crystal Structure of Ceramics, Glass Technology and Production, Clays and Clay Products, Refractories and their properties, Abrasives and Concretes, Sintering methods and principles, Powder pressing, Ceramic mechanisms for increasing the toughness in materials. Production of ceramic powders.

	T	U	K	AKTS
MEM-394 METALLURGICAL PRE-TREATMENTS	**2**	**1**	**3**	**5**

Introduction, raw materials and raw material resources Ore preparation, classification and ore enrichment, Drying and calcination

Types of roasting and roasting Roasting furnaces and industrial applications Agglomeration processes and sintering, Pelleting and briquetting, Solid state reduction and direct reduction, Industrial applications of metallurgical pretreatments Metallurgical pretreatments industrial applications, metallurgical pretreatments and the environment.

	T	U	K	AKTS
MEM-372 WELDING TECHNIQUES AND WELDING METALLURGY	**3**	**0**	**3**	**5**

Classification of welding techniques, Oxyacetylene welding, Electric hand arc welding, Tungsten-inert gas welding, Metal-inert gas welding, Plasma welding, Submerged arc welding, Electric resistance welding, Filling welding, Thermal cutting methods, Special welding methods, Ultrasonic, Diffusion, Electron and Laser welding, Modern soldering techniques, Welding heat flow, Welding capability, Welding zone study, Heat Affected zone (ITAB) and phase transformations in ITAB, Weld metal, Solidification and Phase transformations, Relations between weld zone microstructure and Mechanical properties, Welding of non-allotropic non-transformed steel and non-ferrous materials.

	T	U	K	AKTS
MEM-312 FAILURE ANALYSIS	**3**	**0**	**3**	**5**

Introduction to damage analysis, types of damage, Tensile, compression, bending damages and characteristics, Characteristics of wear and damage, Characteristics of fatigue and damage, Characteristics of corrosion and damage, Characteristics of creep and damage, Coexistence and typical characteristics of damage types, Liquid metal, hydrogen brittleness damages and characteristics, damages and characteristics in composite and electronic materials, plastic deformation and damage in non-crystalline materials, practical examples for damage types.

	T	U	K	AKTS
MEM-314 POLYMER MATERIALS	**3**	**0**	**3**	**5**

General properties of polymer materials, polymer chemistry, polymerization mechanism, amorphous, crystal and elastromeric structures, structure and properties of thermoplastic and thermoset polymers, shaping techniques of polymers, production methods, composites with polymer matrix.

7th semester

	T	U	K	AKTS
MEM-401 IRON-STEEL METALLURGY	**3**	**0**	**3**	**5**

Iron ores, Pelleting, zintering and firing of ores, Iron production in blast furnace, Principles of steel production, Converters, deoxidation, degassing, Continuous casting, rolling, rolling products, Alternative steel production.

	T	U	K	AKTS
MEM-461 ADVANCED TECHNOLOGY MATERIALS	**3**	**0**	**3**	**5**

The definition of advanced materials, historical development, applications, world and Turkey's development. Polymer composites. Advanced ceramic materials. Continuous fiber ceramic composites. Intermetallics. Advanced metal matrix composites. Nickel and nickel alloys. Titanium alloys. Aluminum alloys. Functional materials. Corrosion of engineering materials and the use of advanced materials against corrosion. Standards and codes of advanced materials. Rapid prototyping and manufacturing.

	T	U	K	AKTS
MEM-430 COMPOSITE MATERIALS	**2**	**0**	**2**	**5**

Introduction to composite materials, introduction of composite materials, Matrix and reinforcement materials Accelerators, adhesives, filling materials, Classification and properties according to matrix and reinforcement structure, General characteristics and applications of composite materials production, Mechanics and mechanical behavior of composite materials.

	T	U	K	AKTS
MEM-493 VOCATIONAL PRACTICE-II	**0**	**2**	**0**	**5**

	T	U	K	AKTS
MEM-402 GRADUATION PROJECT				

	T	U	K	AKTS
MEM-481 CASTING PRINCIPLES	**3**	**0**	**3**	**5**

Solidification in casting, Metal flow in mold, Direction of solidification, Shaping of runner and feeder, Feeder optimization, Segmentation, Porosity, Shrinkage mechanisms and prevention, Gases in metals, Degassing procedures in metals, Casting faults in general, Causes and measures of casting defects.

	T	U	K	AKTS
MEM-491 SPECIAL STEELS	**3**	**0**	**3**	**5**

Low alloy high strength steels, Dual phase steels production, Mechanical properties of dual phase steels, Stainless steels, types, properties and heat treatment, Silicon steels (steels used in electrical machines, Austenitic manganese steels, their production, application areas, Hot and cold work tool steels Steels used in high temperature applications.

	T	U	K	AKTS
MEM-451 NON-FERROUS METALS METALLURGY	**3**	**0**	**3**	**5**

Copper production, alloys, standards, Chemical and physical properties of copper, Zinc production, alloys and standards, Chemical and physical properties of Zinc, Aluminum production, alloys and standards, Chemical and physical properties of aluminum, Lead production, alloys and standards, Chemical and physical properties of lead. Properties, Antimony production, alloys, standards, chemical and physical properties, Mercury production, chemical and physical properties of alloys, standards, Molybdenum production, alloys, standards, chemical and physical properties, Magnesium production, alloys, standards, chemical and physical properties, Nickel production Chemical and physical properties of alloys, standards.

	T	U	K	AKTS
MEM-495 METALLURGIC FUELS AND RAW MATERIALS	**2**	**1**	**3**	**5**

Introduction, general information and basic concepts, Fuels and introduction and properties of metallurgical fuels, Types of metallurgical fuels; Solid, liquid, gaseous fuels, Combustion, thermodynamic and kinetic aspects, efficiency, Combustion reactions, their effects on the process and industrial applications, Metallurgical raw materials and their general properties, Relations between geographical structure and the frequency of metallurgical raw materials, Methods of processing metallurgical raw materials with their physical and chemical properties relations between important sources of metallurgical raw materials in the world and Turkey, using areas of evaluation facilities and the final product of metallurgical raw materials in Turkey, an important metallurgical raw materials processing plants in Turkey.

	T	U	K	AKTS
MEM-497 HYDROMETALLURGY	**2**	**1**	**3**	**5**

Introduction: Advantages and future of hydrometallurgy, Dissolution: Dissolution mechanism / Dissolution reactions (anodic and cathodic) / Dissolution thermodynamics / Dissolution kinetics / Factors affecting dissolution / Dissolution techniques. Filtration, Precipitation Techniques: Physical precipitation / Chemical precipitation / Hydrolytic precipitation / Reduction precipitation / Homogeneous reduction precipitation (ionic and non-ionic) / Heterogeneous reduction precipitation (electrochemical and electrolytic) / Ionic precipitation / Solvent extraction and ionic precipitation / Solvent extraction (examples) problem solution.

	T	U	K	AKTS
MEM-499 ELECTROMETALURGY	**2**	**1**	**3**	**5**

Definition and principles of electrometallurgy, Electrothermic, Production in electric arc furnaces and pre-treatments applied before this production, Scrap preheating, scrap chopping, scrap packaging, magnetic cranes, Electrolysis, electrospurification, optimum conditions for electroplating, electroplating and surface preparation.

8th semester

	T	U	K	AKTS
MEM-402 GRADUATION PROJECT	**0**	**2**	**1**	**14**

	T	U	K	AKTS
MEM-412 CORROSION	**2**	**0**	**2**	**4**

Definition of corrosion, Principles of electro-chemical, Types of corrosion, Corrosion in various environments, Protection against corrosion, Selection of corrosion resistant materials, Measurement in corrosion.

	T	U	K	AKTS

MEM-400 BUSİNESS LAW **2 0 2 2**

Introduction to law, Basic sources of labor law, historical development and legal framework of Turkish Labor Law, Basic structure, scope and application area of Labor Law No.4857, Service contract, Obligations imposed by the contract on the parties, Termination of service contracts, termination rights of the employee and employer, Severance pay job search warrant, disabled and ex-convicts to run, fee, payment and deductions, overtime wages, the minimum wage, the minimum wage in Turkey, Organization of work and work time, vacation and order on leave, worker health and safety, business life audit and inspection, the Trade unions Act, trade unions and associations, trade unions in Turkey, workers and employers, union membership, union activities, collective bargaining, strikes and lockouts law, disputes and mediation, strike and lockout definitions.

	T	U	K	AKTS
MEM-493 VOCATIONAL PRACTICE-II	**0**	**2**	**0**	**5**

	T	U	K	AKTS
MEM-440 POWDER METALLURGY	**3**	**0**	**3**	**5**

Metal powder production techniques, Quality control of powders and molding, Introduction of zintering and sintering facilities, Determination of parts suitable for production with Powder Metallurgy, Comparison with other production techniques, New developments in Powder Metallurgy, Quality control of products.

	T	U	K	AKTS
MEM-450 NON-DESTRUCTIVE INSPECTION OF MATERIALS	**3**	**0**	**3**	**5**

The importance of non-destructive testing, Discontinuities in materials, Non-destructive testing methods, Liquid penetration test, Magnetic testing with different techniques, Inspection with Eddy currents, Ultrasonic inspection, X-ray inspection, Error detection and evaluation, Determination of metallurgical properties.

	T	U	K	AKTS
MEM-470 REFRACTORIES AND INDUSTRIAL OVENS	**3**	**0**	**3**	**5**

Types and properties of refractory materials, Classification of furnaces, Furnaces used in steel and non-ferrous production, Heat treatment furnaces, Energy consumption in industrial furnaces, Thermal balance in furnaces, Heat transfer in furnaces, Thermal losses in furnaces, Useful heat in furnaces, Furnace structural elements, Furnace selection, Furnace design parameters.

	T	U	K	AKTS
MEM-480 MATERIAL SELECTION AND DESIGN	**3**	**0**	**3**	**5**

Design phases, Traditional and fracture-based design, Traditional and fracture-based design examples, Modeling in decision making, Optimization in decision making, Material selection, Special applications in material selection, Material design.

	T	U	K	AKTS
MEM-490 NEW TECHNOLOGIES IN IRON AND STEEL PRODUCTION	**2**	**1**	**3**	**5**

Introduction / Reasons for Emergence of New Technologies in Iron and Steel Production / Introduction of New Technologies / Properties of Sponge Iron / Sponge Iron Production Wool / Thermodynamics and Kinetics of Sponge Iron Production / Developments in Steel Production in Electric Arc Furnace / Developments in Converter Technology / Developments in Pot Metallurgy / Environment in Iron and Steel Production Developments in the Evaluation of Problems and Wastes / Developments in the Quality and Diversity of Products in Iron and Steel Production / Industrial Applications.

T : Theoric

U : Practice

K : Credit