T.C. İSTANBUL TİCARET ÜNİVERSİTESİ

FACULTY OF HUMANITIES AND SOCIAL SCIENCES
DEPARTMENT OF MATHEMATICS
COURSE CONTENTS
ACADEMIC YEAR 2025–2026

General English 1

Subject pronouns; possessive adjectives; days of the week; numbers (0–100); classroom language; articles a/an; plurals; demonstratives (this/that/these/those); adjectives and colors; review of adjectives; imperatives; Let's; modifiers (quite/very/really); word order in questions; verb phrases; question words; Simple Present (affirmative/negative/interrogative); telling time; prepositions of time; adverbs; writing: "My Favorite Day"; can/can't; Present Continuous; weather and seasons; comparison of Present Simple and Present Continuous.

General English 2

Word order in questions; Simple Present; phrases with go; holiday activities; Simple Past vs. Past Continuous; time sequence and connectors (so, because, but, although); be going to (plans and predictions); airport vocabulary; Present Continuous for future arrangements; defining relative clauses; paraphrasing; writing: an email about travel arrangements; make/do; Present Perfect (just, yet, already); Present Perfect vs. Simple Past; shopping vocabulary; indefinite pronouns; -ing/-ed adjectives; comparative adjectives and adverbs; as…as; superlatives (+ ever + Present Perfect); describing a place; writing: a description of where you live; quantifiers; too / not enough.

Turkish Language 1

Aims and principles of the Turkish Language course; introduction of topics and course-following methods; languages in terms of structure; the place of Turkish among world languages; language varieties (spoken language, written language, dialect, accent, slang); historical development of Turkish; writing systems used by Turks; writing and language reform; characteristics of Turkish; analyzing opinion texts (topic, theme, main idea); current issues of Turkish; language–culture, language–thought, and language–communication; spelling rules and punctuation; principles and forms of expression; paragraph structure and types; problems in Turkish and errors in language acquisition; foreign words in Turkish; composition writing rules; expression disorders.

Turkish Language 2

General characteristics of written genres; novel, short story, theatre, and criticism in Turkish literature; the novel: features, development, analysis plan, and examples; the short story: features, development, types, analysis plan, examples; practice: identifying the topic and summarizing; theatre: features, development, examples; poetry: periods, movements, examples, practice; student presentations on selected texts (poetry/story/novel); criticism: its place in literature, major critics, examples; oral expression: forum, debate, panel, symposium—rules and examples; official correspondence and formal writing rules; types of formal texts (petition, CV, job applications/cover letters); practice on spelling and punctuation.

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Academic Success and Life Skills

Self-awareness; personal mission and vision; goal setting; time management; definition of communication and communication models; effective communication techniques; active listening in oral communication; conflict resolution; self-confidence and self-presentation; public speaking; stress and coping with stress.

Mathematical Analysis I

Real numbers; complex numbers; functions; limits and continuity; sequences; derivatives; applications of derivatives; differentials; Rolle's Theorem and the Mean Value Theorem; trigonometric, inverse trigonometric, exponential, logarithmic, hyperbolic and inverse hyperbolic functions; L'Hôpital's Rule; graphing functions; polar coordinates; parametric equations.

Mathematical Analysis II

Indefinite integrals; basic integration techniques; substitution; integration by parts; integrals of rational functions; trigonometric substitution; other substitution methods; definite integrals; Fundamental Theorem of Calculus; areas of planar regions; volumes of solids of revolution; surface areas of solids of revolution; arc length; improper integrals.

Linear Algebra I

Matrices and matrix operations; elementary row operations; row equivalence and inverse matrices; reduced row echelon form; elementary matrices and their properties; systems of linear equations (non-homogeneous): general and fundamental solutions; Gauss–Jordan elimination; homogeneous systems; determinants (definition, cofactor expansion, properties); adjugate matrix and properties; Cramer's Rule; applications of determinants; vector spaces: subspaces, span, linear independence, basis and dimension; row, column, and solution spaces.

Linear Algebra II

Linear transformations: definition, kernel and image, isomorphisms; matrix representation of linear transformations; change of basis; eigenvalues and eigenvectors; similar matrices; diagonalization; Cayley–Hamilton Theorem; matrix exponentials; inner product spaces; norms and orthogonality; Cauchy–Schwarz and triangle inequalities; orthogonal complement; orthogonal and orthonormal bases; Gram–Schmidt process; orthogonal projection; applications: Fourier series and least squares; diagonalization and quadratic forms: orthogonal matrices, orthogonal diagonalization, quadratic forms.

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Abstract Mathematics

Logic; propositions and operations; basic set theory; paradoxes; set operations; linear schemes; n-tuples; number systems; relations; ordered sets; well-ordered sets; lattices; functions; finite sets; countability; cardinality of sets.

Physics I

Vectors; motion in one dimension; planar motion; particle dynamics; work and energy; conservation of energy; dynamics of systems of particles; collisions; rotational kinematics; rotational dynamics; equilibrium of rigid bodies; oscillations; traveling waves; sound waves (with related experiments).

Physics II

Coulomb's Law and electric field; Gauss's Law; electric potential; capacitance; electrical energy and properties of dielectrics; current and resistance; energy and current in DC circuits; magnetic field; sources of magnetic field; Faraday's Law; inductance.

Analytic Geometry

Coordinate systems; vectors in the plane and in space; lines and planes in space; conic sections; translation and rotation; general equations of conics; surfaces; coordinate transformations; quadratic surfaces; cylindrical coordinates in space; vector algebra; transformations between coordinate systems; lines and circles; conics; quadrics; planes and lines in three-dimensional Euclidean space.

Mathematical Analysis III

Series; power series; Maclaurin and Taylor series; sequences and series of functions; Fourier series; multivariable functions; partial derivatives; total differentials; chain rule for several variables; implicit functions; maxima and minima; directional derivatives; gradient, divergence, curl; Laplacian; Jacobian.

Mathematical Analysis IV

Double integrals; area computation using double integrals; change of variables in double integrals; triple integrals; surface areas; line integrals; Green's Theorem and applications; surface integrals; Stokes' Theorem; Divergence Theorem.

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Algebra I

Relations and binary operations; divisibility in integers; congruences; prime numbers; fundamentals of group theory; subgroups; cyclic subgroups; cosets and normal subgroups; homomorphisms; quotient groups; isomorphism theorems; Cayley's Theorem; Sylow theorems.

Algebra II

Rings and basic properties; subrings; integral domains; quotient rings; isomorphism theorems for rings; domains; homomorphisms; ideals; prime and maximal ideals; arithmetic in rings: divisibility, units, associates, gcd/lcm, primes, factorization; division algorithm; Euclidean domains; polynomial rings: basic concepts, polynomial rings over fields, division algorithm and factorization.

Differential Equations I

Differential equations; initial conditions; existence and uniqueness theorems; first-order differential equations and solution methods; separable and homogeneous equations; exact equations; integrating factors; first-order linear equations; nonlinear equations: Bernoulli and Riccati equations; selected applications of first-order equations; higher-degree first-order equations.

Differential Equations II

Higher-order linear differential equations; linearity; homogeneous equations; solutions with constant coefficients; reduction of order (d'Alembert); non-homogeneous equations: variation of parameters (Lagrange method) and particular solutions; method of undetermined coefficients; Cauchy–Euler equations; selected applications of second-order equations; series solutions: power series, Taylor series; equations with analytic coefficients; singular and regular singular points; Frobenius method; systems of first-order linear differential equations; matrix differential equations and fundamental solutions; two-variable systems; constant and variable coefficient systems; higher-order systems.

Computer Programming I (C)

Algorithms and flowcharts; variable definitions in C (int, float, double, char); if and switch–case; loops (for, while, do–while); function definition and usage; arrays and strings; mathematical array operations; 2D and 3D matrix applications; pointers; pointer usage in arrays and matrices.

Computer Programming II (Python)

Introduction to Python; basic data types; lists, tuples, dictionaries; logical operators; membership and identity operators; conditional statements; for and while loops; functions and arguments; modules and packages; exception handling; classes; inheritance and encapsulation; GUI basics; web framework fundamentals; Machine Learning I (setup and introductory applications); Machine Learning II (applications and deep learning).

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Descriptive Statistics

Introduction to statistics; fundamental concepts; types of data; data collection; reliability and validity of data; measures of central tendency (arithmetic mean, geometric mean, root mean square, median, mode); properties of central tendency; choosing an appropriate measure; measures of variability (variance, standard deviation, range, coefficient of variation).

Atatürk's Principles and History of the Turkish Revolution I

Purpose of studying the course; the concept of revolution and related basic concepts; causes preparing the collapse of the Ottoman Empire and the Turkish Revolution; World War I and the Armistice of Mudros; the situation in the country under occupation and Mustafa Kemal Pasha's response; landing in Samsun; first steps of the National Struggle; organization through congresses; Kuva-yi Milliye and the Misak-ı Milli; opening of the Grand National Assembly of Türkiye (TBMM); TBMM taking leadership of the War of Independence; the struggle up to the Battle of Sakarya; the Battle of Sakarya and the Great Offensive; from Mudanya to Lausanne.

Atatürk's Principles and History of the Turkish Revolution II

Political reforms; attempts to transition to multi-party politics (I–II); developments in law; developments in education, culture, and health; economic policy in the early Republic; Turkish foreign policy in the Atatürk era (1923–1938); the Kemalist thought system and principles; Türkiye after World War II; domestic political developments (1950–1980); domestic political developments (1980–2012); Turkish foreign policy (1960–2012).

Probability Theory

Set theory; counting techniques; factorial; permutations; combinations; multinomial expansion; probability concepts; addition and multiplication rules; statistical independence; ordered/unordered probabilities; Bayes' Theorem; random variables; discrete and continuous random variables; probability (density) functions; distribution functions; expected value and variance and their properties; standardized random variables; discrete distributions: Bernoulli, Binomial, Poisson, discrete uniform; normal distribution.

Complex Analysis I

Complex numbers; point sets; paths and regions; complex functions and holomorphic functions; harmonic functions; conformal mappings; singularities; power series in complex variables; series representation of functions; zeros and poles; Möbius transformations; rational functions; exponential, trigonometric, and logarithmic functions; complex integration along curves; Cauchy theorems; Cauchy integral formula; derivatives of holomorphic functions; antiderivatives; Morera's Theorem; series of functions; Laurent expansion; residues and the residue theorem.

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Complex Analysis II

Residue computations; integrals over circular arcs; integrals of rational functions; integrals of trigonometric functions; Fourier integrals; counting zeros and poles; analytic continuation; complex continuation; multivalued functions; entire and meromorphic functions; infinite products; Weierstrass product (P-) function; Euler's gamma function.

Numerical Analysis I

Errors: absolute/relative error and error propagation; approximate roots of nonlinear equations and systems; finite differences and applications; difference equations and applications; Lagrange interpolation; Newton interpolation and applications; Aitken's method; curve fitting methods; numerical differentiation (higher-order formulas, partial derivatives); numerical integration methods; numerical methods for multiple integrals; numerical methods for first-order differential equations.

Numerical Analysis II

Direct methods for linear systems: Gaussian elimination, Gauss–Jordan; pivoting and special matrices; LU decomposition; QR decomposition; Gram–Schmidt orthogonalization; iterative methods: Jacobi, Gauss–Seidel, SOR; interpolation: spline and quadratic spline; curve fitting; Runge–Kutta methods; solutions of higher-order systems; numerical solutions of ODEs with boundary conditions; finite difference methods for linear and nonlinear problems; numerical solutions of partial differential equations.

Topology I

Metric spaces; topology; open and closed sets; neighborhoods; closure and interior; induced topology; limit points; bases and subbases; local bases; first and second countability; continuous functions; open and closed maps; separation axioms.

Topology II

Compact spaces; locally compact spaces; sequential compactness; countable compactness; connected spaces; separation axioms; convergence; countability.

Differential Geometry

Curves in (R^2); and (R^3); arc-length parametrization, Frenet frame, curvature and torsion, Frenet–Serret formulas, fundamental theorem of curve theory; isoperimetric inequality. Regular surfaces: tangent plane, differential maps, tangent and normal vector fields, first fundamental form, Gauss map, shape operator, second fundamental form, principal curvatures and directions, Gaussian and mean curvature, normal and geodesic curvature.

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Real Analysis I

Length of an interval; area and volume; length of unions of disjoint intervals; length of open and closed sets; measurability; inner and outer measure; measurable sets; Lebesgue inner and outer measure; Lebesgue measure; measurability theorems; non-measurable sets; measurable functions; convergence almost everywhere; convergence in measure; Egorov's Theorem; geometric interpretation of the Lebesgue integral; representation of Riemann and Lebesgue integrals; Lebesgue integral on bounded measurable sets; Lebesgue integral as a limit of sums; Lebesgue integral theorems; relation between Riemann and Lebesgue integrals.

Real Analysis II

Abstract measure spaces; measure functions; sigma-additivity; measurable functions and properties; integrals in measure spaces; general convergence theorems; signed measures; Hahn decomposition theorem; absolutely continuous and singular measures; Radon–Nikodym theorem; Lebesgue decomposition theorem; (L^p) spaces; outer measure; extension and inner measure; modes of convergence; Fourier series and Fourier integrals.

Functional Analysis I

Preliminaries; metric spaces; linear spaces; normed spaces; Banach spaces; finite-dimensional spaces; linear operators; bounded and continuous linear operators; dual spaces; key theorems; Hahn–Banach, Open Mapping and Closed Graph theorems; inner product spaces; Hilbert spaces; Riesz Representation Theorem; Banach algebras.

Functional Analysis II

Inner product spaces; orthogonality; orthogonal complements; closed subspaces; complete subspaces; Hilbert spaces; linear transformations on Hilbert spaces; identifying functionals; adjoint operators; fundamental theorems of functional analysis; Hahn–Banach; Uniform Boundedness Principle; Open Mapping Theorem; closed linear operators; Closed Graph Theorem; Baire Category Theorem; strong and weak convergence; fixed point theorems in metric and normed spaces and applications.

Partial Differential Equations I

First-order PDEs: linear, quasi-linear, semilinear, fully nonlinear equations; Lagrange's method; method of characteristics; Cauchy problem and existence–uniqueness; Pfaff differential equation; Lagrange–Charpit method; higher-order constant-coefficient linear PDEs; classification and canonical forms of second-order PDEs.

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Partial Differential Equations II

Wave equation; initial value problems; initial-boundary value problems; Fourier series and eigenvalue problems; separation of variables; heat equation; maximum principle; energy integral; Laplace equation; Green's identities; harmonic functions and properties; Green's functions; Dirichlet, Neumann, and Robin boundary value problems; solutions in rectangular and circular domains via separation of variables.

Career Planning

Intelligence, character, and key personal traits; what is a career? basic definitions; career development program and process; career planning; roles and responsibilities of employees; writing a career planning portfolio; career management; roles and responsibilities of organizations; related concepts; new-era career approaches; career problems.

Graduation Project

Under the supervision of an academic advisor, the student is assigned a research topic in advanced mathematics. A literature review is conducted. Using LaTeX, the graduation project is designed as a poster. After the advisor's approval, the student presents the work to a jury within the schedule prepared by the department chair.

Professional English I

Introduction to fundamental grammar structures; sentence building with connectors; translation techniques; basic English terminology in the field; translation practice of field-related texts (English→Turkish and Turkish→English), including topics such as proofs of the infinitude of primes (Euclid), countability/uncountability of sets (Continuum Hypothesis), different sizes of infinity, metric spaces, normed spaces, Banach spaces, linear transformations, and selected problems and theorems from classical geometry.

Professional English II

Norm and inner product in (R^n); open/closed sets; interior, exterior, boundary; compactness; Heine–Borel theorem; continuous functions; differentiation and differentiability; the differential as a linear map; measure theory and integration in (R^n); Riemann integrability; measure and content; measure-zero sets; Jordan measurability; further topics in integration theory; Lebesgue's theorem; fields and forms; integration on manifolds.

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Research and Reporting Techniques

Science and research; scientific research approaches; research methods; qualitative research designs and scales; literature review (reading academic articles); sampling; field research; quantitative research designs; fieldwork; quantitative data analysis; ethics and political perspectives in social research; research report writing and presentation (academic writing rules).

Advanced Programming Languages I

Advanced programming needs and engineering foundations; software used in businesses; technologies and infrastructures behind enterprise software; databases; systems analysis; database systems analysis; SQL programming; data mining with SQL; overview of .NET technologies; data mining with ASP; data mining with VB.NET.

Advanced Programming Languages II

Performing operations in SQL DBMS; data types and definitions; designing databases with required features; creating tables; defining constraints; establishing relationships between tables; querying/modifying/inserting/deleting data using SQL; creating indexes; creating triggers; database backup and recovery.

Computer Programming III (C)

C notation; functions; if–else and for commands; logical operators; else if and loop types; while and do–while loops; using switch–case instead of if; variable types in C; character and numeric arrays; multidimensional arrays; string functions; pointers and their use; pointers in arrays; console input/output commands.

History and Philosophy of Mathematics

Definition of civilization; ancient Egypt; Babylonian civilizations; Egyptian and Babylonian mathematics; antiquity and Roman civilization; mathematics in antiquity and Rome; mathematicians; medieval civilization; medieval mathematics and mathematicians; Islamic mathematicians; Renaissance mathematicians; 19th–20th century mathematicians; mathematicians in the Republic of Türkiye; mathematical thinking methods; crises and paradoxes in mathematics; philosophical views on the foundations of mathematics.

Fuzzy Mathematics

Classical sets and set operations; fuzzy sets and the concept of membership; types of membership functions; (α)-cuts; subsets and support of a fuzzy set; union, intersection, complement; convexity; fuzzy relations and operations; fuzzy numbers and operations; interval arithmetic; (α)-cuts of fuzzy numbers;

types of fuzzy numbers (triangular, trapezoidal); distance and Hausdorff metric; sequences of fuzzy numbers; convergence and boundedness; statistical convergence and boundedness; difference operators.

Introduction to the History of Science and Technology

What is science? what is technology? basic concepts related to technology; technological progress and technological change; science and technology in prehistoric ages; effects of Turks' adoption of Islam on science and technology; science and technology during the Renaissance and Enlightenment; development of science in the modern era in the West; science in Türkiye during the Republican era.

Mathematics Teaching Techniques

The course aims to identify appropriate teaching methods and techniques for science and mathematics based on learning–teaching theories and approaches. It includes examining learning and teaching theories, selecting methods suitable for science and mathematics, developing activities and lesson plans, and implementing them in classroom settings.

Financial Mathematics

Simple interest (true/ordinary); simple discount (true/ordinary, present value); equation of bills using simple discount; amortization with equal installments; investment/placement with simple interest (beginning/end of period); current accounts; compound interest (true/ordinary); compound discount (present value, equation of bills); investments under compound interest (beginning/end of period); annuities (level and varying); borrowing (fixed/variable installments); investment evaluation.

Applied Mathematics

Force fields and work; conservative fields; potential functions; periodic functions; orthogonal and orthonormal function systems; Fourier series for even/odd functions; complex Fourier series; special functions defined via integrals; Leibniz rule; Gamma function; Beta function.

Theory of Ordinary Differential Equations

Existence and uniqueness theorems for initial value problems; first-order equations, systems, and higher-order equations; structure of linear problems; boundary value and eigenvalue problems; oscillation and comparison theorems.

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Galois Theory

Algebraic extensions; algebraic closure; splitting fields; normal extensions; separable extensions; finite fields; fundamental theorem of Galois theory; cyclic extensions; solvability by radicals; solvability of algebraic equations; constructions with straightedge and compass.

Introduction to Lie Groups and Lie Algebras

General linear groups; matrix groups; examples: orthogonal groups; tangent space and dimension of matrix groups; smooth homomorphisms; matrix exponential and logarithm; center of a group; maximal tori; Clifford algebras; normalizers and Weyl groups; reflections and roots.

Projective Geometry

Projective spaces; homogeneous coordinates; dual spaces; affine and projective transformation groups and properties; Desargues' theorem; Pascal's theorem and classical consequences; classification of conics; projective plane curves; singular points; intersection multiplicity; Bézout's theorem; group law on elliptic curves; cross-ratio.

Mathematical Game Theory and Applications

Definition, classification, and formulation of games; zero-sum and positive-sum games; solution concepts: minimax/maximin strategies, Nash equilibrium, dominant strategies; mixed strategies; two-stage repeated games; infinitely repeated games; Nash equilibrium in repeated games.

Orthogonal Polynomials and Applications

Legendre functions; generating functions for Legendre polynomials; recurrence relations; the Legendre differential equation; associated Legendre functions; Hermite polynomials; recurrence relations; Hermite differential equations; Laguerre functions; Laguerre differential equation; associated Laguerre polynomials.

Fourier Series and Periodic Distributions

Properties of periodic functions; convolution; approximation; Weierstrass approximation theorem; periodic distributions and operations; Hilbert spaces; (L^2) space; orthogonal expansions; Fourier series; applications of Fourier series.

Analysis on Manifolds

Functions on Euclidean spaces; differentiation; inverse and implicit function theorems; integration; partitions of unity; Sard's theorem; multilinear maps, tensors, and differential forms; Poincaré lemma; chains and integration over chains; Stokes' theorem; differentiable manifolds; vector fields and differential forms on manifolds; orientation and volume; applications.

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Introduction to Representation Theory

Group representations; (FG)-modules; Maschke's Theorem; irreducible modules and group algebras; characters; inner products of characters; number of irreducible characters; character tables; induced modules and characters; algebraic integers and real representations.

Graph Theory

Graphs; trees; Cayley's formula; connectivity; Eulerian and Hamiltonian graphs; matchings; vertex and edge coloring; chromatic numbers; planar graphs; directed graphs; networks; Kuratowski's theorem.

Metric Spaces

Basic mathematical concepts; metric spaces; normed spaces; topological concepts in metric spaces; subspaces and equivalent metrics; convergence in metric spaces; continuity in metric spaces; related concepts; convergence and continuity in normed spaces; completeness and complete metric spaces; equivalence of metrics and metrizable spaces; compact metric spaces and properties; open and closed sets; connected metric spaces.

Number Theory

Integers; well-ordering principle; induction; Fibonacci numbers; divisibility; primes and distribution of primes; conjectures on primes; gcd and lcm; Euclidean algorithm; fundamental theorem of arithmetic; Fermat factorization; linear Diophantine equations; perfect numbers; Mersenne numbers; congruences; linear congruences; Chinese remainder theorem; Wilson's theorem; Fermat's little theorem; Euler's phi function; Möbius inversion; continued fractions.

Discrete Mathematics

Logic and proofs; sets; functions; sequences and sums; algorithms; integers; matrices; induction and recurrence; counting; pigeonhole principle; permutations and combinations; advanced counting techniques; recurrence relations and solving linear recurrences; generating functions; inclusion–exclusion; graphs; graph isomorphisms; connected graphs; Euler and Hamilton paths.

Dynamical Systems and Chaos

Orbits; graphical analysis; fixed and periodic points; symbolic dynamics; chaos and the dynamics of complex functions.

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Modeling and Analysis of Complex Systems I

Fundamentals of dynamical systems; phase space; discrete-time models via difference equations; classification of model equations; simulation of single-variable discrete-time models; multivariable discrete-time models; finding equilibrium points; cobweb diagrams; phase space visualization; variable rescaling; asymptotic behavior of linear dynamical systems; linear stability analysis; continuous-time models via differential equations; numerical solution methods; simulation techniques in Python.

Modeling and Analysis of Complex Systems II

Analysis of continuous-time models; equilibrium points and stability; vector fields and phase portraits; nullcline analysis; eigenvalue/eigenvector analysis; Jacobian matrix; Hartman–Grobman theorem; bifurcation theory (saddle-node, transcritical, pitchfork, Hopf, period-doubling); chaos theory; chaos in the logistic map; sensitive dependence on initial conditions; Lyapunov exponents; Lorenz and Rössler systems; strange attractors; Feigenbaum constants; bifurcation diagrams.

Mathematics in Social Sciences

This course examines mathematical models used to analyze issues in the social sciences. It aims to enrich the knowledge and skills gained in core mathematics courses through analytical and computational applications and to develop modeling skills for applying mathematics in various fields. Methods from Linear Algebra, multivariable calculus, sequences and series, differential equations, probability, and statistics are actively used through model-based examples. Selected applications include optimization problems, general equilibrium models, growth models, monetary and financial markets, forecasting methods, decision-making under risk and uncertainty, and strategic thinking.

Combinatorics

Logic, sets, and functions; fundamentals of algorithms; numbers and matrices; computational techniques; relations; chromatic polynomials; graphs; trees; Boolean algebra; finite-state machines with/without output.

Integral Equations

Fundamental concepts; classification of integral and integro-differential equations; linearity and homogeneity; converting IVPs to Volterra integral equations and vice versa; converting BVPs to Fredholm integral equations and vice versa; second-kind Volterra integral equations: Adomian decomposition, successive approximations, Laplace transform, series solutions; first-kind Volterra integral equations: series solutions, Laplace transform, reduction to second kind; second-kind Fredholm integral equations: direct methods, Adomian decomposition, successive approximations, series solutions; homogeneous Fredholm integral equations: direct methods; second-kind Volterra integro-differential equations: Laplace transform, series, Adomian decomposition; converting Volterra integro-differential equations to IVPs and to Volterra integral equations; second-kind Fredholm integro-differential equations: direct solutions.

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Coding Theory

Error-correcting codes; linear codes; encoding and decoding with a linear code; dual codes; parity-check matrices; syndrome decoding; Hamming codes.

Difference Equations

Basic definitions; deriving difference equations; first-order difference equations; linear difference equations; constant-coefficient linear difference equations; nonlinear difference equations; applications.

Mathematical Statistics

Basic sampling theory; estimation theory; statistical decision theory; hypothesis testing and significance; small-sample theory; t-distribution and chi-square tests; curve fitting and least squares; correlation theory; multiple and partial correlation; time series analysis; index numbers.

Cryptology

Terminology and history of cryptology; encryption algorithms; symmetric encryption; asymmetric encryption; hybrid algorithms; decryption analysis; cryptanalysis; statistics in cryptology; statistical tests in cryptanalysis; applications; comprehensive review.

Linear Programming

Linear decision-making models; steps of model formulation; general form of linear programming models; converting to standard form; graphical solution method; simplex method; duality and sensitivity analysis; primal–dual relationships; economic interpretation of duality; dual simplex method; Big M method; two-phase simplex method.

Mathematical Software Packages

Vectors and matrices; solving systems of linear equations; polynomials; 2D/3D graphics; programming in MATLAB; symbolic computations (integration, differentiation, solving algebraic equations); numerical computations (root finding, numerical integration); differential equations; numerical methods.

Academic Turkish for International Students I

Aims and principles of the course; introduction of topics and course-following methods; language varieties and structure; place of Turkish among world languages; spoken/written language; dialect/accent/slang; history of Turkish; writing systems; writing and language reform; characteristics of Turkish; analyzing opinion texts (topic, theme, main idea); spelling and punctuation; principles of expression (written/oral);

planning, paragraph writing, summarizing; correct Turkish in oral expression; problems in Turkish and language acquisition errors; foreign words; misuse of elements; official correspondence (petition, CV, job letters); spelling/punctuation practice.

Academic Turkish for International Students II

Common language and writing errors in assignments and exam papers; general characteristics of genres; novel, story, theatre, criticism; novel: features, development, analysis plan and examples; story: features, development, types, analysis plan and examples; poetry: features, development, analysis plan and examples; theatre: features, development and examples; practice and student presentations; written genres: article, column, essay, travel writing, diary, memoir; practice and presentations; oral genres: forum, debate, panel, symposium; features and rules with examples; practice and presentations; evaluation of student work; exam-oriented review and practice.

City, Culture, and Istanbul

Developing an awareness of urban identity through the concept of urban culture; evaluating Istanbul in terms of history, geography, architecture, and literature; experiencing and sustaining Istanbul's culture by following artistic and cultural events; becoming familiar with traditional Turkish arts in the Istanbul context; understanding Istanbul's significance in Türkiye and the world.

Sign Language

Finger alphabet (two-handed) and vocabulary categories: nouns, antonyms, verbs, adjectives; weekly themes: family and social circle; body and health; midterm; home and household items; food and drinks; clothing and accessories; emotions, professional terms, directions.

Civilization and Society

The agricultural revolution; rise of the first civilizations in the Near East and Asia; emergence and development of Greek and Hellenistic civilization; Roman civilization; emergence and development of Islamic civilization; the Middle Ages in the West; Renaissance and Reformation; Enlightenment and post-Enlightenment transformations in modern civilization in political, social, and economic terms.