ELEMENTARY MATHEMATICS EDUCATION PROGRAM COURSE INFORMATION

FIRST TERM

MATH 101 Introduction To Set Theory And Logic (3+2+0)4   ECTS: 7

Propositional and predicate calculus. Introduction to logic. Methods of proof. Axioms of set theory. Cartesian product, relations and functions. Partial and total orderings. Zorn's lemma. Cardinality, finite, countable and uncountable sets. Arithmetic of cardinals and ordinals.

MATH 131 Calculus I (3+2+0)4   ECTS: 6

Functions. Limits and continuity. Derivatives. Rules of differentiation. Applications of derivatives; extreme values, sketching graphs of functions. Definite Integrals, the fundamental theorems of calculus. Methods of integration, areas of plane regions.

ED 101 Introduction to Educational Sciences (3+0+0)3   ECTS: 3

Basic concepts of education and training; aims and functions of education; relationship of education with other fields and sciences; legal, social, cultural, historical, political, economic, philosophical and psychological foundations of education; method in educational sciences; school and classroom as an educational and learning environment; current developments in teaching profession and teacher training; trends in education in the twenty-first century.

CEIT 211 Information Technology (1+0+2)2   ECTS:4

Information technologies and computational thinking; problem solving concepts and approaches; algorithm and flow charts; computer systems; basic concepts about software and hardware; fundamentals of operating systems, current operating systems; file management; utilities (third party software); word processing programs; calculation / spreadsheet / graphics programs; presentation programs; desktop publishing; database management systems; Web designing; internet use in education; communication and collaboration technologies; safe internet use; information ethics and copyrights; the effects of computer and internet on children / teenagers.

AFE 131 Academic English I (2+2+0)3   ECTS: 5

Reading for comprehension, critical thinking and discussion; interacting with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party; producing clear, detailed texts on a wide range of subjects and explaining a viewpoint on a topical issue giving the advantages and disadvantages of various options.

TKL 201 Turkish Language I (2+0+0)2   ECTS: 2

A general information about language in general and world languages, the historical evolution of Turkish and its relationship with other languages, phonetical and morphological characteristics of Modern Turkish, applying/practicing rules of orthography and punctuation.

HTR 301 History of Turkish Revolution-I (2+0+0)2   ECTS:2

The basic purpose of the program is to provide the students with a common understanding on the usefulness and the effective methods of studying history, on the importance of revolutionary history of Turkey and on the role of Ataturk.

SECOND TERM

MATH 102 Basic Algebraic Structures (3+2+0)4   ECTS: 7

Algebraic structures, integers, rings, fields, groups, homomorphisms and isomorphisms, natural numbers and their properties, rational numbers, real numbers and their properties, complex numbers.

(Pre-requisite: Math 101)

MATH 132 Calculus II (3+2+0)4   ECTS: 6

Applications of integrals; volumes of solids of revolution, arc length, areas of surfaces of revolution. Convergence of sequences. Convergence tests for series. Power, Taylor and Maclaurin series. Analytic geometry in 3-space. Functions of several variables, partial derivatives, extreme values. Double integrals.

(Pre- requisite: Math 131)

ED 221 Educational Psychology (3+0+0)3   ECTS: 4

Definition, principles and stages of development; theories of personality, cognitive, moral development, social, language, and physical development; learning and learning theories; relation between development and learning.

AFE 132 Academic English II (2+2+0)3   ECTS: 5

Reading for comprehension; Discussion; understanding a wide range of demanding, longer texts and recognizing implicit meaning; speaking fluently and spontaneously without much obvious searching for expressions; using the language flexibly and effectively for social, academic and professional purposes; producing clear, well-structured, detailed texts on complex subjects, showing controlled use of organizational patterns, connectors and cohesive devices.

TKL 202 Turkish Language II (2+0+0)2   ECTS: 2

Lexicon of Turkish, study of literary texts, rules for formal correspondence, format and rules for scientific research writing and genres of oral narration.

HTR 302 History of Turkish Revolution II (2+0+0)2   ECTS: 2

The fields of the programme are to study the external and internal events in the new state after Laussane Treaty. Moreover following Ataturk's period, it is discussed the Turkish Foreign Policy in the new period which was particularly established after the Second World War.(Turkey's joining to security pacts and the relations with European Union)

Elective Department I (3+0+0)3   ECTS: 5

A course can be chosen from the list of departmental elective courses.

THIRD TERM

MATH 255 Calculus III (3+2+0)4   ECTS: 7

Vector functions; space curves, derivatives and integrals, arc length, motion in space, parametric surfaces. Multiple integrals and applications. Vector calculus; vector fields, line integrals, Green's theorem, curl and divergence, surface integrals, Stokes' theorem, the divergence theorem.

(Pre- requisite: Math 132)

MATH 111 Analytical Geometry (3+2+0)4   ECTS: 7

Vectors, linear operations with vectors. Products of vectors. Definition of Euclidean space. Lines and planes. Circle and sphere. Parametrizations of curves and surfaces. Conics and quadrics, their symmetries and classifications. Translations, orthogonal transformations, similarities and inversions.

EDEM 230 Algorithm and Programming (2+0+0)2   ECTS:5

Design of an algorithm; flow chart diagrams; concept of input-output; recursions; decision trees, decision making and developing appropriate algorithms for recursions; application of programs by representation of algorithm and flow charts (scratch, code.org, etc.); use of functions for solution algorithms; development of solution algorithms by using one and two dimensional arrays; coding of algorithm in computer algebra systems and such applications.

EDEM 240 Geometry for Teachers (3+0+0) 3   ECTS: 5

The properties and concepts under geometry domain in the mathematics curriculum (fundamental geometric concepts and constructions, triangles and quadrilaterals, triangles, measurement of length, area, and volume, geometric solids, angles, lines and angles, circle, transformations, polygons, congruency and similarity); relationship between those concepts; discussion of mathematical concepts and use of multiple representations; proves of selected theorems.

ED 360 Ethics and Moral Issues in Education (2+0+0)2   ECTS:3

Basic concepts and theories about moral and ethics; professional ethics social, cultural, moral, ethical aspects of teaching profession; ethical principles in the process of education, training; ethical principles in relation to educational stakeholders (employers / managers, colleagues, parents, professional organizations and society); ethical responsibilities of education / school administrators, parents and students; unethical behavior in professional life; moral / ethical education and ethics in the school

Elective Area I (3+0+0)3   ECTS: 4

A course can be chosen from the list of area elective courses.

FOURTH TERM

MATH 221 Linear Algebra (3+0+0)3   ECTS: 6

Systems of Equations, Matrices, Determinants, Vector Spaces, Linear Transformations, Orthogonality, Eigenvalues

PHYS 101 Physics I (3+0+2)4   ECTS: 6

Measurement and Unit, Vectors, Motion in one and two dimensions, Newton's Laws of Motion, Work, Power, Energy, Momentum and Collisions, Rotational Motion, Torque and Angular Momentum, Universal Gravitational Law.

EDEM 205 Contemporary Trends in Teaching Mathematics (3+0+0) 3   ECTS: 4

Technologies for mathematics education. Dynamic Geometry Software. Geogebra. Spreadsheets in math education. Mobil apps for math education. Poster and Visuals in mathematics.

ED 340 Instructionals Principles and Methods (3+0+0)3   ECTS: 4

The course content includes learning theories associated with motivation, instruction and learning. This course focuses upon behaviorist, constructivist, and social leaning theories with a particular emphasis upon instructional implications in classroom applications.

Elective Area II (3+0+0)3   ECTS: 5

A course can be chosen from the list of area elective courses.

Elective Department II (3+0+0)3   ECTS: 4

A course can be chosen from the list of departmental elective courses.

FIFTH TERM

MATH 241 Differential Equations (3+2+0)4   ECTS: 6

First order ODE's (homogeneous and non-homogeneous, direct integration, integrating factors, substitution). Second order ODE's (variation of parameters, reduction of order). Laplace transform and its applications. Power series solutions of second order linear differential equations, Frobenius method.

EDEM 325 Development of Thinking Skills (3+0+0) 3   ECTS: 7

Thinking skills and developing thinking skills. Drawing deductively valid conclusions. Critical thinking skills. Critical Thinking and Turkish Education System. Critical Thinking and Mathematical Modelling. Critical Mathematics Education.

ED 362 Classroom Management (2+0+0) 2   ECTS: 3

The course will provide both theoretical understanding and practical application of strategies aimed at creating safe, encouraging, and effective learning environments. Emphasis will be placed on (a) instructional procedures rather than the content (i.e., curriculum) of instruction, (b) behavioral management, and (c) core management principles.

CEIT 311 Instructional Technology (1+0+2)2   ECTS:4

Information Technologies in Education; teaching process and classification of instructional technologies; new directions in current learning and teaching approaches; current literacy, digital student, digital teacher and digital material; instructional technologies as tools and materials; design of teaching materials; developing thematic teaching materials; instructional materials evaluation criteria. Web designing; internet use in education; communication and collaboration technologies; IT law in education, education and copyrights; cyber crimes, cyberbullying and safe internet use; effects of computer and internet technologies on children/youth, social media education and addictions, artificial intelligence in education, augmented reality applications and the use of emotional interactions in learning and teaching environments.

Elective Department III (3+0+0)3   ECTS: 5

A course can be chosen from the list of departmental elective courses.

Elective Free I (3+0+0)3   ECTS: 5

A course can be chosen from the list of free elective courses.

SIXTH TERM

EDEM 346 Task Based Mathematics Instruction (3+0+0)3   ECTS: 7

In this course, definition of a task and elements of task design will be discussed. The participants will be asked to develop and implement different mathematical tasks for middle school students.

They will be also asked to evaluate the effectiveness of the task and make necessary modifications in their tasks.

EDEM 456 Material Development in Elementary Mathematics (2+2+0)3   ECTS: 7

Hands on materials for mathematics education. Including lectures (theoretical) and workshops. The lectures are about the basic concepts and applications of educational technology, quality and the use of educational materials and manipulatives. The workshops are designed on modelling: "how to use manipulatives for mathematical modelling, and how to develop technological/non-technological materials as teaching supplements".

ED 353 Measurement and Evaluation in Education (3+0+0)3   ECTS:4

The basic concepts about measurement and evaluation; Error of measurement; Correlation; The features which have to be found in a measurement tool: reliability and validity; Measurement tools and methods used in education; Test construction and item analysis; The statistical processes apply to test scores; Standard scores.

ED 244 Research Methods in Education (3+0+0)3   ECTS:4

Access to articles, theses and databases; research models and types; basic paradigms in scientific research; quantitative and qualitative research designs; sampling, data collection, analysis of data in qualitative research; validity and safety in qualitative research; article or thesis review, evaluation and presentation; preparing a research report in accordance with research principles and ethics; action (action) research in education.

EDGN 201 Community Service in Practice (1+2+0)2   ECTS: 3

Concepts of community, community service practices and social responsibility; social responsibility projects in terms of community and culture; identification of social problems; developing projects for social problems; participation in social responsibility projects of various organizations and institutions; participation of various panels, conferences or symposiums as a listener, presenter or coordinator; evaluation of social responsibility projects.

Elective Department IV (3+0+0)3   ECTS: 5

A course can be chosen from the list of departmental elective courses.

SEVENTH TERM

EDEM 427 Teaching Methods in Elementary Mathematics I (2+2+0) 3   ECTS: 6

The content of the course will be composed of overview of teaching and learning methods and strategies, planning learning tasks, and implication of teaching strategies and methods in the class.

EDEM 401 School Experience 1 (2+6+0)5   ECTS:10

Observation of teaching methods and strategies used in teaching mathematics; micro-teaching practices with individuals or groups to apply methods and strategies used in teaching mathematics; task and material design for teaching mathematics; organization of learning environment, classroom management, measurement, assessment and reflection.

STAT 410 Statistics (3+0+0)3   ECTS: 5

Frequency Distributions, Table and Graphs, Measures of Central Tendencies, Discrete and Continuous Probability Distributions, Hypothesis Tests, Sampling topics are included in this course as well.Frequency Distributions, Table and Graphs, Measures of Central Tendencies, Discrete and Continuous Probability Distributions, Hypothesis Tests, Sampling topics are included in this course as well.

Elective Department V (3+0+0)3   ECTS: 5

A course can be chosen from the list of departmental elective courses.

Elective Free II (3+0+0)3   ECTS: 5

A course can be chosen from the list of free elective courses.

EIGHTH TERM

EDEM 428 Teaching Methods in Elementary Mathematics II (2+2+0)3   ECTS: 6

Teaching methods in mathematics, Teaching Numbers, Teaching Algebraic Thinking, Teaching Fractions, Decimals and Percentages, Preparing Lesson Plans, Implementing Lesson Plans

EDEM 402 Teaching Practice 2 (2+6+0)5   ECTS:10

Observation of teaching methods and strategies used in teaching mathematics; micro-teaching practices with individuals or groups to apply methods and strategies used in teaching

mathematics; task and material design for teaching mathematics; planning a teaching unit, organization of learning environment, classroom management, measurement, assessment and reflection.

ED 103 Guidance in Education (3+0+0)3   ECTS: 4

History of guidance, developing an understanding of the basic principles of guidance and psychological counseling, recognizing the roles and functions of teachers in guidance, recognizing the types of guidance in education.

Elective Area III (3+0+0)3   ECTS: 4

A course can be chosen from the list of area elective courses.

Elective Free III (3+0+0)3   ECTS: 5

A course can be chosen from the list of free elective courses.

DEPARTMENTAL ELECTIVE COURSES

EDEM 102 Development of Mathematical Contents (3+0+0)3   ECTS: 5

Number concept and its development. Trigonometry and its applications. Development of algebraic concepts. Calculation of probability.

EDEM 480 Teaching Mathematics for Social Justice (3+0+0)3   ECTS: 5

Sociology of education and mathematics education. The role of mathematics education in school and in society. The importance of mathematics for understanding social problems. The role of mathematics education in solving social problems. Sexism and Mathematics Education. Class and cultural differences and mathematics education. Critical Mathematics Education.

EDEM 481 Analysis of Mathematics Course (3+0+0)3   ECTS: 5

Analysis of middle school math curricula. Analysis of teaching tools used in middle school. Analysis of math tasks, implementation of math tasks in a school setting and evaluation of implementation. Analysis of students' math achievement and mathematical skills.

EDEM 482 Qualitative Research Methods in Mathematics Education (3+0+0)3   ECTS: 5

Qualitative research methods used in math education. Validity and reliability. Research studies in math education based on video analysis. Research studies in math education based on analysis of interviews. Research studies in math education based on documentation. Applications of video analysis, interview analysis and documentation.

EDEM 483 Exploring Geometry (3+0+0)3   ECTS: 5

Elementary geometry subjects. Difficulties in the teaching and learning of elementary geometry concepts. Teaching methods and materials used in the teaching of elementary geometry concepts. Geometry in daily life.Discovering geometry concepts, such as length, area and volume measurements, triangles and circle. The use of dynamic geometry software in teaching elementary geometry.

EDEM 484 Mathematical Modelling and Problem Solving (3+0+0)3   ECTS: 5

Definition and samples of mathematical modelling problems. Problem solving and problem solving strategies. Historical development of mathematical modelling. Developing mathematical modelling problems for middle school and high school students. Applications of problem solving and mathematical modelling problems.

EDEM 485 Evaluation of Mathematics Instruction (3+0+0)3   ECTS: 5

Middle school math curriculum. Selecting appropriate assessment items to measure specific learning outcomes. Formative, summative and retention tests. Preparing and implementing math achievement tests and projects. Preparing and using rubrics. Analysis of TIMSS and PISA test items.

EDEM 486   Contemporary Issues in Elementary Mathematics Education (3+0+0)3 ECTS: 5

The major issues in mathematics education research. National and international publications, journals and conferences on Elementary Mathematics Education. Qualitative and quantitative researches on teaching different mathematics subjects. Contemporary experimental researches on the use of different teaching methods and materials in mathematics teaching. Researches on the use of technology in teaching mathematics. Evaluation of researches in elementary mathematics education in Turkey.

EDEM 487 Teaching Probability and Statistics (3+0+0)3   ECTS: 5

Basic concepts in probability, types of probability, probability simulations and distributions; data collection, organization and analysis, distribution concept, frequency distributions, teaching of central tendency and variability (organizing course content - using appropriate teaching materials and strategies, etc.); student knowledge about these subjects (understanding and interpretation of students' thinking, difficulties, mistakes and misconceptions); the relationship of these subjects with daily life and other lessons.

EDEM 490 Instructional Design and Implementation (3+0+0)3   ECTS: 5

Principles of instructional design; goals of teaching middle school mathematics; preparation and implementation of mathematics lessons; preparation of lesson plans; implementation and evaluation of lesson plans.

EDEM 491 History and Philosophy of Mathematics (3+0+0)3   ECTS: 5

Importance of history of mathematics in mathematics education; Ancient Egyptians' mathematics; Ancient Greek's mathematics, Far East's mathematics; mathematicians in Islamic world; emergence of modern mathematics; historical development of mathematical concepts. Ontology and epistemology of mathematics; meanings of mathematical concepts such as, numbers, sets, functions, etc. and meanings of propositions and mathematical expressions; philosophical problems related to foundations, nature and methods of mathematics, objectivity in mathematics and applicability to the real world; relation of mathematical philosophy with mathematics education.