Mathematics Education Department

Undergraduate Program Course Descriptions

FIRST SEMESTER

MATH 133 Calculus

7 ECTS

The concept of limit of functions of single variable and its applications. Continuity of one variable functions and its applications, discontinuity types. Concept of derivative of one variable functions and differentiation rules. Derivatives of trigonometric, logarithmic, exponential, hyperbolic functions, inverses of these functions and implicit functions. Derivatives of higher orders. Extremum and absolute extremum values, extremum problems and their applications in different areas. Rolle and Mean-value theorems. Finite Taylor Theorem. L'Hospital rule and computation of limits of functions using L'Hospital rule. Differential and linear increase. Concept of integral, indefinite integrals, techniques of integration, definite integrals, computation of area and volume via definite integral, applications of integrals in various areas.

MATH 139 Introduction to Discrete Mathematics

5 ECTS

Concepts of axiom and theorem. Explanation of direct and indirect methods of mathematical proof. Axioms and theorems in symbolic logic and applications of symbolic logic. Concept of sets and operations on sets. Cartesian product and graphing. Relations and properties of relations. Different types of relations, equivalence and order relations. Construction of numbers by using equivalence classes. Concept of a function, injective, surjective and bijective functions, composite function, inverse of a function and their applications. Concept of power of a set, finite and infinite sets.

MATH 231 Analytical Geometry

5 ECTS

Introduction to plane analytical geometry: Points in the Cartesian plane, Analytical descriptions of lines, and graphs of curves. Vectors in the plane, lines, conic sections (e.g., circles, parabolas, ellipses, and hyperbolas). Coordinate transformations and curve sketching. Polar coordinates and parametric equations. Vectors in three dimensional space, equations of lines and planes, vectoral equations of lines and planes. Conics in space, plane, and conic sections.

In addition, definition of geometry and its daily-life applications. Fundamental concepts of geometry (e.g., theorems, axioms, and postulates). Euclidean plane geometry and non-Euclidean geometry. Fundamental axioms of Euclidean geometry. Relationships between point, line and plane. Polygons, triangles, similar figures, properties of circles, constructions, geometric solids, finding area and volume of solids.

ELE 102 Introduction to Mathematics Teaching

5 ECTS

The goal of the course is to orient students to teaching profession more specifically mathematics teaching. Students will investigate the theoretical stance of mathematics teaching and how this profession is shaped in Today's Turkey. They will also make visits and observations in different mathematics classrooms in both private and public schools. In addition, students will be introduced to the mathematics education field by introducing important US, Turkish, and European mathematics teacher organizations and their publications and conferences.

TURK 111 Turkish Language and Literature I

2 ECTS

Language theories, the birth of languages, and the relationship between language and culture. The classification of languages with a specific focus on the Ural-Altaic language family that the Turkish language belongs. The study of four major areas of linguistics: Phonetics, morphology, syntax, and semantics. The phonetic structure of Turkish: Word and sentence structure. Analysis of selected poems, essays, and works of fiction. The basic features of written language and written communication with a specific focus on the differences as well. Communication, in relation to written and verbal means; subjective and objective communication; paragraph and types of paragraph (introductory, developmental, and conclusive paragraphs). Definition of text and text types (informative or literary texts); basic tenets of texts (coherence, cohesiveness, intertextuality, etc.). Written communication (free writing, pre-planned writing); stages of pre-planned writing (topic, narrowing down the topic, aim, view point, identifying the main and supporting ideas, outlining, margins); theoretical knowledge on informative texts (petition, letter, news, decision, advertisement, official report, scientific articles); studies on examples and applications; summarizing and outlining a text; correcting the language errors of written productions.

HISTR 211 Principles of Atatürk and History of the Turkish Republic I

2 ECTS

Concepts, definitions, course method and definition of source, Industrial Revolution, French Revolution, Dissolution Period in the history of Ottoman Empire (19th Century), administrative reforms, 1st and 2nd Constitutional Monarchy Period, Tripoli and the Balkans War, 1st World War, Mondros Armistice Agreement, Wilson Principles, Paris Conference, M. Kemal's arrival in Samsun and situation in Anatolia, Amasya Declaration, National Congresses, foundation of Turkish Grand National Assembly (TGNA), national revolts, constitution, foundation of unitary army, 1st İnönü, 2nd İnönü, Kütahya, Eskişehir, Sakarya Wars and Grand Attack, War of Independence, Lausanne and other Treaties and abolition of Sultanic rule.

ENG 101 English for Academic Purposes I

4 ECTS

Focuses on the skills of academic reading, writing, listening, and speaking. It revolves around thematic modules and aims at developing critical thinking skills, which enable students to become confident lifelong learners. Enable university students to use their reading, speaking, listening and writing skills at a certain level of efficiency in academic activities of all sorts they carry out in their study fields. Improving linguistic and communicative competence and foreign language proficiency of the learners by offering interesting contexts, doing exercises that boost functional use of language and using language in real life communication.

SECOND SEMESTER

MATH 134 Advanced Calculus

7 ECTS

Concept of multivariable functions, definition of functions and value sets, function graphs. Concept of limit in bivariate functions and its applications, concept of continuity. Partial differentiation in bivariate functions, chain rule, linearization, local and absolute extremum and their applications. Lagrange multipliers, concept of double integral, calculation of volume using double integrals. Concept of sequence and series and their applications. Convergence and divergence in series, alternating series, convergence criteria in series and power series. Function series, uniform and point-wise convergence in functions, general convergence tests. Taylor series and its applications in daily life, Fourier series.

EDS 101 Introduction to Educational Sciences

5 ECTS

The goal of the course is to have students investigate and understand the social, economic, historical, political, and philosophical foundations of education which shape and continue to affect the current system of education. It also focuses on the relations between these social, economic, cultural forces and student achievement. To help students understand the relations between the social, economic, cultural forces and the current state of schooling, students are required to conduct fieldwork.

EDS 102 Turkish Education System and School Management

5 ECTS

This course is designed for prospective teachers to develop the perception and skills related to education systems, Turkish Education System, and school management. It aims to increase understanding of Turkish Education System and other basic concept of education management such as organizational structure, organizational culture, motivation, leadership, decision-making, communication, organizational change, finance, and personnel administration.

MATH 136 Philosophy of Mathematics

2 ECTS

This course provides students to state several key philosophical questions that prompted a search for a "foundation" for mathematics and mathematics education in the 19th and 20th centuries. Second, students learn to explain how changes in mathematical practice changed philosophical theorizing.

GC 102 Cultural Skills I

3 ECTS

There is a chance of better interactions among students, teachers and community in schools where teachers have a variety of cultural skills and performance abilities. In this course, depending on their individual interests and abilities, prospective teachers will choose a cultural skill, such as musical performance, folkloric dance, acting, cooking, clothing, storytelling, fine arts and the like, and develop expertise and skills on

the chosen cultural component. They are expected to demonstrate competency by performing and producing in the chosen cultural area.

TURK 112 Turkish Language and Literature II

2 ECTS

Basic features of oral language and oral communication. Oral expression; basic features of oral skills (using the natural language and body language); basic tenets of giving a good speech; basic features of a good speaker (stress, intonation, pitch, etc.). Impromptu and prepared speech; stages of prepared speech (selecting a topic, narrowing-down, aim, view point, identification of main and supporting points, planning, preparing the text, presentation of the speech). Types of speech: (dialog, conversation, introducing yourself, answering questions, celebrating special events, such as new year's eve, child birth, festivals, etc., giving directions, talking on the phone, job application, interviewing, speaking on the radio and TV, etc.). Giving impromptu speech on different topics, applications in speech samples and giving speeches, correcting errors in speech.

HISTR 212 Principles of Atatürk and History of the Turkish Republic II

2 ECTS

Political revolutions, political parties, transition to multi-party period, revolutions in law, reorganization of social life, renovations in economy. Turkish foreign policy between the years of 1923 and 1938, Turkish foreign policy after Atatürk, principles of Turkish Revolution (Republicanism, Populism, Secularism, Revolutionism, Statism, Nationalism). Integral principles.

ENG 102 English for Academic Purposes II

4 ECTS

This course has been designed to enable university students to use their reading, speaking, listening and writing skills of English at a certain level of efficiency while conducting academic activities in their own fields. The aim of this course is to raise the knowledge and abilities the students have gained in the "English for Academic Purposes I" course to a higher level. While doing so, the focus is on creating interesting contexts, doing exercises that increase the functional competence, using the language in authentic communicative contexts and in this way to increase the linguistic and communicative competence and the linguistic proficiency of students.

THIRD SEMESTER

MATH 237 Probability and Statistics

6 ECTS

Fundamental concepts, frequency distributions, histogram and frequency polygon, graphical representations of categorical data and applications. Parametric and non-parametric central tendency measures and their applications. Parametric and non-parametric distribution measures and their applications. Skewness and kurtosis. Elementary probability concepts. Introduction to statistics: Descriptive statistics, correlation and regression, estimation and hypothesis testing, non-parametric statistics. The concept of normal distribution, characteristic of the normal distribution, standard normal curve areas, approach of discrete distributions to the normal distribution. A brief theoretical knowledge of sampling theory, the sampling distribution of the means, sample distribution for rates, sampling distribution of the difference between means, sampling distributions of differences between proportions and applications. Brief theoretical knowledge on prediction theory, point estimation and confidence limits, the confidence interval for means, the confidence interval for rates, the confidence interval for standard deviations, the confidence interval for differences between the means, the confidence interval for differences between the rates and applied studies.

MATH 239 Linear Algebra

7 ECTS

Matrices, determinants and systems of linear equations. Vector spaces, the Euclidian space, inner product spaces, linear transformations. Orthogonality, concept of Orthogonality in three-dimensional space and distance function, operation of Gram-Schmidt, orthogonal matrices, least square approximations and applications. Determinants, determinants and row reduction, solution of linear equations using Cramer rule. Characteristic equation of matrices, eigenvalues and eigenvectors. Diagonalizability and matrice operations.

PHYS 103 Physics I

6 ECTS

Standards, SI unit system, dimension analysis, vectors. Motion knowledge (kinematics): definition of motion and variables, examples of motion in one and two dimensions, relative velocity, Force knowledge (dynamic): Newton's laws and applications, universal gravity, friction: energy, work, power, types of mechanic energy, energy in conservative and non-conservative systems. Linear momentum: Center of mass, interaction in one and two dimensions. Circular motion: Equilibrium in solids, kinematics, dynamics, energy and angular momentum of circular motion. Mechanic properties of matter, granular structure of matter, elongation, cut and volume elasticity, pressure, lifting force, viscosity and moving fluids, Bernoulli principle. Oscillating motion: kinematics, dynamics and energy of simple harmonic motion, damped and forced oscillation, resonance. Wave motion: kinematics, dynamics, energy, reflection and refraction, sound waves, static waves, resonance, sound intensity, Doppler phenomenon.

PHYS 103L Physics I Lab.

2 ECTS

Lab experience of Physics I.

EDS 103 Educational Psychology

5 ECTS

Relationship between education and psychology, definition of educational psychology, general theoretical concepts in human development and learning, factors which influence development and learning, learning theories, understanding physical, psychosocial, cognitive and moral development, exploring different approaches of learning and their implications in education. Understanding how motivation, individual differences, group dynamics influence learning in classrooms.

GE 203 Cultural Skills II

4 ECTS

In this course, prospective teachers will continue to develop their knowledge and skills in a cultural area that they are supposed to choose in "Cultural Skills I" which was described as: There is a chance of better interactions among students, teachers and community in schools where teachers have a variety of cultural skills and performance abilities. In this course, depending on their individual interests and abilities, prospective teachers will choose a cultural skill, such as musical performance, folkloric dance, acting, cooking, clothing, storytelling, fine arts and the like, and develop expertise and skills on the chosen cultural component. They are expected to demonstrate competency by performing and producing in the chosen cultural area.

FOURTH SEMESTER

ELE 206 Foundations of Teaching Numbers, Operations and Algebra

5 ECTS

The development of number sense in elementary and middle school children: discussions of how children construct numbers; how to use numbers and make judgments; how to use numbers in flexible ways when adding, subtracting, multiplying, and dividing; how to develop useful strategies when counting, measuring, and estimating. Exploring students' dispositions towards making sense of numbers and operations: How students naturally decompose numbers, use particular numbers as referents to solve problems using the relationships among operations and how computational fluency develops. Improving algebraic thinking: How students understand patterns, relations, and functions; how students generate mathematical models to represent and analyze mathematical situations.

ELE 208 Foundations of Teaching Geometry, Probability and Statistics

5 ECTS

Effective strategies and models of instruction to improve pre-service teachers' pedagogical content knowledge. Assessment techniques to develop geometrical thinking. Analyses of issues, challenges, and problems involved in teaching geometry. Investigations of two- and three-dimensional shapes: definitions, symbols, and facts; properties of geometric shapes, measurements, constructions, and transformations. Learning activities that illustrate the use of various instructional strategies based on the development of spatial reasoning. Teaching probability, data analysis, and statistics in elementary and middle school classrooms. Exploring curriculum and assessment strategies in the areas of probability and statistics. Review of research on students' thinking on stochastic tasks and how mathematics education literature informs teaching practices. Conceptual understanding of probability and statistics and their importance in the current information age.

PHYS 104 Physics II

6 ECTS

The main objective of this course is to provide an algebra based physics course to help students develop conceptual understanding of physical principles, achieve ability to reason, learn the scientific method and gain skills for problem solving. The course covers mainly electricity and magnetism topics, including semiconductors in introductory level. Electric charge and electric field; electric potential and electric potential energy; electric currents; DC circuits and instruments; magnetism; electromagnetic induction and Faraday`s law; electromagnetic waves; semiconductors, diodes and transistors.

PHYS 104L Physics II Lab.

2 ECTS

Lab experience of Physics II.

EDS 206 Instructional Technology and Materials Design for Teaching

5 ECTS

Concepts related to instructional technology, characteristics of various types of instructional technologies, role and use of instructional technologies in teaching process, determining instructional technology needs of schools and classrooms, planning how to use appropriate instructional technologies, designing two and three dimensional materials by using instructional technologies, designing instructional tools, exploring educational software, evaluation of instructional tools and software. Distance education, learning about visual design principles, effectiveness of different instructional technologies and materials, use of instructional technologies in Turkey and worldwide.

MATH 335 Role of Mathematics in Science, Technology and Engineering

5 ECTS

This course will help prospective teachers realize mathematics that makes today's science, technology and engineering possible. The content will be arranged according to the cutting edge developments in science, technology and engineering. Potential topics to be covered include making invisible visible with 3-D imaging (MRI, advanced molecular microscopy, 3-D seismic survey), optimization and engineering, mathematical biology.

EDS 105 Community Service Experience

2 ECTS

Active participation in community service settings; creating projects at individual or group levels to help out in need communities. These communities could be local or in distance. Tutoring, initiating/participating educational projects of different kinds etc. will be the focus of this course. With this course, pre-service teachers will gain experiences to be productive members of the society that they serve.

FIFTH SEMESTER

MATH 332 Differential Equations

7 ECTS

Concept of differential equations, classification of differential equations, basic techniques for solving differential equations. First order equations; classification of second order linear partial differential equations, canonical forms.

EDS 301 Special Education: Teaching Diverse Learners

4 ECTS

Definition of special education, basic principles of special education, reasons of impairment, importance of early diagnosis and treatment, a historical approach to how people regard impairment, students with mental, physical, visual and/or hearing impairment, children with speech defect, communication defect, learning difficulty, Attention Deficit Hyperactivity Disorder, and also autistic and gifted students, teaching and education of these student groups, teaching through games, reactions observed in the families with children in need of special education, special education in Turkey, organizations and institutions founded for special education in Turkey.

ELE 301 Internship 1: School Experience and Teacher Assistantship

10 ECTS

After successfully completing the first two years of university courses, prospective teachers will be placed as full-time teacher assistants in the classes of mentor teachers working in partner schools. In these classes, prospective teachers will: (a) observe the practices of the mentor teacher (b) assist the mentor teacher in education and teaching-related issues, (c) tutor students who need academic support, (d) complete practice-based assignments of their college courses, and (d) do other similar duties assigned by the mentor teacher and college instructors. The duties undertaken by teacher assistants may differ depending on the level and context of their class. However, all of the teacher assistants will undertake the following two duties: (1) observe carefully the performance of their mentor, and learn from their practice. (2) Contribute to the improvement of student achievement by tutoring the low achieving students and learn in practice.

EDS 307 Principles and Methods of Instruction

4 ECTS

This class will be taught in connection with the following topics: Fundamental concepts related to instruction, principles of learning and teaching, importance and benefits of planning for teaching, learning how to plan for teaching (samples of unit-based yearly plans, daily plans and activities). Strategies for improving teaching and learning, instructional methods and their enactment, instructional tools, teachers' responsibility to improve their teaching quality and teacher qualifications.

ELE 303 Methods of Teaching Mathematics I

5 ECTS

Basic concepts related with the field and relation of these concepts with the teaching methods of the field. Analyses of curriculum concepts (aim, objectives, theme, unit, activities, etc.). Investigation of national and international curriculum documents (e.g., National Ministry of Education, International Middle Years Program, etc.). Classroom discourse on teaching, teaching methods, techniques and materials in mathematics.

SIXTH SEMESTER

EDS 403 Scientific Research Experience I

5 ECTS

Science and basic concepts (facts, knowledge, absolute, accurate, false, universal knowledge), basic knowledge related to science history, the structure of scientific research. Defining problems, research design, data collection, methods for data collection and analysis (quantitative and qualitative research methods), explanation of data and reporting.

ELE 304 Methods of Teaching Mathematics II

5 ECTS

This course is an extension of Methods of Teaching Mathematics I where prospective teachers learn different teaching methods, curriculum etc. In this course, prospective teachers will focus on specifically producing lesson plans, exams, curriculum materials etc. to be used in their field experiences. They will focus on children's thinking, collaborative learning, learning with problem solving, project-based learning.

ELE 302 Internship 2: School Experience and Teacher Assistantship

10 ECTS

After successfully completing "School Experience and Teacher Assistantship I," prospective teachers will be placed in classrooms as full-time teacher assistants. The second placement will be in a different school and with a different mentor teacher. The responsibilities of prospective teachers will be as they were in the first placement: They will (a) observe the practices of their mentor and her/his students and complete practice-based assignments of their college courses, (b) assist the mentor teacher in teaching-related issues, (c) tutor students who are in need of academic help, and (d) do other duties assigned by the mentor teacher and college instructors. Their duties may differ depending on the level and context of their classes. However, all of them will undertake the following two duties: (1) observe carefully the performance of their mentor, and "learn from practice." (2) Contribute to the improvement of student achievement in class by tutoring the low achieving students, and "learn in practice."

EDS 304 Guidance

2 ECTS

This class will be taught in connection with the following topics: Purposes of student personality services and their place in education, introduction to guidance services in schools, principles of guidance, diagnosing and guiding students, collection and use of data on student counseling, placement, follow-up advising, research and evaluation, relations with parents and beyond the school community, vocational guidance, purposes of special education, identifying students with special learning needs.

EDS 309 Measurement and Evaluation

4 ECTS

This class will be taught in connection with the following topics: Importance of measurement and evaluation in education, fundamental concepts related to measurement and evaluation, desired qualities in measurement tools measurement tools and their qualities, traditional methods of assessment (written tests, short answered tests, true and false tests, multiple-choice tests, oral evaluations, homework), assessment tools that allow assessment of students from multiple perspectives (observation, interviews, performance evaluations, student portfolios, research papers and projects, attitude evaluations) and using basic statistics in understanding assessment results, developing assessment tools.

EDS 302 Classroom Management

4 ECTS

This class will be taught in connection with the following topics: Fundamental concepts related to classroom management, communication and interaction in classroom, definition of classroom management and how it differs from classroom discipline, factors influencing classroom environment, models of classroom management, management of undesirable student behaviors, classroom organization, development of classroom rules and procedures and their execution in classrooms, building a classroom environment conducive to learning (examples and suggestions).

SEVENTH SEMESTER

MATH 333 Abstract Algebra

5 ECTS

Definition of a group, subgroups, permutation groups, homomorphism, normal subgroups, definition of a ring, subrings, ideals.

EDS 405 Internship 3: Teaching Practice

15 ECTS

Prospective teachers become “Teacher Candidate” after successfully completing “School Experience and Teacher Assistantship I and II.” They are placed in classrooms with chosen mentor teachers for their full-time teaching practice. During this semester, prospective teachers will gradually assume the responsibilities of a teacher. They are required to teach full time for at least five weeks, preferably during the second half of this semester. The mentor teachers and clinical faculty will regularly observe the performance of prospective teachers and provide them with formative feedback to help them grow as professional teachers.

EDS 404 Scientific Research Experience II

5 ECTS

Data analysis, writing reports, presentation of research papers to peers, academicians, and school administration and to community. Applying scientific methods of investigations to solve educational problems, which might occur in the field. Action research type of investigations could be promoted and used as a venue for prospective teachers.

EIGHT SEMESTER

EDS 406 Internship 4: Teaching Practice

15 ECTS

After successfully completing “Teaching Practice and Teacher Candidacy I,” “Candidate Teachers” will be further placed full-time in a different school with a different mentor teacher. This is the last supervised experience in the teacher education of the prospective teachers, and after this semester, they will graduate and become professional “teachers.” For prospective teachers, reaching this semester means that they have successfully completed all the required courses and practices of their teacher education program. In this last semester, they are required to gradually take the full responsibility of teaching for at least seven weeks. The mentor teachers and clinical faculty will regularly observe the performance of prospective teachers and provide them with formative feedback to help them grow as professional teachers.

ELECTIVE COURSES

MATH Elementary Number Theory

5 ECTS

Integer divisibility, prime numbers, important functions in number theory, congruence, linear congruence. Prime factorization, primitive roots, quadratic residues, cryptography and its applications, continuous fractions.

ELE Mathematics, Art and Drama

5 ECTS

Use of art in mathematics education, aesthetics, golden ratio and its applications, relationship of mathematics and art, mathematics and music, mathematics and architecture, mathematics education and origami, mathematics education and krigami, mathematics and its relationship with different types of hand-crafts, fractals and art. Part of this course will also focus on drama techniques and its use for teaching mathematics.

ELE Mathematics and Life

5 ECTS

Students usually wonder how mathematics will be used and helpful in real life. Future teachers should be skilled and exposed to different real world applications of mathematics. By this way, future teachers will appreciate the beauty and functional aspects of mathematics. With this knowledge, they can also help their students pursue careers require mathematics. Real-world applications of mathematics, reciprocal relationships between mathematics and objects in the physical environment. Investigation of the applied and interdisciplinary mathematics: Economics, business, military, and medical health etc.

ELE Advanced Problem Solving and Preparation for Mathematics Olympiads and Projects in Mathematics

5 ECTS

Prospective teachers will be exposed to the structures of Mathematics Olympiads and scientific competitions (for 5-12 grade students) such as TUBITAK, MEF schools. The goal of this course is to help prospective teachers to be competent in these areas and develop guiding/directing skills to be used in the future. Definition of a mathematical problem and problem solving. Use of problem solving strategies in mathematical processes. Solving advanced problems and preparing students for solving Mathematics Olympiads problems. Investigation of advanced mathematics problems and topics to develop a research project in mathematics.

EDS Children’s Rights and Democracy

5 ECTS

In a democratic society all individuals including children are equal and have natural-inborn rights. However, in order to use these rights, individuals need education, so that, their abilities can be unfolded and they can realize themselves. In this course, the knowledge, values and skills of democracy, democratic rights and responsibilities, human rights, and particularly children’s rights to equal and fair education will be studied.

PCG Environmental Conscious

5 ECTS

Natural-environmental sources are the common assets of humanity. Misusing natural-environmental sources is the destruction of the future of humanity. Natural environmental sources must be consciously used and protected. The knowledge, values and skills needed for the protection of natural environment can be better learned in schools. In this class, nature of environment, environmental problems, future of environments, knowledge, skills and values needed for the protection of environment will be studied. In order to raise students with environmental consciousness, first, teachers should have the same conscious and awareness.

PCG Comparative Education and Cultures

5 ECTS

Every nation is formed by a unique culture. Every culture creates its own language, music, dances, foods, traditions and the like. Similarly, every culture creates its own education. In this sense, education is culture-bound and national by nature. However, education is not only national; it has also universal and technical dimensions. All human beings need education and learning occurs in all minds when conditions are met. Learning about the cultures and educational systems of other nations is a powerful dynamic of social and educational development. In this class, cultures and educational system of at least five most successful countries in international tests, such as PISA and TIMSS will be studied and compared with Turkey.