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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | SPRING |

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| **COURSE CODE** |  | **COURSE NAME** | QUANTITATIVE RESEARCH METHODS |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Labratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| SPRING | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | TURKISH |
| **COURSE CATAGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
|  | | X | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MID – TERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Mid-Term | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 2 | | 10 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | |  | | | | | 1 | | 50 |
| **PREREQUIEITE(S)** | | | | |  | | | | | | | |
| **COURSE DESCRIPTION** | | | | | Basic concepts and principles related to research methods, Scientific research process / Ethical rules, Access to articles, theses and databases / Citation, Problem definition / Literature review, Basic paradigms in scientific research (Science and philosophy of science), Research types, Survey model, Causal research, causal comparison, Experimental designs, Universe Sampling / Random Sampling methods, General characteristics of data collection tools | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of this course is to provide students with the technical knowledge, skills, scientific attitudes and behaviours required by the research method in education. This process includes reading, understanding and interpreting scientific research, deciding on quantitative research models suitable for research questions / hypotheses by considering the stages in a quantitative research process in detail, research methods and techniques for developing a scientific (quantitative) research, knowledge and skills related to reporting rules. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUATION** | | | | | It aims to gain scientific attitudes and behaviours equipped with quantitative research methods and techniques in professional applications. It is aimed to gain competencies to be able to propose solutions to the problems in the field from a scientific point of view, to be open to innovations and development, to think analytically and critically, to carry out academic studies independently. | | | | | | | |
| **COURSE OUTCOMES** | | | | | Explain the basic concepts and principles of quantitative research methods.  Explain the differences between scientific research paradigms.  Compares research types (quantitative, qualitative and mixed) used in educational research.  Scientific research process, defines the steps.  Knows ethical principles in educational research.  Gains the ability of literature review (articles, thesis, access to databases).  Gains the ability to cite and reference in accordance with APA principles.  Explains the differences between research models.  Decides on the universe-sample suitable for the type of research.  Explains the general characteristics of data collection tools.  Analyses scientific studies in the field of education with a scientific approach. | | | | | | | |
| **TEXTBOOK** | | | | | Creswell, J.W. (2013). Araştırma deseni. (S. B. Demir Çev.) Ankara: Eğiten kitap.  Field A. & Hole G. (2003) Araştırma nasıl tasarlanır ve raporlaştırılır (A. Özer Çev.). Ankara: Anı Yayıncılık.  Şen, S. ve Yıldırım, İ. (2019). Eğitimde araştırma yöntemleri. Ankara: Nobel Yayınevi. | | | | | | | |
| **OTHER REFERENCES** | | | | | APA (2011). Publication manual of the american psychological association. washington, DC: American Psychological Association  Field A. & Hole G. (2003) Araştırma nasıl tasarlanır ve raporlaştırılır (A. Özer Çev.). Ankara: Anı Yayıncılık.  Creswell, J.W. (2013). Araştırma deseni. (S. B. Demir Çev.) Ankara: Eğiten kitap.  Sayım, F. (2019). Sosyal bilimlerde araştırma ve tez yazım yöntemleri. Ankara: Seçkin Yayıncılık.  Şen, S. ve Yıldırım, İ. (2019). Eğitimde araştırma yöntemleri. Ankara: Nobel Yayınevi.  Büyüköztürk, Ş., Kılıç-Çakmak, E., Akgün, Ö.E., Karadeniz, Ş. ve Demirel, F. (2012). Bilimsel araştırma yöntemleri. Ankara: Pegem A Yayıncılık.  Karasar, N. (2012). Bilimsel araştırma yöntemi. Ankara: Nobel Yayın Dağıtım.  Day, A. R. (1996). Bilimsel bir makale nasıl yazılır ve yayımlanır (G. A. Altay, Çev.), 4.bs.- Ankara: TÜBİTAK.  Ural, A, ve Kılıç, İ. (2011). Bilimsel araştırma süreci ve SPSS ile veri analizi. Ankara: PegemA Yayıncılık  Karasar, N. (2012). Araştırmalarda rapor hazırlama. Ankara: Nobel Akademi Yayıncılık.  Neuman, W.L. (2006). Toplumsal araştırma yöntemleri: Nitel ve Nicel Yaklaşımlar. (Çev.: S. Özge). İstanbul: Yayın Odası Yayınları.  Yıldırım, A. ve Şimşek, H. (2011). Sosyal bilimlerde nitel araştırma yöntemleri. Ankara: Seçkin Yayınevi.  Yılmaz, K. ve Arık, S. (2019). Bilim ve araştırma etiği. Ankara: Pegem Akademi Yayıncılık. | | | | | | | |
| **TOOLS AND EQUIPMENTS REQUIRED** | | | | |  | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | Basic concepts and principles of research methods |
| 2 | Scientific research process |
| 3 | Ethical codes |
| 4 | Problem definition/Literature review |
| 5 | Basic paradigms in scientific research (Science and philosophy of science) |
| 6 | Types of research |
| 7-8 | MIDTERM EXAM (Take-Home Exam) |
| 9 | Survey model |
| 10 | Causal research, causal comparison |
| 11 | Experimental designs |
| 12 | Universe-Sampling/Random Sampling methods |
| 13 | General characteristics of data collection tools |
| 14 | Problems in current research in education |
| 15-16 | Final exam (Take-Home Exam) |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena. |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used previously. |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of communities of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| 19 |  |  |  |  |
| 20 |  |  |  |  |
| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | SPRING |

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| **COURSE CODE** |  | **COURSE NAME** | Qualitative Research Method |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Labratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| SPRING | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ELECTIVE | | | TURKISH |
| **COURSE CATAGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
|  | | X | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MID – TERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Mid-Term | | | | | 1 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | |  | | | | | 1 | | 50 |
| **PREREQUIEITE(S)** | | | | |  | | | | | | | |
| **COURSE DESCRIPTION** | | | | | Research Paradigms and Comparison: Quantitative; Qualitative; Data Collection Techniques in Qualitative Research: Observation, Documents and artifacts, Researcher journal, Visual data, Interview; Ethical Rules in Qualitative Research; Qualitative Research Designs: Case study, Ethnography, Phenomenology, Grounded theory, Action research; Narrative research; Self-study; Meta-synthesis; Planning Qualitative Research Process; Analysis in Qualitative Research: Content analysis, Inductive analysis, Other analysis techniques; Trustworthiness in Qualitative Research; Preventions for Trustworthiness; The researcher's role; Analysis of Published Qualitative Research Report | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Explains general aspects of qualitative and quantitative research methods.  Compare some of the main qualitative research designs and their characteristics.  Explain basic qualitative data collections methods based on the main characteristics of the research designs.  Explain analysis methods of the qualitative data.  Evaluates the methods of reporting qualitative data. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUATION** | | | | |  | | | | | | | |
| **COURSE OUTCOMES** | | | | | Compares characteristics of qualitative research and quantitative research.  Compares ethical issues of qualitative research and quantitative research.  Categorizes some of main (well-known) qualitative research designs.  Exemplifies some of main qualitative research designs based on their characteristics.  Explains how to improve validity of some main qualitative research designs.  Examines the settings, participants, and researcher/researchers’ roles according to the ethical issues, in some main qualitative research designs.  Explains the main characteristics of qualitative data collection methods.  Discusses how to employ those data collection methods based on different qualitative research designs.  Explains how to improve the trustworthiness of the research during data collection process.  Explains various qualitative data analysis methods.  Critically analyses a published qualitative research report according to the evaluation criteria. | | | | | | | |
| **TEXTBOOK** | | | | | Saban, A., & Ersoy, A. (2024). Eğitimde nitel araştırma desenleri. (Genişletilmiş 4. Baskı). Ankara: Eğiten Kitap.  Yıldırım, A. & Şimşek, H. (2021). Sosyal bilimlerde nitel araştırma yöntemleri. (Gözden geçirilmiş 12. baskı). Ankara: Seçkin. | | | | | | | |
| **OTHER REFERENCES** | | | | | https://tqr.nova.edu/ | | | | | | | |
| **TOOLS AND EQUIPMENTS REQUIRED** | | | | | Computers and projection / Interactive whiteboard | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | Course description and determining rules |
| 2 | General characteristics of qualitative research methods |
| 3 | Comparison of qualitative and quantitative research methods |
| 4 | Qualitative research designs |
| 5 | Qualitative research designs |
| 6 | Qualitative research designs |
| 7-8 | Midterm exam |
| 9 | Participants/workgroup in qualitative research |
| 10 | Qualitative data collection methods |
| 11 | Qualitative data analysis |
| 12 | Reporting of qualitative research |
| 13 | Qualitative research and ethics |
| 14 | Course evaluation |
| 15-16 | Evaluation of student's research |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena. |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used previously. |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of communities of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| 20 |  |  |  |  |
| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

|  |  |
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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | SPRING |

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| **COURSE CODE** | 546812002 | **COURSE NAME** | Current Trends in Mathematics Education |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Laboratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| 1 | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | Turkish |
| **COURSE CATEGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
| %50 | | %50 | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MIDTERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
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| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | | Written exam | | | | | 1 | | 60 |
| **PREREQUIEITE(S)** | | | | | - | | | | | | | |
| **COURSE DESCRIPTION** | | | | | The Nature of Mathematical Thinking, Learning and Teaching, Use of Multiple Representations in Mathematics Education, Constructivist Approach in Mathematics Education, Realistic Mathematics Education, Technology Supported Mathematics Teaching, Flipped Learning in Mathematics Education, Problem-Based Mathematics Education, Collaborative Learning in Mathematics Education, STEM and Mathematics Education Applications, Art-Based Mathematics Education, Creative Drama in Mathematics Education, Project-Based Mathematics Teaching, Lesson Study Professional Development Model in Mathematics Education, Inquiry-Based Mathematics Teaching. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main purpose of this course is to investigate the theories about what the current approaches in mathematics teaching are and how to use them in mathematics lessons, and to present study and application examples. It is aimed to present content from theory to practice regarding current trends and problems in mathematics research, each learning approach that can be used in mathematics lessons, how to use these approaches in mathematics lessons, and research and applications such as sample activities and lesson plans. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUCATION** | | | | | It is thought that by introducing new approaches to mathematics education to mathematics educators, which will be discussed within the scope of the course, it will be possible to use these approaches in mathematics classes and will contribute to teachers' knowledge of mathematics teaching methods and techniques. | | | | | | | |
| **COURSE OUTCOMES** | | | | | 1.To know what the current approaches are in mathematics teaching,  2.To know how to use current approaches in mathematics lessons,  3.To research scientific studies on current approaches in mathematics education and to present application examples. | | | | | | | |
| **TEXTBOOK** | | | | | Ünlü, M. (Edt). (2021). Uygulama Örnekleriyle Matematik Öğretiminde Yeni Yaklaşımlar, Ankara: Pegem Akademi Yayıncılık | | | | | | | |
| **OTHER REFERENCES** | | | | | Erdoğan, F. (Edt). (2023). Matematik ve Fen Bilimleri Eğitiminde Yeni Yaklaşımlar-I, İstanbul: Efe Akademik Yayıncılık  Erdoğan, F. (Edt). (2023). Matematik ve Fen Bilimleri Eğitiminde Yeni Yaklaşımlar-II, İstanbul: Efe Akademik Yayıncılık  Gökhan, A. & Erdoğan, F. (Edt). (2023). Matematik ve Fen Bilimleri Eğitiminde Yeni Yaklaşımlar-III, İstanbul: Efe Akademik Yayıncılık | | | | | | | |
| **TOOLS AND EQUIPMENT REQUIRED** | | | | | Computer, projecton. | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | The Nature of Mathematical Thinking, Learning and Teaching |
| 2 | Use of Multiple Representations in Mathematics Education |
| 3 | Constructivist Approach in Mathematics Education |
| 4 | Realistic Mathematics Education |
| 5 | Technology Supported Mathematics Teaching |
| 6 | Flipped Learning in Mathematics Education |
| 7 | Problem-Based Mathematics Education |
| 8 | Midterm Exam |
| 9 | Collaborative Learning in Mathematics Education |
| 10 | STEM and Mathematics Education Applications |
| 11 | Art-Based Mathematics Education |
| 12 | Creative Drama in Mathematics Education |
| 13 | Project-Based Mathematics Teaching |
| 14 | Lesson Study Professional Development Model in Mathematics Education |
| 15 | Inquiry-Based Mathematics Teaching |
| 16-17 | Final Exam |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Elementary Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena. |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used before. |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of groups of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| 20 |  |  |  |  |
| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | FALL |

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| **COURSE CODE** | 546811001 | **COURSE NAME** | Misconceptions in Mathematics Education |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Laboratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| 1 | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | Turkish |
| **COURSE CATEGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
| %50 | | %50 | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MIDTERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | | Written exam | | | | | 1 | | 60 |
| **PREREQUIEITE(S)** | | | | | - | | | | | | | |
| **COURSE DESCRIPTION** | | | | | Similarities and differences between mathematical errors, difficulties and misconceptions, Types of misconceptions, Mathematical concepts and common misconceptions related to concepts in the literature, Questioning techniques that reveal the thinking processes of secondary school students, Suggestions for solutions to misconceptions according to the characteristics of the subject area and individual differences of students. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main purpose of this course is to understand the mathematical difficulties and misconceptions that students encounter in mathematics education research and in non-classroom environments and to develop solutions. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUCATION** | | | | | It is thought that by introducing the misconceptions encountered in mathematics education, which will be discussed within the scope of the course, to mathematics educators, it will be possible to detect and eliminate these misconceptions in mathematics classes and will contribute to teachers' knowledge of mathematics teaching methods and techniques. | | | | | | | |
| **COURSE OUTCOMES** | | | | | 1.To know what the misconceptions encountered in mathematics teaching are,  2.To know how to diagnose and eliminate misconceptions encountered in mathematics lessons,  3.To research scientific studies on misconceptions encountered in mathematics education and to offer solutions. | | | | | | | |
| **TEXTBOOK** | | | | | Bingölbali, E. & Özmantar, M. F. (Edt). (2009). İlköğretimde Karşılaşılan Matematiksel Zorluklar ve Çözüm Önerileri, Ankara: Pegem Akademi Yayıncılık | | | | | | | |
| **OTHER REFERENCES** | | | | | Özmantar, M. F., Bingölbali, E. & Akkoç, H. (Edt). (2015). Matematiksel Kavram Yanılgıları ve Çözüm Önerileri, Ankara: Pegem Akademi Yayıncılık | | | | | | | |
| **TOOLS AND EQUIPMENT REQUIRED** | | | | | Computer, projecton. | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | Similarities and Differences Between Mathematical Errors, Difficulties and Misconceptions |
| 2 | Misconception Types and Causes of Misconceptions |
| 3 | Elimination of Misconceptions |
| 4 | The Concept of Place Value in Numbers and the Difficulties Encountered by Students |
| 5 | Addition and Subtraction Concepts and Difficulties Experienced by Students |
| 6 | Misconceptions About Fractions |
| 7 | Misconceptions About Negative Numbers |
| 8 | Midterm Exam |
| 9 | Misconceptions about Ratio and Proportion |
| 10 | Misconceptions about First Order Equations with One Unknown |
| 11 | Misconceptions About Measurement and Measurements |
| 12 | Misconceptions About Symmetry |
| 13 | Misconceptions About Probability |
| 14 | Research on Misconceptions |
| 15 | Research on Misconceptions |
| 16-17 | Final Exam |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Elementary Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena. |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used before. |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of groups of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| 19 |  |  |  |  |
| 20 |  |  |  |  |
| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | Fall |

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| **COURSE CODE** |  | **COURSE NAME** | Conceptual Frameworks on Reasoning in Mathematics Education |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Labratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| Fall | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY ELECTIVE | | | Turkish |
| **COURSE CATAGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
|  | | X | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MID – TERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Mid-Term | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | | Report | | | | | 1 | | 60 |
| **PREREQUIEITE(S)** | | | | |  | | | | | | | |
| **COURSE DESCRIPTION** | | | | | The main topics of the course include Peirce's and Lithner's types of reasoning, Argumentation Model, reasoning in mathematical proofs, types of proofs, proof schemes in students, algebraic reasoning, proportional reasoning, geometric reasoning, spatial reasoning, algorithmic thinking, and knowledge processing reasoning. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of this course is to learn conceptual frameworks related to forms of reasoning in mathematics education. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUATION** | | | | | The conceptual frameworks explored in the course will enable educators to gain new perspectives on the nature and types of reasoning, which play a fundamental role in mathematics education. Consequently, educators will be able to enrich their teaching processes. Moreover, it will provide educators with the opportunity to draw on various conceptual frameworks when analyzing reasoning processes in students in their research endeavors. | | | | | | | |
| **COURSE OUTCOMES** | | | | | At the end of the course, participants will be able to explain the characteristics of reasoning types related to different learning domains in mathematics education, prepare reasoning-based learning environments in instructional activities, and utilize conceptual frameworks related to reasoning in conducted research. | | | | | | | |
| **TEXTBOOK** | | | | | Theories in Mathematics Education (Matematik Eğitiminde Teoriler) (Eds: E. Bingölbali, S. Arslan, İ. Ö. Zembat) | | | | | | | |
| **OTHER REFERENCES** | | | | | Logical Reasoning (Mantıksal Akıl Yürütme) (Eds: Emrullah Erdem)  Mathematical Proof and Proof Teaching (Matematiksel İspat ve Öğretimi) (Eds: Işıkhan Uğurel)  Mathematics Teaching Knowledge (Matematiği Öğretme Bilgisi) (Ed: A. Baki)  Cognitive Processes in Geometry Teaching (Geometri Öğretiminde Bilişsel Süreçler) (Eds: R. Akkuş, Z. Toluk-Uçar, A. Duatepe-Paksu, B. Boz-Yaman) | | | | | | | |
| **TOOLS AND EQUIPMENTS REQUIRED** | | | | | Computer, projection | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | Reasoning Types Model of Peirce |
| 2 | Reasoning Types Model of Lithner and the Related Studies |
| 3 | Argumantation Model |
| 4 | The Studies Regarding Argumantation Model |
| 5 | Mathematical Proof and Proving Methods |
| 6 | Proof Schemes |
| 7 | The Studies Regarding Proof Schemes |
| 8 | Mid-Exam |
| 9 | Algebraic Reasoning |
| 10 | Proportional Reasoning |
| 11 | Geometric Reasoning |
| 12 | Spatial Reasoning |
| 13 | Algoritmic Thinking and Computational Reasoning |
| 14 | Mathematical Definitions and Defining Criterion |
| 15 | The Studies Regarding Mathematical Reasoning |
| 16-17 | Final Exam |

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| **NO** | **LEARNING OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Mathematics Education and reach original results that will bring innovation to science. | X |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena. |  |  | X |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  | X |
| 4 | Gain the ability to use a new method or methods that have been used previously. |  |  | X |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of communities of experts and discuss them by communicating effectively. | X |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. | X |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. | X |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. | X |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  | X |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  | X |
| **1**: None. **2**: Partially contribution. **3**: Completely contribution. | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | Spring |

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| **COURSE CODE** |  | **COURSE NAME** | Conceptual Frameworks on Technology Integration in Mathematics Education |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Labratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| Spring | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY ELECTIVE | | | Turkish |
| **COURSE CATAGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
|  | | X | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MID – TERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Mid-Term | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | | Report | | | | | 1 | | 60 |
| **PREREQUIEITE(S)** | | | | |  | | | | | | | |
| **COURSE DESCRIPTION** | | | | | The content of this course consists of conceptual models by Taylor (1980), Pea (1985), and Bechberger (1990) in the context of the integration of innovative teaching technologies into mathematics education. Additionally, it includes the Instrumental Genesis Theory, Semiotic Mediation Model, Instrumental Orchestration Model, Technological Pedagogical Content Knowledge Model, dependency hierarchy related to representations in the context of dynamic geometry environments, as well as concepts of drawing, and dragging schemas. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of this course is to learn conceptual frameworks related to the roles and usage of innovative instructional technologies in mathematics education. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUATION** | | | | | The conceptual frameworks examined in the course will enable educators to gain new approaches on how to integrate innovative digital technologies into instructional activities, thereby enriching their teaching processes. Furthermore, it will provide educators with the opportunity to leverage various conceptual frameworks when deciphering how instructional technologies are used in learning environments in their research. | | | | | | | |
| **COURSE OUTCOMES** | | | | | At the end of the course, students will be able to articulate the roles and usage patterns of innovative technologies in mathematics education. They will also be able to benefit from different approaches to innovative technologies in instructional activities and leverage relevant conceptual frameworks in their research endeavors. | | | | | | | |
| **TEXTBOOK** | | | | | Theories in Mathematics Education (Matematik Eğitiminde Teoriler) (Editörler: E. Bingölbali, S. Arslan, İ. Ö. Zembat) | | | | | | | |
| **OTHER REFERENCES** | | | | | Mathematics Teaching Knowledge (Matematiği Öğretme Bilgisi) (Editör: A. Baki)  Cognitive Processes in Geometry Teaching (Geometri Öğretiminde Bilişsel Süreçler) (Editörler: R. Akkuş, Z. Toluk-Uçar, A. Duatepe-Paksu, B. Boz-Yaman) | | | | | | | |
| **TOOLS AND EQUIPMENTS REQUIRED** | | | | | Desktop computer or laptop, GeoGebra, SketchUp, Elica 3D | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to Dynamic Mathematics Software and Examination of Tools |
| 2 | Introduction to 3D Modelling Software and Examination of Tools |
| 3 | Technological Pedagogical Content Knowledge |
| 4 | Conceptual Frameworks of Taylor (1980), Pea (1985) and Bechberger (1990) |
| 5 | Instrumental Approach and Instrumental Genesis Theory |
| 6 | Instrumental Integration |
| 7 | Instrumental Orchestration |
| 8 | Mid-Exam |
| 9 | Instrumental Orchestration Types |
| 10 | Studies Regarding Instrumental Orchestration |
| 11 | Drawing, figure, dependency, direct/indirect invariant concepts in dynamic geometry environment |
| 12 | Dragging and dragging types in dynamic geometry environment |
| 13 | Reasoning in dynamic geometry environment |
| 14 | Studies regarding reasoning in dynamic geometry environment |
| 15 | Semiotic mediation |
| 16-17 | Final Exam |

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| **NO** | **LEARNING OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Mathematics Education and reach original results that will bring innovation to science. | X |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena. | X |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  | X |
| 4 | Gain the ability to use a new method or methods that have been used previously. |  |  | X |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of communities of experts and discuss them by communicating effectively. | X |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. | X |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. | X |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. | X |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  | X |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  | X |
| **1**: None. **2**: Partially contribution. **3**: Completely contribution. | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | SPRING |

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| **COURSE CODE** | 546812001 | **COURSE NAME** | MATHEMATICAL PROOF AND ITS TEACHING |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Laboratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| 2 | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | Turkish |
| **COURSE CATEGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
| x | |  | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MIDTERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | |  | | | | |  | |  |
| **PREREQUIEITE(S)** | | | | | There are no prerequisites for this course. | | | | | | | |
| **COURSE DESCRIPTION** | | | | | The concept of proof, mathematical proof within the framework of the history and philosophy of mathematics, the place and importance of proof in mathematics curriculum, the roles and functions of proof, argumentation and proof, proof schemes, methods of making proofs, visual proof, origami and proof… | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The Mathematical Proof and Teaching course aims to develop mathematical thinking skills and provide students with a deep understanding of mathematical concepts. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUCATION** | | | | | Developing knowledge of teaching mathematics; applying the knowledge gained in the field of mathematics education to the process of teaching mathematics. | | | | | | | |
| **COURSE OUTCOMES** | | | | | At the end of this course, students will be able to use mathematical proof methods, think mathematically, understand mathematical concepts and gain advanced problem-solving skills. | | | | | | | |
| **TEXTBOOK** | | | | | Uğurel,I.(2020). Matematiksel İspat ve Öğretimi. Anı Yayıncılık. | | | | | | | |
| **OTHER REFERENCES** | | | | | Daniel J. (2006). Vellemantun.How to Prove It: A Structured Approach" | | | | | | | |
| **TOOLS AND EQUIPMENT REQUIRED** | | | | |  | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | What is Proof? Some Basic Concepts in Proof |
| 2 | Proof and Demonstration in the Context of History and Philosophy of Mathematics |
| 3 | The Place and Importance of Proof in Mathematics Curriculum and International Standards |
| 4 | The relationship between mathematical competencies and conceptual and procedural understanding. |
| 5 | The Relationship Between Reasoning and Proof |
| 6 | Roles and Functions of Proof |
| 7 | The Relationship Between Argumentation and Mathematical Proof Processes |
| 8 | MIDTERM |
| 9 | Proof Schemes |
| 10 | Methods of Proving |
| 11 | Visual Proofs |
| 12 | Origami and Proof |
| 13 | Article Review |
| 14 | Article Review |
| 15 | Student Presentations |
| 16-17 | FINAL |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
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| 19 |  |  |  |  |
| 20 |  |  |  |  |
| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | FALL |

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| **COURSE CODE** | 546811007 | **COURSE NAME** | APOS LEARNING THEORY AND APPLICATIONS |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Laboratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| 1 | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | Turkish |
| **COURSE CATEGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
| x | |  | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MIDTERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | |  | | | | |  | |  |
| **PREREQUIEITE(S)** | | | | | There are no prerequisites for this course. | | | | | | | |
| **COURSE DESCRIPTION** | | | | | Abstraction in Mathematics, Piaget Reflective Abstraction, APOS Theory, ACE Teaching Cycle. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To learn the meaning of the concept of abstraction in mathematics and mathematics teaching, to learn the abstraction theories of Piaget, Skempt and Sfard, to learn how a mathematical concept is structured according to the APOS theory and how a teaching environment can be designed according to the ACE teaching model. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUCATION** | | | | | It contributes to learning the abstract structure of mathematics and the abstraction process of a mathematical concept. | | | | | | | |
| **COURSE OUTCOMES** | | | | | Abstraction in Mathematics, Abstraction in Mathematics Education, Reflective Abstraction, Mental Structures and Mechanisms in APOS Theory, Genetic Decomposition, ACE Teaching Cycle | | | | | | | |
| **TEXTBOOK** | | | | | Dubinsky, E. (2014). APOS Theory A Framework for Research and Curriculum Development in Mathematics Education | | | | | | | |
| **OTHER REFERENCES** | | | | | Various article deai with Abstraction in mathematics. | | | | | | | |
| **TOOLS AND EQUIPMENT REQUIRED** | | | | |  | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | Abstraction in Mathematics and Mathematics Education |
| 2 | Piaget Reflective Abstraction Article Review |
| 3 | Skempt's Theory of Abstraction |
| 4 | Skempt's Abstraction Theory Article Review. |
| 5 | Sfard's Theory of Abstraction |
| 6 | Sfard's Abstraction Theory Article Review |
| 7 | The Relationship Between Argumentation and Mathematical Proof Processes |
| 8 | MIDTERM |
| 9 | Dubinsky Apos Abstraction Theory |
| 10 | Mental Structures and Mental Mechanisms |
| 11 | Genetic Decomposition |
| 12 | ACE Teaching Cycle |
| 13 | Article Review |
| 14 | Article Review |
| 15 | Student Presentations |
| 16-17 | FINAL |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used previously |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of communities of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | FALL |

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| **COURSE CODE** |  | **COURSE NAME** | Project-Based Mathematics Education |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Laboratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| III | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | Turkish |
| **COURSE CATEGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MIDTERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Midterm | | | | | - | | - |
| Quiz | | | | | - | | - |
| Homework | | | | | 4 | | 20 |
| Project | | | | | 1 | | 60 |
| Report | | | | | - | | - |
| Others (     ) | | | | | - | | - |
| **FINAL EXAM** | | | | | Oral Presentation | | | | | 1 | | 20 |
| **PREREQUIEITE(S)** | | | | | No prerequisites for the course | | | | | | | |
| **COURSE DESCRIPTION** | | | | | Project-based learning, project applications in mathematics education, project preparation steps in mathematics education (determining the project topic; collecting information about the project; conducting the project; evaluating the project and writing and presenting the report), project evaluation criteria. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Comprehending project-based learning, project development for mathematics subjects at primary, secondary and higher education level, project-based learning, project applications in mathematics education, project preparation steps in mathematics education (determining the project topic; collecting information about the project; conducting the project; evaluating the project and writing and presenting the report), project evaluation criteria contents constitute the scope of the course. From theory to practice, project titles, contents and examples such as project topic selection, literature review, project management, problem analysis, method, original value, work and timetable, budget and risk plans, widespread impact, team building are included. Called projects; national projects (TUBITAK, SPO, National Development Agencies, Ministries etc.); international projects (EU etc.); creating an original project proposal is aimed to create learning outcomes of the course. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUCATION** | | | | | The aim of the course is to provide students with the knowledge of research project idea development, writing, realization and reporting and to gain the necessary desire to become trainers, experts and executors in projects. | | | | | | | |
| **COURSE OUTCOMES** | | | | | Evaluates the projects made in mathematics education.  Knows the steps of project preparation in mathematics education.  Proposes a project in mathematics education.  Realizes a project in mathematics education. | | | | | | | |
| **TEXTBOOK** | | | | | - | | | | | | | |
| **OTHER REFERENCES** | | | | | Capraro, R. M., Capraro, M. M., & Morgan, J. R. (Eds.). (2013). STEM project-based learning: An integrated science, technology, engineering, and mathematics (STEM) approach. Springer Science & Business Media.  Carter, S. (2016). Traditional vs. project-based learning: The effects on student performance and motivation in honors level mathematics courses. Liberty University.  Fancher, C., & Norfar, T. (2021). Project-based learning in the math classroom: Grades 6-10. Routledge.  Fleming, D. S. (2000). A Teacher's Guide to Project-Based Learning. Scarecrow Education, Attn: Sales Department, 15200 NBN Way, PO Box 191, Blue Ridge Summit, PA 17214.  Glaister, E. M., & Glaister, P. (2000). The role of applications in mathematics teaching and the enhancement of mathematics learning through project work. International Journal for Mathematics Teaching and Learning, 18.  Holmes, V. L., & Hwang, Y. (2016). Exploring the effects of project-based learning in secondary mathematics education. The Journal of Educational Research, 109(5), 449-463.  Kelly, A. E., & Lesh, R. A. (Eds.). (2012). Handbook of research design in mathematics and science education. Routledge.  Larmer, J., Mergendoller, J., & Boss, S. (2015). Setting the standard for project based learning. ASCD.  Lee, J. S., & Galindo, E. (2021). Project-Based Learning in Elementary Classrooms: Making Mathematics Come Alive. National Council of Teachers of Mathematics. 1906 Association Drive, Reston, VA 20191.  McHugh, M. L. (2023). Bringing Project-Based Learning to Life in Mathematics, K-12. Corwin Mathematics Series. Corwin.  Norfar, T., & Fancher, C. (2022). Project-based Learning in the Math Classroom: Grades 3-5. Routledge.  Vithal, R., Christiansen, I., & Skovsmose, O. (1995). Project work in university mathematics education: A Danish experience: Aalborg University. Educational Studies in Mathematics, 29(2), 199-223. | | | | | | | |
| **TOOLS AND EQUIPMENT REQUIRED** | | | | | - | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | National projects in education/mathematics education |
| 2 | National projects in education/mathematics education |
| 3 | International projects in education/mathematics education |
| 4 | International projects in education/mathematics education |
| 5 | Review of National Project Examples |
| 6 | Review of International Project Examples |
| 7 | Project development stages |
| 8 |  |
| 9 | Methodological knowledge in projects |
| 10 | Preparation of project reports |
| 11 | Project proposal presentation |
| 12 | Writing a project proposal within the scope of the course -Part I |
| 13 | Writing a project proposal within the scope of the course -Part I |
| 14 | Writing a project proposal within the scope of the course -Part I |
| 15 | Finalizing the project report |
| 16-17 | Oral presentation of the project |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena. |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used previously. |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of communities of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | FALL |

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| **COURSE CODE** | 546811004 | **COURSE NAME** | Mathematics Education on the Axis of Knowledge, Skills, Culture and Art |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Laboratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| II | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | Turkish |
| **COURSE CATEGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MIDTERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Midterm | | | | | - | | - |
| Quiz | | | | | - | | - |
| Homework | | | | | 4 | | 20 |
| Project | | | | | 1 | | 60 |
| Report | | | | | - | | - |
| Others (     ) | | | | | - | | - |
| **FINAL EXAM** | | | | | Oral Presentation | | | | | 1 | | 20 |
| **PREREQUIEITE(S)** | | | | | No prerequisites for the course | | | | | | | |
| **COURSE DESCRIPTION** | | | | | The content of this course is designed to train researchers and practitioners who emphasize skills and skill development in the processes of knowledge creation in mathematics education, emphasize the concept of ethnomathematics, realize mathematics teaching with the relationship between culture and art, and gain knowledge, skills and experience in this context from theory to practice. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of this course is to include researches and applications in mathematics teaching and specifically in mathematics education, including researches that aim to provide students with knowledge, skills, values, culturally sensitive mathematics education, ethnomathematics concepts, and the relationship between mathematics and art. The concepts of knowledge, skills, culture, value and art; related concepts and the place, importance and meaning of the related concepts in mathematics education will be discussed in relation to the national and international objectives of mathematics education. The theoretical frameworks in which these concepts are included, research data in the literature will be covered and the course has a content that includes the concepts and related fields from research to practice in which learning activities and lesson plans are created within the scope of presenting these concepts with concrete materials, virtual manipulatives and digital technologies. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUCATION** | | | | | Students taking the course will have knowledge, skills and experience in "mathematics education on the axis of knowledge, skills, culture and art" from theory to practice. | | | | | | | |
| **COURSE OUTCOMES** | | | | | Knows skills, process skills and higher order thinking skills in mathematics teaching.  Knows the relationship between culture and mathematics.  Knows the concept of ethnomathematics.  Knows the relationship between art and mathematics.  Develops skill-based lesson plans, activities and content.  Develops content that emphasizes the relationship between culture and mathematics.  Develops content that emphasizes the relationship between art and mathematics.  Knows skill-based, culturally sensitive learning environments and content development tools that emphasize art.  Structures mathematics teaching on the axis of knowledge, skills and art, develops content and conducts research. | | | | | | | |
| **TEXTBOOK** | | | | | Ascher, M. (2005). Etnomatematik: matematik dünyasına çokkültürlü bir bakış. Okyanus Yayıncılık.  Kalajdzievski, S. (2011). Math and art: an introduction to visual mathematics. Chapman and Hall/CRC. | | | | | | | |
| **OTHER REFERENCES** | | | | | Andersen, K. (2008). The geometry of an art: the history of the mathematical theory of perspective from Alberti to Monge. Springer Science & Business Media.  Bier, C. (2009). Number, shape, and the nature of space: thinking through Islamic art (pp. 827-851). Oxford: Oxford University Press.  Bier, C. (2015). Geometry in Islamic art. Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures, 1-21.  Bonner, J. (2017). Islamic geometric patterns: their historical development and traditional methods of construction. Springer.  Bouleau, C. (2014). The painter's secret geometry: A study of composition in art. Courier Corporation.  Calter, P. (2008). Squaring the circle: Geometry in art and architecture. Key College Pub..  Edgerton, S. Y. (2020). The heritage of Giotto's geometry: art and science on the eve of the scientific revolution. Cornell University Press.  Frantz, M., & Crannell, A. (2011). Viewpoints: Mathematical perspective and fractal geometry in art. Princeton University Press.  Ghyka, M. C. (1977). The geometry of art and life. Courier Corporation.  Henderson, L. D. (2018). The fourth dimension and non-Euclidean geometry in modern art. Mit Press.  Ivins Jr, W. M. (1946). Art & geometry: a study in space intuitions. Harvard University Press.  Kappraff, J. (1991). Connections: The geometric bridge between art and science. McGraw-Hill, Inc..  Maor, E., & Jost, E. (2017). Beautiful geometry. Princeton University Press.  Ouchi, H. (2013). Japanese optical and geometrical art. Courier Corporation. | | | | | | | |
| **TOOLS AND EQUIPMENT REQUIRED** | | | | | - | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | Knowledge, Skill, Culture and Art Concepts |
| 2 | The relationship between culture and mathematics |
| 3 | The concept of ethnomathematics |
| 4 | Research on the relationship between culture and mathematics |
| 5 | Research on the relationship between culture and mathematics |
| 6 | The relationship between art and mathematics |
| 7 | Research on the relationship between art and mathematics |
| 8 | - |
| 9 | Research on the relationship between art and mathematics |
| 10 | Developing content on the relationship between culture and mathematics |
| 11 | Preparing a research problem on the relationship between culture and mathematics |
| 12 | Developing content on the relationship between art and mathematics |
| 13 | Preparing a research problem on the relationship between art and mathematics |
| 14 | Conducting and Reporting Research |
| 15 | Conducting and Reporting Research |
| 16-17 | Research Presentation and Report Submission |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena. |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used previously. |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of communities of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | SPRING |

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| **COURSE CODE** | 546812003 | **COURSE NAME** | Online Distance Mathematics Education and Applications |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Laboratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| I | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | Turkish |
| **COURSE CATEGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MIDTERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Midterm | | | | | - | | - |
| Quiz | | | | | - | | - |
| Homework | | | | | 4 | | 30 |
| Project | | | | | 1 | | 60 |
| Report | | | | | - | | - |
| Others (     ) | | | | | - | | - |
| **FINAL EXAM** | | | | | Oral Presentation | | | | | 1 | | 10 |
| **PREREQUIEITE(S)** | | | | | The course has no prerequisites. | | | | | | | |
| **COURSE DESCRIPTION** | | | | | To examine online distance education from theory to practice, to examine the feasibility of online distance mathematics education on the basis of theories, methods, approaches; to experience online distance learning tools, to design online distance courses and to create research problems appropriate to the content of the course. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of this course is to examine the theories of online distance education in mathematics teaching and to provide knowledge and experience in the design, delivery and evaluation of online courses from theory to practice in a broad framework. In this context, the course also includes mathematics-specific research on some online distance learning concepts and contents such as selection of online learning environments, e-learning standards and content development tools, open educational resources (OER), virtual reality, augmented reality, mixed reality, massive open online courses, the use of productive artificial intelligence in education. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUCATION** | | | | | Students taking the course will gain knowledge, skills and experience in online distance mathematics education from theory to practice. | | | | | | | |
| **COURSE OUTCOMES** | | | | | Knows the theories of online distance education.  Knows the design of online courses.  Knows online learning environments and content development research.  Knows e-learning standards and open educational resources.  Designs an online distance course suitable for mathematics teaching. | | | | | | | |
| **TEXTBOOK** | | | | | Fırat, M. (2019). Uygulamadan kurama açık ve uzaktan öğrenme. Ankara: Nobel Akademi Yayınları.  Taştepe, M., & Aksoy, N. C. (2022). Uzaktan Matematik Eğitimi. Ankara: Vizetek Yayınları.  Zawacki-Richter, O., & Jung, I. (Eds.). (2023). Handbook of open, distance and digital education. Springer.Zawacki-Richter, O., & Jung, I. (Eds.). (2023). Handbook of open, distance and digital education. Springer. | | | | | | | |
| **OTHER REFERENCES** | | | | | Berry III, R. Q., Conway IV, B. M., Lawler, B. R., & Staley, J. W. (2020). High school mathematics lessons to explore, understand, and respond to social injustice. Corwin Press.  Camilleri, A. F., Ehlers, U. D., & Pawlowski, J. (2014). State of the art review of quality issues related to open educational resources (OER). Luxembourg: Publications Office of the European Union.  Ferdig, R. E., Baumgartner, E., Hartshorne, R., Kaplan-Rakowski, R., & Mouza, C. (Eds.). (2020). Teaching, technology, and teacher education during the COVID-19 pandemic: Stories from the field. Waynesville, NC: Association for the Advancement of Computing in Education.  Haber, J. (2014). MOOCs. MIT Press.  Kesim, M., Yüzer T. V. (2020). Açık ve Uzaktan Öğrenmenin Teknolojik Boyutu, Pegem Akademi Yayıncılık.  Kotsiou, A., & Shores, T. (2021). OER and the Future of Digital Textbooks. In Handbook for Online Learning Contexts: Digital, Mobile and Open: Policy and Practice (pp. 5-20). Cham: Springer International Publishing.  Morgan, C. (2020). Assessing open and distance learners. Routledge.  Rumble, G. (2019). The planning and management of distance education. Routledge.  Sewart, D., Keegan, D., & Holmberg, B. (Eds.). (2020). Distance education: International perspectives. Routledge.  Trouche, L., Gueudet, G., & Pepin, B. (Eds.). (2019). The'resource'approach to mathematics education. Springer Nature.  Zawacki-Richter, O., & Qayyum, A. (2019). Open and distance education in Asia, Africa and the Middle East: National perspectives in a digital age (p. 140). Springer Nature. | | | | | | | |
| **TOOLS AND EQUIPMENT REQUIRED** | | | | | - | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | Basic concepts of online distance education |
| 2 | Theoretical foundations of online distance education |
| 3 | Theoretical foundations of online distance education |
| 4 | Theories of online distance education |
| 5 | Theories of online distance education |
| 6 | Online learning environments |
| 7 | Online learning standards |
| 8 |  |
| 9 | Review of national research on online distance mathematics education |
| 10 | Review of international research on online distance mathematics education |
| 11 | Course design for online distance education |
| 12 | Course design for online distance education |
| 13 | Course design for online distance education |
| 14 | Online distance course design appropriate for mathematics teaching |
| 15 | Online distance course design appropriate for mathematics teaching |
| 16-17 | Presentation of the Designed Course |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena. |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used previously. |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of communities of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | SPRING |

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| **COURSE CODE** | 546812004 | **COURSE NAME** | COMPETENCIES IN MATHEMATICS EDUCATION |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Laboratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| II | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | Turkish |
| **COURSE CATEGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
|  | | X | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MIDTERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | | Project | | | | | 1 | | 60 |
| **PREREQUIEITE(S)** | | | | | There is no prerequisite for this course. | | | | | | | |
| **COURSE DESCRIPTION** | | | | | The concept of mathematical competency and mathematical skill;KOM project and its effects; conceptual frameworks and their comparative analysis; fundamental mathematical competencies; assessment of mathematical competencies; samples of mathematical literacy problems and their analysis; samples of competency-based problems and their analysis; supporting development of mathematical competencies in math learning environments | | | | | | | |
| **COURSE OBJECTIVES** | | | | | -to provide students with knowledge about the concept of mathematical competency and fundamental mathematical competencies  -to provide students with knowledge and skill about how to support mathematical competencies in math learning environments | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUCATION** | | | | | Developing knowledge of mathematics teaching, applying the knowledge gained in the field of mathematics education to the mathematics teaching process. | | | | | | | |
| **COURSE OUTCOMES** | | | | | Students will be able to;  - explain the concept of mathematical competency  - explain fundamental mathematical competencies  - analyze the solution process of a PISA mathematical literacy problem in terms of fundamental mathematical competencies  -analyze the solution process of a skill-based math problem in terms of fundamental mathematical competencies  -explain how to support mathematical competencies in math classes | | | | | | | |
| **TEXTBOOK** | | | | | Niss, M., & Højgaard, T. (2020). Mathematical Competencies in Mathematics Education. Springer | | | | | | | |
| **OTHER REFERENCES** | | | | | Kabael, T. (2019). Matematik Okuryazarlığı ve PISA. Ankara: Anı Yayıncılık  Altun, M. (2020). Matematik Okuryazarlığı El Kitabı. Aktüel Yayınları  Stacey, K. & Turner, R. (2015). Assessing Mathematical Literacy: The PISA Experience. Springer.  Jankvist, U. T., & Geraniou, E. (2022). Mathematical Competencies in the Digital Era. Springer. | | | | | | | |
| **TOOLS AND EQUIPMENT REQUIRED** | | | | | Computer, projector. | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | The concept of mathematical competency and historical perspective |
| 2 | Handling of mathematical competencies in math curricula |
| 3 | Assessment of mathematical competencies |
| 4 | The relationship between mathematical competencies and conceptual and procedural learning |
| 5 | The concept of mathematical digital competency |
| 6 | Analysis of PISA mathematical literacy problems |
| 7 | Analysis of competency-based math problems |
| 8 | MIDTERM |
| 9 | Mathematical communication and fostering this competency |
| 10 | Mathematizing and fostering this competency |
| 11 | Representation and fostering this competency |
| 12 | Reasoning and argumentation and fostering this competency |
| 13 | Devising strategies and fostering this competency |
| 14 | Using mathematical language and fostering this competency |
| 15 | Using mathematical tools and fostering this competency |
| 16-17 | FINAL EXAM |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used previously |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of communities of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | FALL |

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| **COURSE CODE** | 546811002 | **COURSE NAME** | DESIGNING, CONDUCTING AND PUBLISHING RESEARCH IN MATHEMATICS EDUCATION |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Laboratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| I | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | Turkish |
| **COURSE CATEGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
|  | | X | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MIDTERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | | Project | | | | | 1 | | 60 |
| **PREREQUIEITE(S)** | | | | | There is no prerequisite for this course. | | | | | | | |
| **COURSE DESCRIPTION** | | | | | The purpose and value of the theoretical framework; iterative steps that are key to a literature review; developing a research program; considerations when conducting research in quantitative and qualitative paradigms; conducting the research process; publishing research; communicating with editors and reviewers; barriers to publication and overcoming them; yesterday, today and tomorrow in mathematics education research. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | It is aimed to provide students with basic knowledge about the processes of designing, conducting and publishing a research in mathematics education and to contribute to students' ability to carry out these processes. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUCATION** | | | | | Applying the knowledge gained in the field of research in mathematics education. | | | | | | | |
| **COURSE OUTCOMES** | | | | | Students will be able to:  - explain the considerations in designing a research in mathematics education.  - explain the considerations in conducting a research in mathematics education  -explain the considerations in publishing a research in mathematics education  -examine the studies on mathematics learning and teaching  -experience the processes of designing, conducting and publishing a mathematical research. | | | | | | | |
| **TEXTBOOK** | | | | | Leatham, K. R.. (2019). Designing, conducting and publishing quality research in mathematics education. Springer. | | | | | | | |
| **OTHER REFERENCES** | | | | | KCai, J., Hwang, S., & Robison, V. (2019). Journal for Research in Mathematics Education: Practical guides for promoting and disseminating significant research in mathematics education. In G. Kaiser & N. Presmeg (Eds.), Compendium for early career researchers in mathematics education (pp. 425–442). New York, NY: Springer. | | | | | | | |
| **TOOLS AND EQUIPMENT REQUIRED** | | | | | Computer, projector. | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | The Role of Theoretical Frameworks in Mathematics Education Research |
| 2 | Conducting a Literature Review |
| 3 | Designing and Conducting Quality Research |
| 4 | Putting Quantitative Pieces Together |
| 5 | Analyzing Qualitative Data in Mathematics Education |
| 6 | Design-Based Research in Mathematics Education |
| 7 | Design-Based Research in Mathematics Education |
| 8 | MIDTERM |
| 9 | Going to Where Your Research Takes You |
| 10 | Principles for Effectively Communicating the Theoretical Framework |
| 11 | Writing as Communicating with Reviewers |
| 12 | Removing Obstacles to Quality Research Publishing |
| 13 | Publishing for International Impact in Math.Edu.Res.Journals |
| 14 | Revising and Resubmitting |
| 15 | Getting Published |
| 16-17 | FINAL EXAM |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used previously |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of communities of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | SPRING |

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| **COURSE CODE** | 546812005 | **COURSE NAME** | Technological Pedagogical Content Knowledge in Mathematics Education |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Laboratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| 2 | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | Turkish |
| **COURSE CATEGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
| %50 | | %50 | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MIDTERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | | Written exam | | | | | 1 | | 60 |
| **PREREQUIEITE(S)** | | | | | - | | | | | | | |
| **COURSE DESCRIPTION** | | | | | The content of the Technological Pedagogical Content Knowledge course in Mathematics Education, What is Pedagogical Knowledge? What is Domain Knowledge? What is Technological Knowledge? What is Pedagogical Content Knowledge? Comparing content knowledge and pedagogical content knowledge, Examining Pedagogical Content Knowledge models, Analyzing research on pedagogical content knowledge in Mathematics, What is Technological Content Knowledge? Examining Technological Content Knowledge models, Analyzing research on technological content knowledge in Mathematics, What is Technological Pedagogical Knowledge? Comparing pedagogical knowledge and technological pedagogical knowledge, examining Technological Pedagogical Knowledge models, analyzing research on technological pedagogical knowledge in mathematics, examining design-based learning approaches and examples in the development of Technological Pedagogical Content Knowledge (TPACK), examining transformative models and components in TPACK development, examining TPACK developments. It constitutes an examination of the studies on the issue. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of this course is to present mathematical concepts using technology; pedagogical techniques that use technology constructively to teach content; knowledge of the factors that make concepts easier or more difficult and how to use technology to overcome the problems faced by students; To develop new epistemologies and to understand the relationship between technological innovations, pedagogy and scientific content, which requires knowledge of how they can be used to build new knowledge | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUCATION** | | | | | It is thought that by introducing technological pedagogical content knowledge and its importance to mathematics educators in mathematics education, which will be discussed within the scope of the course, it will be possible to take these components into account and use them in mathematics classes and will contribute to teachers' mathematics teaching methods and technical knowledge. | | | | | | | |
| **COURSE OUTCOMES** | | | | | 1. A framework for concepts, theories, models, approaches, research and practice regarding technology integration in mathematics education will be given.  2. How to teach mathematical concepts with appropriate pedagogy using current technology models and the measurement and evaluation methods that can be used in this teaching will be examined. | | | | | | | |
| **TEXTBOOK** | | | | | Fen Eğitimi Araştırmalarına Güncel Bakış. (2020). (n.p.): Akademisyen Kitabevi.  New Directions in Technological Pedagogical Content Knowledge Research: Multiple Perspectives. (2015). Amerika Birleşik Devletleri: Information Age Publishing. | | | | | | | |
| **OTHER REFERENCES** | | | | | Baran, E., & Bilici, S. C. (2015). Teknolojik Pedagojik Alan Bilgisi (TPAB) Üzerine Alanyazın İncelemesi: Türkiye Örneği A Review of the Research on Technological Pedagogical Content Knowledge: The Case of Turkey. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi (H.U. Journal of Education), 30(1), 15-32.  Çağıltay, K., Çakıroğlu, J., Çağıltay, N., & Çakıroğlu, E. (2001). Öğretimde bilgisayar kullanımına ilişkin öğretmen görüşleri. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 21(21). | | | | | | | |
| **TOOLS AND EQUIPMENT REQUIRED** | | | | | Computer, projecton. | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | What is Pedagogical Knowledge? What is Domain Knowledge? What is Technological Knowledge? |
| 2 | What is Pedagogical Content Knowledge? |
| 3 | Comparison of content knowledge and pedagogical content knowledge |
| 4 | Examining Pedagogical Content Knowledge models |
| 5 | Analyzing research on pedagogical content knowledge in mathematics |
| 6 | What is Technological content Knowledge? |
| 7 | Examination of Technological content Knowledge models |
| 8 | Midterm Exam |
| 9 | Analyzing research on technological content knowledge in mathematics education |
| 10 | What is Technological Pedagogical Knowledge? |
| 11 | Comparison of pedagogical knowledge and technological pedagogical knowledge |
| 12 | Examination of Technological Pedagogical Knowledge models |
| 13 | Analyzing research on technological pedagogical knowledge in mathematics |
| 14 | Examination of design-based learning approach and examples in the development of Technological Pedagogical Content Knowledge (TPACK) |
| 15 | Examining the transformative model and its components in TPACK development, examining studies on TPACK development |
| 16-17 | Final Exam |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Elementary Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena. |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used before. |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of groups of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**

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|  | **T.C.**  **ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ**  **EĞİTİM BİLİMLERİ ENSTİTÜSÜ**  **DERS BİLGİ FORMU (İngilizce)** |

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| **SEMESTER** | FALL |

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| **COURSE CODE** | 546811006 | **COURSE NAME** | Interdisciplinary Practices: STEM and Mathematical Modeling |

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| **SEMESTER** | **WEEKLY COURSE PERIOD** | | | | | | **COURSE OF** | | | | | |
| **Theory** | | **Practice** | **Laboratory** | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| 1 | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ELECTIVE | | | Turkish |
| **COURSE CATEGORY** | | | | | | | | | | | | |
| **Basic Science** | | **Educational Science** | | | |  | | | | | **Social Science** | |
| %50 | | %50 | | | |  | | | | |  | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **MIDTERM** | | | | | **Evaluation Type** | | | | | **Quantity** | | **%** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Others (     ) | | | | |  | |  |
| **FINAL EXAM** | | | | | Written exam | | | | | 1 | | 60 |
| **PREREQUIEITE(S)** | | | | | - | | | | | | | |
| **COURSE DESCRIPTION** | | | | | Interdisciplinary Applications: The content of the STEM and Mathematical Modeling course, the importance of interdisciplinary applications, the models developed for interdisciplinary applications, the place and importance of Science, Technology, Engineering and Mathematics applications in each discipline, the importance of each discipline in Science, Technology, Engineering and Mathematics applications. Relationship with disciplines, Examination of research and developed projects related to interdisciplinary applications including science, technology, engineering and mathematics, Giving mathematical modeling and its components, place and importance of mathematical modeling in the transition to STEM education, Examining and evaluating studies based on mathematical modeling in STEM education. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main purpose of this course is to contribute to the applicability of these approaches in mathematics classes by associating the mathematical modeling approach with the STEM approach, which shows that it is an effective tool in teaching science, mathematics, engineering and technology disciplines simultaneously by associating mathematics with other disciplines. | | | | | | | |
| **ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUCATION** | | | | | It is thought that by introducing mathematical modeling and STEM and interdisciplinary approaches to mathematics educators, it will be possible to use these approaches in mathematics classes and will contribute to teachers' knowledge of mathematics teaching methods and techniques. | | | | | | | |
| **COURSE OUTCOMES** | | | | | 1. To know mathematical modeling and STEM approaches in mathematics teaching,  2. To know how to use STEM and mathematical modeling approaches in mathematics lessons,  3.To research scientific studies on STEM and mathematical modeling in mathematics education and to present application examples. | | | | | | | |
| **TEXTBOOK** | | | | | Doğan, M. F., Gürbüz, R., Çavuş Erdem, Z. ve Şahin, S., (2018). STEM eğitimine geçişte bir araç olarak matematiksel modelleme. R. Gürbüz ve M. F. Doğan (Ed.), Matematiksel modellemeye disiplinler arası bakış: Bir STEM yaklaşımı. (ss. 43-56). Ankara: Pegem Akademi. | | | | | | | |
| **OTHER REFERENCES** | | | | | Interdisciplinary Mathematics Education: The State of the Art and Beyond. (2019). Almanya: Springer International Publishing.  Advancing and Consolidating Mathematical Modelling: Research from ICME-14. (2023). Almanya: Springer International Publishing. | | | | | | | |
| **TOOLS AND EQUIPMENT REQUIRED** | | | | | Computer, projecton. | | | | | | | |

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| **COURSE SYLLABUS** | |
| **WEEK** | **TOPICS** |
| 1 | The importance of interdisciplinary applications |
| 2 | Models developed for interdisciplinary applications |
| 3 | The place and importance of Science, Technology, Engineering and Mathematics applications in each discipline |
| 4 | The place and importance of Science, Technology, Engineering and Mathematics applications in each discipline |
| 5 | The relationship of each discipline with other disciplines in Science, Technology, Engineering and Mathematics applications |
| 6 | The relationship of each discipline with other disciplines in Science, Technology, Engineering and Mathematics applications |
| 7 | Examining research on interdisciplinary applications including science, technology, engineering and mathematics |
| 8 | Midterm Exam |
| 9 | Examining research on interdisciplinary applications including science, technology, engineering and mathematics. |
| 10 | Mathematical modeling and its components |
| 11 | Mathematical modeling and its components |
| 12 | The place and importance of mathematical modeling in the transition to STEM education |
| 13 | The place and importance of mathematical modeling in the transition to STEM education |
| 14 | Examining and evaluating studies based on mathematical modeling in STEM education |
| 15 | Examining and evaluating studies based on mathematical modeling in STEM education |
| 16-17 | Final Exam |

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| **NO** | **PROGRAM OUTCOMES** | **3** | **2** | **1** |
| 1 | Develop and deepen the knowledge in the field of Elementary Mathematics Education and reach original results that will bring innovation to science. |  |  |  |
| 2 | Comprehend the relationship between Mathematics Education and other scientific fields, and use the knowledge that requires expertise in the evaluation of new and complex ideas, events and phenomena. |  |  |  |
| 3 | Gain the ability to use high-level qualitative and quantitative scientific research methods in the field. |  |  |  |
| 4 | Gain the ability to use a new method or methods that have been used before. |  |  |  |
| 5 | Defend original discoveries, opinions, approaches and suggestions in front of groups of experts and discuss them by communicating effectively. |  |  |  |
| 6 | Take active roles in Scientific, technological, social and cultural advances in the field of Mathematics Education; in creating an information society, solving problems with scientific methods and decision stages. |  |  |  |
| 7 | Establishes complex relationships between different disciplines and subfields that her field is related to, using her expert knowledge and skills, and designs new research topics. |  |  |  |
| 8 | Prepares an article about the field education with a method she has developed or is known to be published in a national or international peer-reviewed journal and contributes to scientific research. |  |  |  |
| 9 | Using a foreign language effectively; communicates verbally and in writing with colleagues in the field of study or other disciplines. |  |  |  |
| 10 | Takes into account the social and cultural differences in her researches and all other studies related to the field, acts in accordance with scientific and professional ethical values and makes suggestions by defending that these values should always be on national and international grounds. |  |  |  |
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| **1**: None **2**: Partially contribution **3**: Completely contribution | | | | |

**Date:**

**Instructor(s):**

**Signature:**