

KARAMANOĞLU MEHMETBEY UNIVERSITY
KAMİL ÖZDAĞ SCIENCE FACULTY
DEPARTMENT OF MATHEMATICS THE 1ST CLASS COURSE CONTENTS

FIRST SEMESTER

Abstract Mathematics-I (2 2 3) (ECTS: 6)

Propositions. Truth tables. Logical equivalencies. Logical implications. Methods of proofs of implications and equivalences. Mathematical Induction. Quantifiers. Sets, subsets, set operations, the laws of set theory. Cartesian product. Relations. Inverse relations. Composition of relations. Equivalence relations. Equivalence classes and Partitions. Order relations: Partial order, total order, well order. Functions. Injective, surjective and bijective functions. Composition of functions and inverse of functions.

Analysis-I (4 2 5) (ECTS: 8)

Numbers, Trigonometry, Classes of Function , Property of Functions, Indefinite Shapes , Continuity of Functions, Continuity Theorems, Derivative, Differential, Application of Differential, Basic Theorems of Differential Computation, Change of Function , Graph sketching and problems of extrema.

Analytic Geometry-I (2 2 3)(ECTS: 6)

Coordinates in Affine Space, Vectors, Operations Related To Vectors, Vector spaces on a Field, Operations Related To Vectors in Euclidean Space, Euclidean Vector Space, Some properties of Euclidean Vector Space, Transformations of Coordinate, Translation and Rotations, Spherical and Cylinder Coordinates, Line in the Plane, Plane, Line in the Space.

Physics-I (4 0 4) (ECTS: 4)

Measurement, Vectors, Motion in one Dimension, Motion in Two Dimensions, The Laws of Motion, Circular Motion and Other Applications of Newton's Laws, Work and Energy, Potential Energy and Conservation of Energy, Linear momentum and Collisions, Rotation of a Rigid Body About a Fixed Axis, Rolling Motion, Angular Momentum and Torque.

Atatürk's Principles and Revolution History-I (2 0 2) (ECTS: 2)

Modernization and Europa. Revolution of French, Westernization Affairs of the Otoman Empire, The Balcan Wars, The First World War, The Emergence of the National Movement and Organization, Sevres Peace Treaty, Turkish National Struggle and Wars and Lausanne Peace Treaty, Turkish Political Life.

Turkish Language-I (2 0 2) (ECTS: 2)

1. Definition and characteristics of the language, the relationships between language-nation, language-thought and language-culture. 2. Languages in the world, the position of the Turkish language among these languages and its historical progress, 3. Language revolution of Atatürk, his linguistic understanding and works. 4. Sound properties of Turkish 5. Spelling rules and their applications 6. Punctuation marks and applications. 7. Information about the words, root-affix and body, construction roots, conjugation roots, the ways of word deriving.

Foreign Language (English) -I (2 0 2) (ECTS: 2)

Subject Pronouns, possessive adjectives, nouns and their plurals, indicative adjectives and some adverbs, The simple present tense, positive, negative and question forms of the verb to be. Conjunctions, signing pronouns, definite and indefinite adjectives, verbal nouns and object pronouns. Inflection auxiliary verbs “can” and the use of example will be considered.

SECOND SEMESTER**Abstract Mathematics-II (2 2 3) (ECTS: 6)**

Binary operations, groups, subgroups and homomorphism of groups. Number systems: Natural numbers, integers, rational and real numbers. Well-ordered sets, axiom of choice. Equipollent sets, finite and infinite sets. Countability of sets.

Analysis-II (4 2 5) (ECTS: 8) Parametric Equation, Graph sketching in Polar Coordinates, Indefinite Integral, Definite Integral, Riemann Integral, Fundamental Theorems, Plane area and Volume, Length of arc, areas of a surface of revolution, Improper Integral.

Analytic Geometry-II (2 2 3)(ECTS: 6)

Homogeneous Coordinates, Curves, Classify of Algebraic Curves, Circles, Conics, Elementary Definition of Conics, Parabola, Ellipse, Hyperbole, Tangents of A Conic, Quadrics, sphere, Surfaces of Cylinder and Cone, Surfaces of Revolution.

Physics-II (4 0 4) (ECTS: 4)

Coulomb Force, Electrical Fields, Gauss's Law, Electrical Potential, Capacitance and Dielectrics, Current and Resistance, Direct Current Circuits, Magnetic Fields, Sources of the Magnetic Field, Faraday's Law, Lenz's Law, Inductance, Alternating Currents .

Atatürk's Principles and Revolution History-II (2 0 2) (ECTS: 2)

Foundation of Turkish Republic, Political life in Turkey, Political party, Multi-Party system, Revolution of Atatürk, Changing of cultural life, Principle of Atatürk's, Until today foreign and domestic policy of Turkey from after death of Atatürk.

Turkish Language-II (2 0 2) (ECTS: 2)

1. Word and its definition; words with different meanings; real, subsidiary and metaphoric meanings of the words; idioms; reduplications; terms 2. Language mistakes (the mistakes related with the structure and meaning of the word). 3. Sentence structure in Turkish, elements of the sentence, analyses of the sentence. 4. Language mistakes (the mistakes resulting from the absence of object, complement and predicate) 5. Types of written expression: a) Event writings (story novel examples) b) Thought writings (article, essay, column examples) c) Sensation writings (poet examples) 6. Communications, minutes and report examples. 7. Petition, letter and cv examples 8. Discussion and its types (discussions on problems of youth, importance of love and tolerance, education in Turkey, effects of media, human rights, environmental problems, modernization, secularity, democracy, freedom of thought etc.)

Foreign Language (English) -II (2 0 2) (ECTS: 2)

Adverbs, imperatives, pronouns, necessity modules, applications of the future tense, idioms and applications of present and past perfect tense will be considered.

DEPARTMENT of MATHEMATICS THE 2ND CLASS COURSE CONTENTS**THIRD SEMESTER****Analysis-III (3 2 4) (ECTS: 8)**

Sequences, Positive terms sequences and convergenes test of these sequences. Alternate sequences. Regular convergence and integral, differentiation. Power series, Taylor polynomials and series. Laplace transformations. Curves.

Differential Equations-I (2 2 3) (ECTS: 7)

Fundamental terms of differential equations. Bernoulli, Riccati and perfect differential equations. Homogeneous and first ordered linear equations. Solution metot of Euler's approximations, entity and unity theorem.

Linear Algebra-I (3 2 4) (ECTS: 8)

Vectors in R^n and C^n , vector operations. Gauss elimination method for linear equation systems. Vector spaces and sub-spaces. Basis and dimensions. Direct sum and rank of a matrix. Linear transformations, find kernel and valuation space.

Probability (3 0 3) (ECTS: 4)

Probability terms, expected value, random variables and special functions. Probability functions, moments, abrupt distributions, poisson distribution and Gamma distribution.

Elementary Computer Technologies and Usage -I (1 2 2) (ECTS: 3)

Fundamental definitions in programming. Definitions and software of Algorithm. Problem solutions schemas. Algorithm with numbers, Exercises deal with algorithms and schemas. Algorithms of subprogrammes.

FOURTH SEMESTER

Analysis-IV (3 2 4) (ECTS: 8)

Multivariables functions, some topology terms. Directional differentiation, maxima and minima, differential of under integral sign. Curves integrals and theorems of curves integrals. Planes integrals and theorems of plane integral and applications.

Differential Equations-II (2 2 3) (ECTS: 7)

Entity and unity theorems for high order differential equations. High order homogeneous and nonhomogeneous linear differential equations with constant coefficient and their special solutions. The Frobenius method, Changing of parameter method and indefinite coefficient method. Laplacian transformation and some properties. Differential operators.

Linear Algebra-II (3 2 4) (ECTS: 8)

Linear functionals and dual space. Transpose of a linear transformation and n linear functions. Bilinear forms. Permutations, Determinants and properties. Eigenvalues and eigenspaces. Inner product and some properties. Gram-SCHMIDT method. Unitary and orthogonal operators.

Statistics (3 0 3) (ECTS: 4)

Fundamental terms of statistics, distributions of frequency, median, sampling distributions, method of EKK. Regression, correlation and hypothesis testing.

Elementary Computer Technologies and Usage-II (1 2 2) (ECTS: 3)

Programming in Visual Basic, Software of Visual Basic and programme commands. Read, data, Print Tab(), Print Using commands. Decision commands such as IF, THEN, ELSE, CASE, DO WHILE, FOR-NEXT...etc.

DEPARTMENT OF MATHEMATICS THE 3RD CLASS COURSE CONTENTS

FIFTH SEMESTER

Introduction to Algebra-I (2 2 3) (ECTS: 6)

Integers, Groups, classification of groups, transformations and subgroups, normal subgroups, Sylow Theorems.

Differential Geometry (2 2 3) (ECTS: 6)

Affine and Euclidean Spaces and frameworks, topological spaces, topological manifold, Hausdorff Spaces, tangent spaces, transformation of derivative, directional derivative, definition of the curve, properties of curves, the derivative formulas of Frenet-Serret, osculator, rectification and normal planes, Bertrand's Curve Pairs, involute-evolute and spherical curves.

Theory of Complex Functions-I (2 2 3)(ECTS: 6)

Definition of complex numbers, Functions of a complex variable, limit, continuity, derivative, Cauchy-Riemann Equations, Cauchy Integral Theorem, Morera's Theorem, complex integrals and Cauchy-Goursat Theorem.

Numerical Analysis-I (3 0 3) (ECTS: 6)

The behavior of discrete structures, error analysis, nonlinear equations, difference equations, finite difference, interpolations.

Topology-I (4 0 4) (ECTS: 6)

The concept of topology, open and closed sets, internal, external and edge points. Limit points, the closure of a set. Methods for establishing the topology, bases and sub-bases, neighborhoods and neighborhood bases. The general definition of continuity and some theorems about it. Isomorphism of topological transformations, Comparison of topologies, and ranking. Subspaces, product spaces, quotient spaces. Sequences, filterings and grids (reticles).

SIXTH SEMESTER

Introduction to Algebra-II (2 2 3) (ECTS: 6)

Rings, Ideals, Ring's Homomorphisms, Polynomials, divisibility, fields and field extensions.

Theory of Complex Functions-II (2 2 3)(ECTS: 6)

Analytical functions, zeros of analytical functions, Sequence, series, types of convergence, the principle of maximum and minimum, fundamental theorem of algebra. The Taylor's and Laurent's Series, residue theorem and Rouché's Theorem.

Numerical Analysis-II (3 0 3) (ECTS: 6)

Computer arithmetic and error analysis, solutions of equations in one variable. Numerical solutions of systems of linear equations.

Topology-II (4 0 4) (ECTS: 6)

On the separation axioms in topological spaces, T_0 and T_1 spaces and properties, T_2 space and properties. T_3 ve T_4 spaces, normal spaces and properties. Separation axioms, connected spaces, connected subsets. Locally connected topological spaces, path connected topological spaces

ELEKCTIVE COURSES

Linear Algebra-III (3 0 3) (ECTS: 6)

The positive vertical, identity and orthogonal matrices, hermitian quadratic forms, orthogonal uniform matrix forms, inner products, orthogonal projections, linear operators, normal operators, identity operator and orthogonal operators.

Elementary Number Theory (3 0 3) (ECTS: 6)

The prime numbers and divisibility, φ Euler's Function, Linear Diophant's Equations, congruences, the systems of congruence, the sequence of Fibonacci, properties of prime numbers, arithmetic functions, perfect square sums, continue fractions, general applications.

Difference Equations (3 0 3) (ECTS: 6)

The analysis of difference and properties, Linear difference equations and solutions, high order linear difference equations and solutions. Difference equations with variable coefficients and solutions, generating functions, z-transformations.

Spectral Theory (3 0 3) (ECTS: 6)

The differential expressions, boundary conditions, Sturm-Liouville's operators, calculation of eigenvalue and eigenfunction, integral equations, spectral expansion, Resolvent operator, asymptotic calculations.

SEVENTH SEMESTER

Functional Analysis-I (2 2 3) (ECTS: 6)

Metric spaces, open set, closed set, neighbourhood, boundedness, convergence, Cauchy's sequence, separability, vector spaces, subspaces, Hamel basis, linear operators, functionals, normed spaces and properties.

ELECTIVE COURSES

Financial Mathematics (3 0 3) (ECTS: 6)

Definition of fundamental financial terms, types of interest and calculation, calculation of discount and depreciation, expenditure-income, supply-demand functions and the relationships between them. Marginal revenue and other marginal functions, types of flexibility and their applications.

Advanced Algebra (3 0 3) (ECTS: 6)

Notes on the group, Sylow Theorems. Free groups, rings, rings of endomorphism, submodules and direct sums of submodules. Quotient modules, finite generating modules, fundamental and maximal modules.

Partial Differential Equations-I (2 2 3) (ECTS: 6)

First ordered partial differential equations, their solutions and applications.

Real Analysis (3 0 3) (ECTS: 6)

Notations, the theory of fundamental set, sets and functions, countable and uncountable sets and their examples, Riemann's Integral, σ -algebra, measure, null set, external measure, Lebesgue measurable sets, Borel's sets, measurable functions, the theorems of monotone convergence, integrable functions, Lebesgue's integral, L_p spaces.

Abstract Algebra-I (3 0 3) (ECTS: 6)

Introduction to group theory, definition of group, group homomorphisms, finite and infinite groups and their examples, Cayley's Theorem, Lagrange's Theorem, Sylow's Theorem, Hall's Theorem. Group extensions and their examples, free multiplication on the groups, direct multiplication, semi-direct multiplication and their examples. Representations of group and group multiplications. Tietze transformations and general applications.

Applied Mathematics-I (2 2 3) (ECTS: 6)

Investigation of second ordered partial differential equations, fourier series, Sturm-Liouville systems, fourier transformations, solutions of partial differential equations with separation of variables method.

Number Theory-I (3 0 3) (ECTS: 6)

Integers and some properties, divisibility and it's properties and theoretical number functions.

EIGHTH SEMESTER**Graduation Project (2 2 3) (ECTS: 6)**

Determining the subject of Project, determining the material and method of Project, review of the literature, regulation of the obtained informations and writing Project.

ELECTIVE COURSES**Partial Differential Equations-II (2 2 3) (ECTS: 6)**

High ordered partial differential equations, their solutions and applications.

History of Mathematics (3 0 3)(ECTS: 6)

The importance of mathematics in the history of science, arithmetic, algebra, geomtry, analytical geometry, trigonometry, differential equations, probability, statistic, Linear algebra, Vector calculation, logarithm etc...The lives of some of Greek, Turkish-Islamic Mathematicians.

Mathematical Modeling (3 0 3) (ECTS: 6)

The term and types of mathematical modeling, development of mathematical modeling, test the reality of modeling, optimization and discrete modeling.

Scattering Theory (3 0 3) (ECTS: 6)

Fourier Transformations, Jost solution, scattering function, existence and uniqueness of solutions, inverse problem, Parseval's equality, Levinson's Formula.

Number Theory-II (3 0 3) (ECTS: 6)

Congruences, applications of congruence, primitive roots and indices, quadratic residues and continued fractions.

Abstract Algebra-II (3 0 3) (ECTS: 6)

Rings and fundamental properties, subrings and ideals, integral domain and fields. Homomorphism and isomorphism theorems on the rings. Polynomial rings, Euclidean regions, field expansions, normal expansions, field of fractions, automorphisms and Galois expansions, the Notion of the module.

Applied Mathematics-I (2 2 3) (ECTS: 6)

Boundary value problems, Green functions, eigenvalue problems, asymptotic expansions.

Functional Analysis-II (3 0 3) (ECTS: 6)

Inner product spaces, Hilbert Spaces, the rule of parallelogram, direct summations, orthonormal sets and sequences, notation of functionals on Hilbert Spaces, Hahn-Banach Theorem, Hilbert adjoint operators, adjoint operator, Closed graph theorem, Boundedness theorem and applications, strong and weak convergence.

Projective Geometry (3 0 3) (ECTS: 6)

Fundamental spaces, tensors, types of curves and surfaces; dual, Lorentz, hyperbolic and projective geometries.

Metric Topology (3 0 3) (ECTS: 6)

Topological groups, Lie groups, triple surfaces, Euler's characteristic and nodes.