

COURSE CONTENTS

17.03.2026 11:10
E-16816204-199-24298
05882245

1. Year Fall Semester	Number of Courses	ECTS
Compulsory	Six	Thirty

AITB1001 **Atatürk's Principles and History of Turkish Revolution - I** **2+0+0** **ECTS:2**

Historical concepts, descriptions, descriptions of resources and methods, French Revolution and Industrial Revolution, Collapse of the Ottoman Empire, Tanzimat and Islahat Firman (order) , I. and II. Constitutional Monarchy, Tripoli and Balkan Wars, I. World War, Mondros Truce, Wilson principles, Paris Conference, Atatürk, Samsun and Anatolia, Amasya Notice, National Congress, Opening the Mebusan Assembly, Foundation of Turkish National Assembly (TBMM) , Internal rebellions, 1921 Organic Law, Foundation of the Army, I. İnönü, Sakarya, Kütahya, Eskişehir Wars and the Last Attack, Pacts during the Turkish War of Independence, Lozan Pact, Abrogate of Saltanate.

FIZ1003 **Physics - I** **4+0+0** **ECTS:6**

Vectors. Motion in one dimension. Motion in two dimensions. The laws of motion. Circular motion and other application 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. Static equilibrium and elasticity. Oscillatory motion. The law of universal gravitation. Temperature. Thermal expansion and ideal gases. Heat and laws of thermodynamics. The kinetic theory of gases.

MAT1005 **Analysis - I** **4+2+0** **ECTS:9**

Sets and elementary operations on sets, real number system and principles, basic algebraic inequalities and mathematical induction method, relations and functions, trigonometric, exponential, logarithmic, and hyperbolic functions, real number sequences and convergence, basic properties of convergent sequences, substructure and functions of real number sequences. upper limits, limits of functions, continuity of functions, basic properties of continuous functions, basic properties of derivative and differentiable functions, and applications of derivatives.

MAT1013 **Basic Mathematics** **4+2+0** **ECTS:9**

Propositions, conjunctions, Truth tables, Logical Equality, Implication, Proof Methods, Quantifiers, Sets, Cartesian Product, Relation, Inverse relation, Functions, Bijections, Compound Function, Equipollent Sets, Denumerability, Equivalence relations, Equivalence Class and decompositions, Quotient Set, Order Relation, Total order, Well Ordering, Mathematical Induction and recursion theorem of function.

TDB1001 **Turkish Language - I** **2+0+0** **ECTS:2**

Language and languages; (Language-Nation Relations, Language-Culture) Languages in the world and the place of Turkish language among other languages; (Language families in terms of their sources) Historical Development of Turkish written language: (Old Turkish- Middle Turkish-Divanü Lügati't-Türk, Atabet'ül Hakayık, Harezmi Turkish) . Old Turkey Turkish (Old Anatolian Turkish) ; The era new Turkish, Modern Turkish era, West (West eastern Turkish) Turkey's Turkish, East (North-eastern Turkish) Karatay Turkish Phonetics; (Sound and the formation of sound the harmony of vowel sounds) , Fundamental sound Features in Turkish; (Features sound of Turkish, Spelling structure of Turkish, Sentence Emphasis) . Morphology; (Words in terms of form, prefixes, suffixes, roots) . Enumeration and words in respect to their functions; (Noun, pronouns, and adjectives) Verbs; (Shape and Tense supplements). Prepositions-Gerunds; (Derived from nouns-verbs). Meaning Science: Meaning in word, The frame of word meaning. Sentence Knowledge: (Kinds of Sentences). The analysis of sentences.

YDB1003 **English - I** **2+0+0** **ECTS:2**

Unit 1)Present Simple/Present Rogressive Unit 2) Articles/Nouns Unit 3) Some-Any-No-Every/Musch-Many-A lot of-A few-A Little/ How much-How Many Unit 4) Object Pronouns/ Possessive Adjectives / Possessive Pronouns/ Possessive Case Unit 5)Adjectives/Adverbs /Comparisons –Revision Units 1-5 Unit 6) past Simple/Past Progressive Unit 7) Propositions of Time /Propositions of Place /Prepositions of Movement Unit 8) Relative Clauses /Relative Pronouns (who, which, that, whose) unit9) Reflexive EMphatic Pronouns/ Which/ One-Ones –Revision Units 10)Present Perfect Simple Unit11) Present Perfect Simple vs. Past Simple



1. Year Spring Semester	Number of Courses	ECTS
Compulsory	Seven	Thirty

AITB1000	Ataturk's Principles and History of Revolution II	2+0+0	ECTS:2
-----------------	--	--------------	---------------

Revolutions in the political field, political parties and attempts to transition to multi-party political life, revolutions in the field of law, regulation of social life, innovations in the economic field, Turkish foreign policy in the period of 1923-1938, Turkish foreign policy after Atatürk, Principles of the Turkish Revolution: (Republican, Populism, Secularism, Revolutionism, Statism, Nationalism). Integrative Principles.

FIZ1000	Physics - II	4+0+0	ECTS:6
----------------	---------------------	--------------	---------------

Electric fields. Gauss law, Electric potential, Capacitance and dielectrics, Current and resistance, Direct current circuits, Magnetic fields, Sources of the magnetic field, Faradays law, Inductance, Alternating current circuits.

MAT1000	Basic Algebraic Structures	4+0+0	ECTS:5
----------------	-----------------------------------	--------------	---------------

Chains, lattices, boole algebras, well ordered sets, natural numbers, integers, rational numbers, finite and infinite sets, countable and uncountable sets, cardinal arithmetic.

MAT1002	Analytic Geometry	4+0+0	ECTS:5
----------------	--------------------------	--------------	---------------

Cartesian coordinates in plane and space; Vectors in plane and space; Straight lines in the plane; Straight lines and planes in 3-dimensional space; Relations between point-line, point-plane, line-plane and plane-plane; Rotations and translations in plane; Basic notions about conics; General quadric equations in the plane and their canonic forms and graphics; Polar, cylindrical and spherical coordinates; Special surfaces in space: Cylinders, Rotational surfaces, Quadric surfaces.

MAT1006	Analysis - II	4+2+0	ECTS:8
----------------	----------------------	--------------	---------------

Real number series, series with positive terms and convergence tests, alternating series and convergence tests, series with any signed terms and convergence tests, power series and convergence tests, Taylor series, primitive function and indefinite integral, basic integration methods, concept of Riemann integral, Riemann some classes of integrable functions, fundamental theorem of integral calculus, Riemann integral calculation techniques, mean value theorems, applications of definite integrals, improper integrals and their classification, convergence tests for improper integrals.

TDB1000	Turkish Language - II	2+0+0	ECTS:2
----------------	------------------------------	--------------	---------------

Punctuation and Composition (Punctuation Marks, Other Marks) marks of abbreviations, Spelling Rules (The spelling of capital letters, The writing of quotations. numbers, The Composition the purpose of composition, method in composition writing, planning, introduction, development and result in composition, the features of telling (purity in telling, simplicity in telling, clarity and sincerity in telling mistakes in telling (the use of synonymous words in the sentence). The use of synonymous words in the sentence, The misuse of phrases, Explanation, story, description, criticism, portray, speaking, proving. The kinds of verbal telling (daily and unprepared speaking- prepared speaking, debate, panel) The kinds of written telling (letter, telegraph, celebration, invitation, literary letter Job letters, formal letter, petition, report, decision, announcement, advertisement). Talking, criticism, memoir, travel, writing, interview, survey Autobiography biography novel- story, fable- theater tragedy, drama- scenario, poetry and its kinds.

YDB1004	English - II	2+0+0	ECTS:2
----------------	---------------------	--------------	---------------

Present Perfect (15,16,17) Present Perfect (18,19,20) Adjectives (85,86,87) Adjectives & Adverbs (88,89,90) Adjectives & Adverbs (90,91,92) Passives (21) Passives (22) Conditionals (99,100) Relative Clause (101) Relative Clause (102) Noun Clause (49) Reported Speech (50) Gerunds And Infinitives (51,52)



2.Year Fall Semester	Number of Courses	ECTS
Compulsory	Four	Twenty-Six
Social (Cultural)	One	Four

MAT2001 Probability and Statistics I 4+0+0 ECTS:6

Random variable concept, probability space, probability distributions with one variable, multivariate probability distributions, mathematical expectation value, characteristics functions, producer functions, expectation value with condition, some inequalities, some discrete and concrete probability distributions

MAT2005 Linear Algebra-I 4+0+0 ECTS:7

Vectors spaces, subspaces, linear independence, span, bases, dimension, linear transformations, matrix algebra, inverse of an nxn matrix, systems of linear equations, Gaussian elimination.

MAT2011 Differential Equations 4+0+0 ECTS:6

First order differential equations and applications. Existence and uniqueness of the solutions. First order linear differential equations. Bernoulli differential equation. Separable differential equations. Exact differential equations . integrating factor for non exact differential equations.introduction to higher order linear differential equations.Second order linear differential equations. Linear independence and wronskian. Reduction of order. Homogeneous constant coefficient second order linear equations. Cauchy-Euler equation, Nonhomogeneous equations Undetermined coefficients and variation of parameters. Laplace transformation and solution of initial value problems by Laplace transformation.Systems of differential equations.

MAT2023 Analysis - III 4+2+0 ECTS:7

Functions of several real variables, Topology of R^n , Limit, Continuity, Compactness, Sequences of functions, Series of functions. Series in R^n , Linear operators and matrices. Derivative, Chain rule. Mean value theorems. Partial derivatives. Implicit and inverse function theorems. Maximum and minimum, Lagrange multiplier rule

MAT2025, Social (Cultural) Professional English 2+0+0 ECTS:4

Selected Examples from Topics such as English Course Names, Branches of Mathematics and Mathematical Terms, Writing Techniques for Definitions, Theorems, Propositions, Corollaries and Proofs, Mathematical Terms and Sentences Used in Translation, Latin Abbreviations and Symbols, Numbers, Complex Numbers, Arithmetic Operations, Algebraic Expressions, Indices, Functions, Limits, Derivatives, and Integrals, and Presentation Techniques.

USEC0003, Social (Cultural) Professional Ethics 2+0+0 ECTS:4

Morality and ethics, ethical theories, professional ethics, engineering ethics, scientific and publication ethics, professional corruption, discussion

2.Year Spring Semester	Number of Courses	ECTS
Compulsory	Four	Twenty-Six
Social (Cultural)	One	Four

MAT2006 Probability and Statistics II 4+0+0 ECTS:6

Sampling theory and sample selection, arrangement of data and analyzing, the central limit theory, distribution theory, variation, sampling distributions and estimation, interval estimation (for the mean of the population), interval estimation (for the variance of the population), problems and introduction to hypothesis, hypothesis test about mean of the population, hypothesis test about variance of the population, importance of the Chi-square tests, problem solutions and introduction to regression analysis, regression analysis and ekk confidence interval for the parameters and hypothesis tests, multi-variable linear regression, correlation and importance of the correlation coefficients.

MAT2008 Mathematical Computation 4+0+0 ECTS:6

Main concepts, Numerical Computation and programming with OCTAVE (scalars, vectors, matrices, functions and plotting, iterative and conditional structures, constructing function programs, applications).

Symbolic computation and programming with MAXIMA (scalars, vectors, matrices, functions and their graphs, limit, differentiation, integration, series, linear algebra applications, differential equations).



MAT2010 **Linear Algebra-II** **4+0+0** **ECTS:7**
Determinants, eigenvectors and eigenvalues, characteristic polynomials, binary linear transformations, inner product spaces, Euclidean spaces, Positive definite matrices

MAT2014 **Analysis - IV** **4+2+0** **ECTS:7**
Multiple integrals. Application of double and triple integrals. Change of variables for double and triple integrals. Integral and uniform convergence. Vectorial analysis. Gradient, Rotation, Divergence. Integrals along paths. Surfaces and surface integrals. Green theorem, Divergence theorem, Stokes theorem

USEC0032, Social (Cultural) **Basketball** **2+0+0** **ECTS:4**
The objective of the course is to equip students with the basic skills to apply technical abilities specific to basketball and strategies for tactical applications

USEC0024, Social (Cultural) **Table Tennis** **2+0+0** **ECTS:4**
Table tennis equipment, game rules, and development of basic skills

USEC0020, Social (Cultural) **Volleyball** **2+0+0** **ECTS:4**
Fundamental Concepts in Physical Education and Sports; The Place, Function, Objectives, Philosophy, and Relationship with Other Sciences in Education and Instruction of Physical Education and Sports; Future of Professional Fields in Physical Education and Sports; Place and Function within Turkish Education and Sports Institutions; Effects of Physical Education and Sports on the Human Body; Conditioning and Motor Characteristics; Conditioning Practices; Approaches for Healthy Body and Healthy Living; Adequate and Balanced Nutrition; Basic Purpose and Duties of Training; Relationship between Loading and Rest in Training; Training Techniques; Understanding Volleyball branch, game rules, and philosophy.

USEC0022, Social (Cultural) **Football** **2+0+0** **ECTS:4**
The objective of the course is to equip students with knowledge and skills to describe the motor characteristics that need to be developed in the field of football, apply techniques specific to the sport, and analyze them based on principles of biomechanics

USEC0018, Social (Cultural) **Occupational Health and Safety** **2+0+0** **ECTS:4**
Security concepts, The definition of occupational health and safety in the modern sense, The historical development of the concept of ISG, occupational health and safety legislation, constitutional obligations relating to occupational health and safety, control of occupational health and safety, the duties and responsibilities of employers, the criminal and duties responsibilities of employers, regulation on principles and procedures of ISG training, frequently causes of occupational accidents and hazards, occupational diseases, occupational hygiene basics, signs, first aid and emergency exit signs, fire fighting and signs, emergency measures, personal protective equipment, safety culture, anthropometry, human-machine-environment, the scope of ergonomics, daily working order, ensuring the views and participation of employees taking.

3.Year Fall Semester	Number of Courses	ECTS
Compulsory	Three	Twenty
Technical (Departmental) Elective	One	Six
Social (Cultural)	One	Four

MAT3005 **Complex Analysis** **4+0+0** **ECTS:7**
Complex numbers, Topology of the complex plane, Functions of complex variable, Elementary functions. Limit and continuity of complex functions, Analytic functions, Complex integration. Cauchy integral theorems

MAT3007 **Abstract Algebra** **4+2+0** **ECTS:6**
Groups, Subgroups and Normal subgroups, Cyclic groups, Lagrange's Theorem, Group Homomorphisms, Group isomorphic Theorems, Rings, Factor Rings, Ring Homomorphisms, Ring Isomorphism Theorems, Prime and Maximal Ideals, Completeness Regions, Fields, Fraction Objects, Euclidian Regions, Principal Ideal Region, One kind of fragmentation regions.



MAT3011 **Differential Geometry** **4+0+0** **ECTS:7**

Euclidean Space; Tangent Vectors and Vector Fields in 3-dimensional Space, Directional Derivatives; Curves in 3-dimensional Space; 1-Forms; Differential Forms; Mappings Between Euclidean spaces; Dot Product; Curves; The Frenet Formulas; Arbitrary-Speed Curves; Covariant Derivatives; Frame Fields; Connection Forms; Surfaces 3-dimensional Space; Patch Computations; Differentiable Functions and Tangent Vectors; The Shape Operator; Normal Curvature; Gaussian Curvature; Computational Techniques; Special Curves in a Surface; Surfaces of Revolution.

MAT3003 Technical
(Departmental) Elective **Riemann Integrals Dependent on Parameters** **4+0+0** **ECTS:6**

Limit, continuity, derivation and integral of Riemann integrals depending of parameter; Gamma and Beta functions.

MAT3029 Technical
(Departmental) Elective **Numerical Analysis I** **4+0+0** **ECTS:6**

The need for numerical analysis, the stages of numerical analysis, coding with MATLAB/OCTAVE (conditional structures, loops and function programs, review). Finding an interval containing a zero of a function, the principles of numerical analysis using a paradigm problem of approximating a real zero of a function. Computer number system. Representation of real numbers in computers and related errors. Approximation of a function around a point using Taylor polynomials and resulting errors. Estimating an unknown value in a data set using polynomials and resultant errors (algebraic formulation, Lagrange, Newton and spline interpolations). Approximating a function over an interval using elementary functions and related error.

MAT3037
Technical
(Departmental) Elective **Fourier Series and Applications** **4+0+0** **ECTS:6**

Basic information and periodic functions, Fourier series of periodic functions, Fourier sine and cosine series convergence of Fourier series, Fourier series of general periodic functions. Non-homogeneous boundary value problems for ordinary differential equations, eigenvalues, eigenfunctions expansion method. Applications of non-homogeneous boundary value problems

MAT3025 Technical
(Departmental) Elective **History of Mathematics** **2+0+0** **ECTS:4**

History of number, mathematics in Egypt, Mesopotamia, Greek, European, Islam and modern

3.Year Spring Semester	Number of Courses	ECTS
Compulsory	Two	Fourteen
Technical (Departmental) Elective	Two	Twelve
Social (Cultural)	One	Four

MAT3010 **Partial Differential Equations** **4+0+0** **ECTS:7**

Basic concepts, First order linear partial differential equations and solutions with the method of characteristics, Cauchy problems for first-order equations (existence and uniqueness). Method of characteristics for second-order linear differential equations in two variables. D'Alembert solution of the wave equation. Separation of variables. Fourier series, Boundary value problems, eigenvalues and eigenfunctions. Fourier series solution of homogeneous and nonhomogeneous Diffusion, Laplace, Poisson and Wave equations.

MAT3014 **General Topology** **4+0+0** **ECTS:7**

The course focuses on the basic notions of topological spaces, open and closed sets, basis and sub basis for a topology, interior/closure/exterior of a set and neighborhood of a point, sub space topology, continuous functions between topological spaces, homeomorphisms, metric functions, topology induced by a metric, continuity between metric spaces, product and quotient spaces, countability, separation axioms, connectedness and compactness.

MAT3008 Technical
(Departmental) Elective **Number Theory** **4+0+0** **ECTS:6**

Linear Congruences, High Degree Congruence, Prime Modules, Power Residues, Quadratic Residues, The Legendre Symbol, The Quadratic Reciprocity Theorem, The Jacobi Symbol, Multiplicative Functions, Diophantine Equation



MAT3024 Technical (Departmental) Elective **Introduction to Motion Geometry** **4+0+0** **ECTS:6**

Groups, Rings, Dual numbers, Ring of dual numbers, D-Modul, The matrix representation of a dual number, 1st absolute value of a dual number, Conjugate dual numbers, Group action on a set, System of equivalent vectors and G-orbit, G-invariant function, 2nd absolute value of a dual number, The group D1, The group GD1, Relation between The groups D1 and GD1, The problem of D1-equivalence, The problem of GD1-equivalence, The group D2, The group GD2, Relation between The groups D2 and GD2, The group D3, The group GD3, Relation between The groups D3 and GD3.

MAT3026 Technical (Departmental) Elective **Difference Equations** **4+0+0** **ECTS:6**

First order linear difference equations. Second order linear difference equations; constant coefficient homogeneous difference equations, constant coefficient non-homogeneous difference equations, variable coefficient homogeneous difference equations, variable coefficient non-homogeneous difference equations. Applications of difference equations. Higher order linear difference equations. Systems of first order difference equations

MAT3036 Technical (Departmental) Elective **Graph Theory** **4+0+0** **ECTS:6**

History of graph theory, graphs, subgraphs, graph isomorphisms, paths and trees, Euler tour, Hamilton cycles, applications to real life problems

MAT3032 Technical (Departmental) Elective **Academic Translation** **2+0+0** **ECTS:4**

Terms of mathematics, Mathematical texts and some examples, History of school of Mathematics.

USEC0010, Social (Cultural) **Project Management** **2+0+0** **ECTS:4**

Concepts of projects and programs; introduction to organizations and support mechanisms that provide project funding such as Kalkınma Ajansları, KOSGEB, TÜBİTAK, and framework programs; originality analysis of projects; local factors; risk analysis; analysis of priority areas; NACE codes; introduction to the professional consultancy sector; emerging new trends; discussion of the concept of sustainability; project cycle management and, in this context, the logical framework approach; the concept of grants; grant agreements; analysis and planning stages; situation analysis; stakeholder analysis; problem analysis; objective analysis; strategy analysis; time-activity and resource planning; SWOT analysis; completing the logical framework matrix; project budgeting; main and sub-costs; eligible and ineligible costs; resource planning; the concept of sustainability; the concept of multiplier effect; the concept of final beneficiaries; performance indicators; project monitoring; procurement mechanisms; and grant funding sources.

USEC0002, Social (Cultural) **History of Science** **2+0+0** **ECTS:4**

In this course, will be examined the emergence, development and interactions between civilization of science in ancient Egypt, Mesopotamia, China, India, Ancient Greece, Ancient Rome, medieval European and Islamic world, modern period. In this stage, will be included the examples from the major thinkers who contribute to science from each civilization. Thus, it will be possible to understand and interpret the stages of science in the historical process, the reasons for regression, displacement and change.

USEC0012, Social (Cultural) **Career Planning** **2+0+0** **ECTS:4**

Concepts related to career planning and development, career management practices and tools, career cycles and career problems and solutions, Relationship between career planning and vocational counseling, Individual career development, CV preparation and CV types, Job interview, Lifelong career planning, sensitive skills, Information is provided on concepts such as future professions, personal development, time and stress management. With the participation of human resources managers from public and private institutions, information is provided on recruitment processes and achievements.

4.Year Fall Semester	Number of Courses	ECTS
Compulsory	One	Six
Technical (Departmental) Elective	Four	Twenty-Four

MAT4001 **Seminar - I** **0+2+0** **ECTS:6**

The study will be selected in the field of mathematic with the director of advisor lecturer



MAT4007, Technical (Departmental) Elective **Applied Mathematics** **4+0+0** **ECTS:6**

Basic concepts, Power series methods for differential equations with variable coefficients, Frobenius method, Bessel and Legendre equations, integral transform methods, Solution of partial differential equations with Laplace method, introduction to variational calculus, perturbation methods.

MAT4013, Technical (Departmental) Elective **Transformations and Geometries** **4+0+0** **ECTS:6**

Euclidean geometry, transformations from the plane to itself, transformation groups, geometric invariants, translations, rotations, reflections, similarity geometry, similarity transformations, similarity group, Affine geometry, affine transformations, affine group, decomposition of a general affine transformation, projective transformations, Projective group, projective geometry

MAT4015, Technical (Departmental) Elective **Field extensions and Galois Theory** **4+0+0** **ECTS:6**

Introduction, (basic concepts of Rings, Polynomial rings and Vector spaces) Algebraic extensions of fields, Normal and Separable extensions, Introduction to Galois Theory.

MAT4017, Technical (Departmental) Elective **Introduction to Hyperbolic Geometry** **4+0+0** **ECTS:6**

Introduction to hyperbolic metric and hyperbolic field concepts. Review the basic concepts and relationships of hyperbolic trigonometry

MAT4021, Technical (Departmental) Elective **Numerical Solutions of Differential Equations** **4+0+0** **ECTS:6**

Mathematical models as initial value and/or boundary value problems; need for numerical methods, Initial value problems; single step methods (derivation, convergence analysis and implementation) (Euler, Trapezoidal, Runge-Kutta) , Multistep methods(explicit and implicit methods). Boundary-value problems: finite difference, shooting method; Difference methods and stability analysis for parabolic, elliptic and hyperbolic equations. Implementations with MATLAB GUI

MAT4023, Technical (Departmental) Elective **A first course in integral equations** **4+0+0** **ECTS:6**

The general terms about integral equations: The short history of integral equations, definition and classification; Solution of an integral equation; Converting Volterra Equation to an ordinary differential equation; Converting initial value problem to Volterra equation; Converting boundary value problem to Fredholm integral equation; Taylor series, Infinite geometric series, Solving Fredholm integral equation with using the Adomian decomposition method, the variational iteration method, the direct computation method, the successive approximations method, the method of successive substitutions; Homogeneous Fredholm integral equations; Fredholm integral equations of the first kind: The method of regularization; Solving Volterra integral equation with using the Adomian decomposition method, the variational iteration method, the series solution method, the successive approximations method, the method of successive substitutions; Volterra integral equations of the first kind: The series solution method, Conversion of first kind to second kind; Singular integral equations

MAT4025, Technical (Departmental) Elective **Introduction to Algebraic Topology** **4+0+0** **ECTS:6**

Continuous maps, product and quotient spaces, identification spaces, homotopy, fundamental group covering spaces, categories and functors

MAT4027, Technical (Departmental) Elective **Inequalities** **4+0+0** **ECTS:6**

Some basic inequalities, inequalities related to some special means of two and three positive numbers and their applications, geometric (triangular) inequalities, applications of geometric (triangular) inequalities, Bernoulli, Cauchy-Schwarz inequalities, Chebishev, inequalities related to some special means of n positive numbers, Convexity, Jensen, Popoviciu, Hermite-Hadamard inequalities, Applications of Convexity, Jensen, Popoviciu, Hermite-Hadamard inequalities, Hölder, Minkowski inequalities, types and applications.



MAT4029, Technical (Departmental) Elective **Cryptography** **4+0+0** **ECTS:6**

Modular arithmetic, History of cryptography, Classification of cryptographic systems, Caesar cipher, Affine cipher, Vigenere cipher, Vernam cipher, Hill cipher, Playfair cipher, ADFGX cipher, Permutation cipher, Pohlig-Hellman cipher, RSA cipher, ElGamal cipher, Elliptic curve cryptography, DES cipher.

4.Year Spring Semester	Number of Courses	ECTS
Compulsory	Two	Twelve
Technical (Departmental) Elective	Three	Eighteen

MAT4000 **Graduation Project** **2+2+0** **ECTS:6**

Carrying out academic research in comply with ethical issues, technical document preparation and presentation, document preparation and presentation on any topic suggested by advisor.

MAT4010 **Seminar II** **0+2+0** **ECTS:6**

Any topic at an undergraduate level chosen by advisor

MAT4004, Technical (Departmental) Elective **Discrete Groups** **4+0+0** **ECTS:6**

The Basic Spaces; A Model for the Hyperbolic Plane, Riemann Sphere, The Boundary at Infinity of the upper half-plane, The General Möbius Group, The Group of Möbius Transformations and Transitivity Properties of its, The Cross Ratio, Classification of Möbius Transformations, A Matrix Representation, Reflections, The Conformality of Elements of Möb, Preserving the upper half-plane, Topological groups, topological transformation groups, coverings, PSL (2, R) group and diskrete subgroups of its, Hyperbolic Length and Distance in the upper half-plane, hyperbolic polygons, hyperbolic area, Gauss-Bonnet formula, Fuchsian groups and algebraic properties, fundamental domains.

MAT4012, Technical (Departmental) Elective **Industrial Mathematics** **4+0+0** **ECTS:6**

Industrial mathematics and mathematical problems industry, Leontief input-output model, Typical optimization problems, geometric approach, algebraic approach: Simplex method, Dual problem, Two phase simplex method, Discrete Fourier transform and applications, Convolution and image applications, Mathematics of Tomography, Mathematics of GPS.

MAT4014, Technical (Departmental) Elective **Introduction to Functional Analysis** **4+0+0** **ECTS:6**

Metric spaces ; Connectedness, Completeness, and compactness; Normed linear spaces and Banach spaces; Inner product spaces, Hilbert spaces and orthogonal expansions; Lineer bounded functionals, dual spaces and Hahn-Banach Theorem; Lineer bounded operators; Lineer bounded operators in Hilbert spaces; ; Spectrum of an operator ; Compact operators.

MAT4016, Technical (Departmental) Elective **Module Theory** **4+0+0** **ECTS:6**

Modules, submodules, factor modules, module homomorphisms, free modules, finitely generated modules, cyclic modules, irreducible modules, non-separable modules, semi-simple modules, Artinian and Noetherian modules.

MAT4020, Technical (Departmental) Elective **Dynamical Systems** **4+0+0** **ECTS:6**

Basic concepts, dynamical systems, stability, bifurcation analysis.

MAT4024, Technical (Departmental) Elective **Manifolds and Hypersurfaces** **4+0+0** **ECTS:6**

Affine space, Euclidean space, topological manifolds, differentiable manifolds, curves on manifolds, tangent vectors and tangent space, Riemannian manifolds and covariant derivative, hypersurfaces, normal vector field in hypersurfaces, orientation, geodesics and parallelism, shape operator, Gauss transformation, calculation of the matrix of Weingarten transformation, fundamental forms and algebraic invariants of the shape operator.

MAT4028, Technical (Departmental) Elective **Discrete Mathematics** **4+0+0** **ECTS:6**

Basic Mathematical Logic concepts, proof methods, Basic Principles of Counting, Basic counting tools and combinatorics, Recurrence relations, Probability, Binomial expansion, Algorithms, Basic graphs and their properties.

