Tarih: 24 Ağustos 2025 00:14

Department of Mathematics Education / Department of Mathematics and Science Education /

Course Code	Course Name	Teorical	Practice	Laboratory	Credits	ECTS
İMEAE 401	PROBLEM SOLVING IN MATHEMATICS	2.00	0.00	0.00	2.00	3.00

Course Detail

Course Language	:	Turkish
Qualification Degree	:	Bachelor
Course Type	:	Compulsory
Preconditions	:	Not
Objectives of the Course	:	The aim of this course is to examine the fundamental purposes of using problem solving in mathematics education and to equip students with the ability to design rich, meaningful, and student-centered learning environments through problem-based learning approaches.
Course Contents	:	This course covers the concepts of problem and problem solving, types of problems, the importance of teaching problem solving, recent developments in problem solving, mathematical problem-solving strategies, and the significance of multiple representations in problem solving. It also includes examples of problems that can be solved using different problem-solving strategies, the assessment of problem solving, the definition, process, characteristics, and importance of problem posing, classifications and strategies of problem posing, implementation of various problem posing activities, as well as the inclusion of problem posing in middle school mathematics curricula and textbooks, and the evaluation of problem posing.
Recommended or Required Reading	:	Within the scope of the course, students are expected to acquire theoretical knowledge related to mathematical problem-solving processes, become familiar with various problem-solving strategies, and develop applicable methods for classroom practices. In this context, in addition to lecture notes and instructional materials, various visual and digital tools such as smart boards and projectors will be utilized. Furthermore, several supplementary resources will be used to support both the theoretical and practical aspects of the problem-solving approach. The recommended resources are as follows: (1) Ersoy, E. (Ed.) (2024). Matematikte Problem Çözme: Lisans ve Lisansüstü Öğrencileri İçin. Ankara: Nobel Yayıncılık. (2) Yazgan, Y. & Arslan, Ç. (2021). Matematiksel Sıra Dışı Problem Çözme Stratejileri ve Örnekleri (9th ed.). Ankara: Pegem Akademi Publishing. (3) Özkaya, A. & Aksu, G. (2017). Gerçekçi Matematik Eğitimi. İstanbul: Maya Akademi Publishing. (4) Posamentier, A. S. & Krulik, S. (2019). Matematikte Problem Çözme: 3-6. Sınıfla Kavramayı Derinleştirecek Güçlü Stratejiler (2nd ed.) (Trans. L. Akgün, T. Kar & M. F. Oçal). Ankara: Pegem Akademi Publishing. (5) Ministry of National Education (MoNE) (2024). Türkiye Yüzyılı Maarif Modeli Mathematics Curriculum. Ankara: Board of Education. (6) National Council of Teachers of Mathematics (NCTM) (2000). Principles and Standards for School Mathematics. Reston, VA: NCTM Publications.
Planned Learning Activities and Teaching Methods	:	In this course, a variety of teaching methods and learning activities are designed to develop students' theoretical knowledge and practical skills related to mathematical problem solving and problem posing. Throughout the course, instructional strategies such as lectures, discussions, question-answer sessions, individual and group-based problem-solving activities, case analyses, structured problem-posing tasks, and project-based learning will be employed. A particular focus will be placed on introducing mathematical problem-solving strategies, explaining how and when to use multiple representations through concrete examples, and guiding students to apply these strategies in their own problem-solving processes. Sample problems of different types will be explored, and students will be encouraged to articulate their solutions both orally and in writing. In the problem-posing component, students will be expected to use their creative thinking skills to develop original problem scenarios inspired by their own lives, present them in class, and improve them based on peer feedback. The middle school mathematics curriculum and textbooks will be analyzed to identify how problem-solving and problem-posing are embedded, and the findings will be discussed with a focus on classroom application. Students will be encouraged to participate actively in both individual and collaborative activities throughout the course. At the end of the term, they will be guided to design and present a sample project based on either a problem-solving or problem-posing framework.
Recommended Optional Programme Components	:	To ensure the effectiveness of this course, students are expected to regularly follow the weekly syllabus, complete assigned readings on time, and prepare in advance for each topic, especially by reviewing key concepts. Active participation in problem solving, problem posing, group discussions, and presentation activities during the course is highly encouraged. In order to enhance students' critical thinking, creative problem posing, and strategy development skills, they are required to take responsibility in both individual and collaborative tasks. Throughout the course, students will be expected to work on example problems, develop solutions, and express these solutions using various representations (oral, written, or visual). Additionally, students will be encouraged to write short reports, create original problem scenarios using course materials and supplementary resources, and share them in class. For end-of-term projects or assessment activities, consistent attendance and attention to formative evaluations will be essential. In this context, taking an active role in collaborative learning environments, alongside individual study, is recommended for an effective and meaningful learning experience.
Course Instructors	:	Doç. Dr. Deniz Kaya
Instructor's Assistants	:	There is no teaching assistant assigned for this course.
Presentation Of Course	:	This course will be conducted in an in-person and interactive format, supported by student-centered instructional methods that encourage active participation. Throughout the semester, core concepts such as problem and problem solving, types of problems, the significance of teaching problem solving, recent developments in the field, mathematical problem-solving strategies, and the role of multiple representations will be addressed through both theoretical and practical approaches. Students will be expected to analyze problem-solving strategies, engage with sample problems, and develop diverse solution pathways from multiple perspectives. Problem-solving processes will be evaluated through classroom activities, where students will be encouraged to express their solutions using various methods. The topic of problem posing will also be thoroughly explored, covering its definition, processes, classifications, and strategies. Students will engage in original and creative problem-posing activities and apply these within the context of middle school mathematics curricula and textbooks. Evaluation criteria will be used to assess and reflect on the effectiveness of their designs. Throughout the course, a variety of instructional methods will be used, including lectures, discussions, Q&A sessions, group work, case studies, problem-solving and problem-posing workshops. Individual and collaborative assignments will support the development of students' critical thinking, creative problem-solving, and mathematical communication skills. Instructional materials will be digitally supported, and interaction with online resources will be encouraged where appropriate. Regular attendance, preparation, and active engagement in activities are crucial for success in this course.
Update Date	:	8/24/2025 12:09:34 AM
Dosya İndirilme Tarihi	:	8/24/2025

Course Outcomes

Upon the completion of this course a student :
1 Can explain problems and types of problems.
2 Can explain the place of problem solving in the mathematics curriculum.
3 Can explain the problem solving strategies.
4 Can explain the problem solving process and use it in teaching.
5 Can explain the problem posing process and use it in teaching.
6 Will be able to explain alternative evaluation systems through problem solving and constructing.
7 Can design lesson designs for different learning areas with problem-based learning.

Preconditions

Course Code	Course Name	Teorical	Practice	Laboratory	Credits	ECTS

Weekly Contents

	Teorical	Practice	Laboratory	Preparation Info	Teaching Methods	Course Learning Outcomes
1.Week	*Introduction to the course, review of the syllabus, explanation of the concepts of “problem” and “problem solving”; discussion on the essential characteristics of a well-constructed problem.			*Before starting this week, students are expected to have a general understanding of fundamental mathematical concepts and problem-solving processes. To better comprehend the concepts of "problem" and "problem solving" discussed in class, it is recommended to read Chapter 1 (“Problem”) of the course textbook: Ersoy, E. (Ed.) (2024). Problem Solving in Mathematics: For Undergraduate and Graduate Students. The content in this chapter provides an essential foundation for understanding the characteristics of a well-structured problem, distinguishing between different types of problems, and actively participating in class discussions.	*This course will utilize a variety of instructional methods aimed at developing students’ problem-solving and problem-posing skills. Student-centered approaches such as lectures, discussions, individual and group work, case study analysis, problem-based learning, question-and-answer sessions, brainstorming, and the use of multiple representations will be emphasized. In addition, students will be encouraged to actively participate through activities that involve developing strategies for mathematical problem solving, analyzing types of problems, and designing original problem-posing tasks.	Ö.Ç.1 Ö.Ç.1 Ö.Ç.1
2.Week	*Examining the significance of problem solving in the current mathematics curriculum and the learning outcomes related to problem solving and problem posing.			***Preparation Information:** Before starting this week, students are expected to have a general understanding of the current middle school mathematics curriculum. In particular, it is important to carefully review the learning outcomes, competencies, and skill-based approaches related to **problem solving** and **problem posing** included in the curriculum. Students are encouraged to reflect on how these outcomes are implemented in classroom practices and to evaluate the role of problem solving within the curriculum. Additionally, reading the relevant sections of the "Türkiye Yüzyılı Maarif Modeli Mathematics Curriculum" published by the Ministry of National Education (MoNE) will contribute to more active participation in discussions.	***Teaching Methods:** This week, various instructional methods will be employed to support students in evaluating problem-solving and problem-posing processes within the context of the mathematics curriculum. These methods include lectures, classroom discussions, group work, individual analysis, examination of curriculum documents, sample learning outcome analyses, question-and-answer sessions, and collaborative learning strategies. Students will also be given the opportunity to design short activities that integrate relevant learning outcomes from the curriculum into instructional practices.	Ö.Ç.2 Ö.Ç.2 Ö.Ç.2

	Teorical	Practice	Laboratory	Preparation Info	Teaching Methods	Course Learning Outcomes
3.Week	*The purposes of using problem solving in mathematics education based on its historical development and types of problems			*Before starting this week, students are expected to have a general understanding of the historical development of problem solving. It is also important for them to be familiar with the basic concepts of different types of problems and to reflect on how these types can be integrated into instructional practices. It is recommended that students read Chapter 2 of the course book Ersoy, E. (Ed.) (2024). Matematikte Problem Çözme: Lisans ve Lisansüstü Öğrencileri İçin in advance. The content of this chapter will significantly contribute to understanding various problem types and developing insights into their application in teaching processes.	***Öğretim Metotları:** Bu hafta, problem çözmenin tarihsel gelişimi ve problem türlerine yönelik kavramların işlenmesinde çeşitli öğretim yöntemleri kullanılacaktır. Ders anlatımı, örnek problem analizleri, sınıf içi tartışmalar, grup çalışmaları, bireysel değerlendirme etkinlikleri, beyin fırtınası ve soru-cevap oturumları gibi yöntemlerle öğrencilerin aktif katılımı teşvik edilecektir. Öğrencilerden, tarihsel süreçte farklı dönemlerde kullanılan problem türlerine örnekler getirmeleri ve bu örnekler üzerinden öğretimle ilişkili yorumlar geliştirmeleri beklenmektedir. **Teaching Methods:** This week, various instructional methods will be employed to explore the historical development of problem solving and the types of problems. These methods include lectures, sample problem analysis, in-class discussions, group work, individual assessment activities, brainstorming, and question-and-answer sessions to encourage active student participation. Students will be expected to bring examples of problem types used in different historical periods and develop instructional insights based on these examples.	Ö.Ç.2 Ö.Ç.4 Ö.Ç.2 Ö.Ç.4 Ö.Ç.2 Ö.Ç.4
4.Week	*Non-routine problems and problem-solving strategies			*Before starting this week, students are expected to have a level of understanding that enables them to grasp what non-routine problems are and to identify the basic strategies used in solving such problems. In particular, it is important for students to develop awareness of strategies such as intuitive thinking, pattern recognition, using representations, working backward, and drawing on similar problems — as well as how to apply these strategies effectively. In this context, it is recommended that students carefully review the chapter titled “Problem Solving and Its Stages” in the course textbook: Ersoy, E. (Ed.) (2024). Matematikte Problem Çözme: Lisans ve Lisansüstü Öğrencileri İçin. This reading will enhance students' ability to develop solution methods beyond conventional patterns and support their active participation in in-depth discussions.	*Throughout this week, the instructional process will focus on experiential learning activities that allow students to explore and apply strategies for solving non-routine problems. Various student-centered teaching methods will be utilized, including group discussions, case-based problem-solving sessions, individual and collaborative tasks, guided discovery, brainstorming, strategy development workshops, and peer evaluations. Students will be asked to solve different types of non-routine problems and express the strategies they use both orally and in writing. The instructor will provide continuous guidance and support, helping students increase their strategic awareness and offering constructive feedback during the problem-solving process.	Ö.Ç.3 Ö.Ç.4 Ö.Ç.3 Ö.Ç.4 Ö.Ç.3 Ö.Ç.4

	Teorical	Practice	Laboratory	Preparation Info	Teaching Methods	Course Learning Outcomes
5.Week	*Analyzing problems that can be solved using the working backward strategy			***Preparatory Information** Before starting this week, students are expected to have a basic understanding of the "working backward" strategy, including what it entails, in which types of problems it can be effectively used, and the general steps involved in applying it. It is especially important for students to grasp the logic of starting from the result and reasoning backward to the given data. In this context, reviewing the examples provided in the **“Assessment in Problem Solving”** section of the course textbook *Ersoy, E. (Ed.) (2024). Problem Solving in Mathematics: For Undergraduate and Graduate Students* is recommended. This reading will serve as essential preparation for the in-class analyses and discussions.	***Teaching Methods** This week, to facilitate understanding and application of the “working backwards” strategy in problem solving, student-centered and exploratory teaching approaches will be employed. Emphasis will be placed on problem-based group work, guided practice, analysis of example problems, and in-class discussions. Students will be guided through step-by-step solution analyses to comprehend the logic behind the working backwards strategy, and they will explore how this approach can be applied to similar problems. Individual tasks and peer assessments will also be used to help students develop the ability to use the strategy accurately and effectively. Through these methods, students will gain experience in approaching problem solving systematically and generating solutions through alternative pathways.	Ö.Ç.3 Ö.Ç.4 Ö.Ç.3 Ö.Ç.4 Ö.Ç.3 Ö.Ç.4
6.Week	*An analysis of problems solvable by the equation-forming strategy			*Before starting this week, students are expected to have a basic understanding of the “equation-forming” strategy, including what it is, the types of problems in which it can be effectively used, and the step-by-step process involved in its application. It is particularly important that students grasp the reasoning behind analyzing the given information in a verbal problem, defining the unknowns, representing the situation with an algebraic equation, and solving the equation to interpret the result in context. In this regard, reviewing the examples provided in the "Conceptual Structure of Problem Posing" section of the course textbook Ersoy, E. (Ed.) (2024). Mathematics Problem Solving: For Undergraduate and Graduate Students is considered preparatory work for the analyses that will be conducted during the lesson.	*In this week’s lesson, interactive and structured instructional methods will be employed to help students understand how the equation-forming strategy is used in the problem-solving process. The session will begin with a brief conceptual overview, followed by instructor-led problem-solving demonstrations using selected examples. Throughout this process, learning will be deepened through question-and-answer sessions and small group discussions that promote active student participation. Students will also be expected to construct their own mathematical models for specific problem situations, thereby supporting experiential learning. Individual exercises and reflective evaluation activities following the core instruction will aim to reinforce both the strategy itself and students’ representational skills. A learning environment based on multiple representations will be established by integrating both visual (such as diagrams and equations) and verbal (such as problem scenarios and discussions) forms of representation throughout the teaching process.	Ö.Ç.4 Ö.Ç.5 Ö.Ç.4 Ö.Ç.5 Ö.Ç.4 Ö.Ç.5

	Teorical	Practice	Laboratory	Preparation Info	Teaching Methods	Course Learning Outcomes
7.Week	*Elbette, yalnızca ilk harf büyük olacak şekilde düzenlenmiş hali: **Examination of problems related to the patterning strategy and investigation of the impact of patterns on algebraic thinking**			*Before starting this week, students are expected to have a basic understanding of the concept of patterns, types of patterns (arithmetic, geometric, visual, etc.), and the processes involved in identifying pattern rules. It is especially important that they develop an awareness of how patterning can serve as a problem-solving strategy and how this strategy connects with the development of algebraic thinking. Students are encouraged to recall their prior experiences related to identifying number patterns, generalizing relationships, symbolizing expressions, and transitioning toward the concept of variables. In this context, it is recommended that students review the examples provided in the "Problem Posing Approaches and Strategies" section of the course textbook Ersoy, E. (Ed.) (2024). Mathematics Problem Solving: For Undergraduate and Graduate Students as preparatory work.	*In this week's instruction, inquiry-based and constructivist teaching approaches will be emphasized to help students effectively understand the patterning strategy and connect it to algebraic thinking. The lesson will begin with guiding questions that activate students' prior knowledge and experiences, followed by sample problems focused on identifying, extending, and generalizing patterns. Students will be encouraged to analyze numerical and visual patterns, uncover the underlying structures, and formulate algebraic generalizations based on their observations. Throughout the process, group work, peer collaboration, and classroom discussions will be utilized to promote the use of multiple representations (verbal, visual, and symbolic) and to enrich students' reasoning processes. Additionally, dynamic geometry software and digital tools will be incorporated to visualize patterns and support students in reinforcing abstract thinking through concrete, interactive experiences. The lesson will conclude with reflective assessment activities aimed at fostering students' strategic awareness regarding the processes of constructing and generalizing patterns.	Ö.Ç.4 Ö.Ç.5 Ö.Ç.6 Ö.Ç.4 Ö.Ç.5 Ö.Ç.6 Ö.Ç.4 Ö.Ç.5 Ö.Ç.6
8.Week	*Midterm exam week			*Midterm exam week	*Midterm exam week	
9.Week	*Examination of problems related to the strategy of solving simple and similar problems			*Before starting this week, students are expected to have a foundational understanding of the strategy of solving simple and similar problems. In particular, it is important that they comprehend the idea of approaching a complex or unfamiliar problem by first solving a simpler, structurally similar version and then transferring the solution strategy to the original problem. This strategy is closely linked to high-level cognitive skills such as making analogies, recognizing structural similarities, and generalizing. Students are also encouraged to recall connections with problem-solving strategies discussed in previous weeks, in order to better understand how this method can be integrated with other approaches. In this context, reviewing the relevant examples in the "Problem Posing Approaches and Strategies" section of the course textbook Ersoy, E. (Ed.) (2024). Mathematics Problem Solving: For Undergraduate and Graduate Students will serve as useful preparation for in-class analyses.	*In this week's lesson, example-based and inquiry-oriented instructional methods will be combined to help students effectively experience how the strategy of solving simple and similar problems can be used to approach complex problem situations. The session will begin by activating students' prior knowledge and intuitive thinking processes, followed by instructor-guided activities where students work from simpler problems toward solving the target problem. Instead of solving a given problem directly, students will be encouraged to formulate a structurally similar but simpler version and develop strategies based on that model. Throughout the lesson, small group work, peer explanations, and collaborative discussions will support strategic thinking, while promoting students' abilities to recognize similarities, make generalizations, and transfer solutions. A combination of verbal explanations and visual representations will be used to deepen conceptual understanding. Reflective assessment activities at the end of the session will aim to foster students' metacognitive awareness of the strategies they employed.	Ö.Ç.4 Ö.Ç.5 Ö.Ç.6 Ö.Ç.4 Ö.Ç.5 Ö.Ç.6 Ö.Ç.4 Ö.Ç.5 Ö.Ç.6

	Teorical	Practice	Laboratory	Preparation Info	Teaching Methods	Course Learning Outcomes
10.Week	*Examination of problem-based example applications			*Before starting this week, students are expected to have a basic understanding of the fundamental principles of the problem-based learning (PBL) approach. In particular, it is important that they grasp how working with real-life related, open-ended, and multi-step problems contributes to the development of mathematical thinking, modeling, and problem-solving skills. Additionally, recalling previously studied strategies—such as equation-forming, patterning, and solving similar problems—will help students recognize how these methods can be integrated into problem-based applications. In this context, it is recommended that students review the "Evaluation of Problem Posing" section of the course textbook Ersoy, E. (Ed.) (2024). Mathematics Problem Solving: For Undergraduate and Graduate Students prior to the lesson.	*This week's lesson will be based on the problem-based instructional approach, aiming to develop students' mathematical modeling, strategy selection, and problem-posing evaluation skills through real-life example problems. The session will begin with the presentation of open-ended and multi-step problem scenarios. Students will work in groups to analyze the problems, suggest solution paths, and generate alternative problem formulations. With instructor guidance, students' constructed problems and strategies will be collaboratively evaluated and discussed in class. This will encourage deeper thinking about how to assess problem-posing in terms of accuracy, relevance, and mathematical value. Visual materials, problem-posing templates, and digital tools will be integrated into the lesson to promote the use of multiple forms of representation. At the end of the lesson, individual reflective writing tasks will support students in engaging in self-assessment and developing strategic awareness related to the process of posing and evaluating problems.	Ö.Ç.5 Ö.Ç.6 Ö.Ç.7 Ö.Ç.5 Ö.Ç.6 Ö.Ç.7 Ö.Ç.5 Ö.Ç.6 Ö.Ç.7
11.Week	*Examination of problems related to the strategies of drawing figures and focusing on different perspectives			*Before starting this week, students are expected to understand the role of strategies such as drawing figures and considering different perspectives in the problem-solving process. In particular, they should reflect on how visualizing abstract or complex problems through diagrams or drawings can support concrete reasoning and facilitate the solution process. Having prior experience with creating visual representations—such as figures, diagrams, or tables—to reflect the structure of a problem will be helpful preparation. Additionally, students are encouraged to develop an awareness of how approaching a problem from alternative perspectives (e.g., thinking in reverse, testing different strategies, or reorganizing components) can open up new solution pathways. In this context, reviewing the "Product Evaluation" section of the course textbook Ersoy, E. (Ed.) (2024). Mathematics Problem Solving: For Undergraduate and Graduate Students is recommended as preparation for the lesson.	*In this week's lesson, visual-based and exploratory instructional methods will be primarily utilized to support students in effectively applying the strategies of drawing figures and adopting different perspectives. The session will begin with a joint analysis of example problem scenarios, focusing on how these problems lend themselves to visual representation. Students will then be asked to generate figures, tables, graphs, or diagrams that reflect the structure of the problem and to develop solution strategies based on these representations. Within the scope of the perspective-shifting strategy, students will also be encouraged to reframe the problem from different angles, explore alternative solution paths, and, if necessary, restructure the problem itself. Group work, open-ended discussions, and peer feedback sessions will be used to promote comparison of reasoning styles and mutual learning among students. Throughout the lesson, a product-oriented assessment approach will be adopted, evaluating students' visual representations and solutions in terms of clarity, functionality, and mathematical coherence.	Ö.Ç.4 Ö.Ç.6 Ö.Ç.7 Ö.Ç.4 Ö.Ç.6 Ö.Ç.7 Ö.Ç.4 Ö.Ç.6 Ö.Ç.7

	Teorical	Practice	Laboratory	Preparation Info	Teaching Methods	Course Learning Outcomes
12.Week	*The importance of problem-based learning in light of the changing paradigm			*Before starting this week, students are expected to develop a general awareness of paradigm shifts in education and understand how these shifts necessitate transformation in mathematics teaching practices. In particular, they should reflect on the reasons behind the transition from teacher-centered, transmission-based models to approaches that emphasize student activity, inquiry, and problem solving. Within this context, students should recognize problem-based learning not just as a teaching technique, but as a fundamental component of modern instructional philosophy in mathematics education. Students are encouraged to revisit the problem-posing strategies discussed in previous weeks and consider how these can be effectively integrated into instructional design. As part of their preparation, it is recommended that they review the “Problem Posing Approaches and Strategies” chapter from the course textbook Ersoy, E. (Ed.) (2024). Mathematics Problem Solving: For Undergraduate and Graduate Students. Additionally, students should examine key reports published by the National Council of Teachers of Mathematics (NCTM), especially sections from Principles and Standards for School Mathematics (2000) and those focused on Mathematical Problem Solving, to gain an international perspective on the role of problem-based learning in contemporary mathematics education.	*This week’s instructional design focuses on understanding the impact of educational paradigm shifts on mathematics instruction and exploring the role of problem-based learning (PBL) within this transformation. The session will begin with an open-ended prompt inviting students to brainstorm the differences between traditional teaching methods and student-centered, problem-oriented approaches. This will be followed by a presentation of the conceptual framework from the Problem Posing Approaches and Strategies chapter, guiding students in analyzing various instructional scenarios. The session will integrate principles from the NCTM’s Principles and Standards for School Mathematics (2000), specifically those concerning problem solving, to help students connect problem-based learning to internationally recognized pedagogical standards. As part of small-group work, students will be asked to design micro-teaching plans that demonstrate how to teach a mathematical concept using a problem-based approach. Finally, individual reflective writing activities will invite students to evaluate the paradigm shift in mathematics instruction from their own perspectives, fostering metacognitive insight into the evolving nature of teaching and learning mathematics.	Ö.Ç.2 Ö.Ç.6 Ö.Ç.7 Ö.Ç.2 Ö.Ç.6 Ö.Ç.7 Ö.Ç.2 Ö.Ç.6 Ö.Ç.7

	Teorical	Practice	Laboratory	Preparation Info	Teaching Methods	Course Learning Outcomes
13.Week	*Problems related to learning domains aimed at exploring concepts in problem-based learning			*Before starting this week, students are expected to understand that problem-based learning is not only a process of solving problems but also a powerful context for fostering conceptual exploration. It is particularly important that they reflect on how to design problem situations that allow learners to construct mathematical concepts themselves, rather than being directly presented with definitions or procedures. Students should be familiar with the main mathematics learning domains (number and operations, algebra, geometry, measurement, data and probability), and prepare by considering which types of problem contexts are suitable for discovering concepts within these areas. Students are also expected to recall the problem-posing and problem-solving strategies explored in previous weeks and reflect on how these strategies can be restructured to support concept development. In this regard, it is recommended that they revisit the "Problem Posing Approaches and Strategies" section of the course textbook Ersoy, E. (Ed.) (2024). Mathematics Problem Solving: For Undergraduate and Graduate Students, and analyze the sample problem scenarios provided. Additionally, reviewing sample problems aligned with NCTM's approach to conceptual understanding will help students engage more effectively with the applications presented in this week's lesson.	*This week's instruction will be structured to enable students to explore mathematical concepts within the context of problem-based learning. Open-ended, discovery-oriented problem scenarios related to core mathematics learning domains (e.g., algebra, geometry, measurement, data) will be presented. Students will be expected to analyze these problems, develop solution strategies, and identify the underlying mathematical concepts that emerge through the process. The instructor will take on a facilitative role, guiding students not toward receiving concepts directly, but toward constructing them through problem engagement. Group work, shared solution discussions, and conceptual generalization activities will be employed to deepen mathematical thinking. Concept-focused comparisons will be made across different learning domains using selected problems, supporting connections and conceptual continuity between related topics. Furthermore, examples from NCTM reports that emphasize concept-based instruction will be integrated into the lesson, helping students develop pedagogical perspectives on how problem-based approaches can foster deep understanding of mathematical ideas.	Ö.Ç.5 Ö.Ç.6 Ö.Ç.7 Ö.Ç.5 Ö.Ç.6 Ö.Ç.7 Ö.Ç.5 Ö.Ç.6 Ö.Ç.7

	Teorical	Practice	Laboratory	Preparation Info	Teaching Methods	Course Learning Outcomes
14.Week	*Steps to follow in classroom implementation of problems related to learning domains aimed at exploring concepts in problem-based learning			*Before starting this week, students are expected to have a foundational understanding of the planning processes and instructional phases required for effectively implementing problem-based learning (PBL) activities in the classroom. It is particularly important for them to develop strategic awareness not only about how to design concept-focused problems but also about how to present them in class, manage student interactions, and structure the problem-solving process. Students are encouraged to revisit the problem examples related to different mathematical learning domains explored in previous weeks and begin to formulate their own ideas for how these could be applied in a classroom setting. Additionally, they should familiarize themselves with the core stages of an effective PBL cycle—problem introduction, problem analysis, information gathering, proposing solutions, sharing outcomes, and reflection—supported by relevant literature. In this context, reviewing the “Problem Posing Approaches and Strategies” chapter from Ersoy, E. (Ed.) (2024). Mathematics Problem Solving: For Undergraduate and Graduate Students, along with classroom implementation examples from NCTM reports, will provide a strong foundation for meaningful engagement during the session.	*This week’s instructional approach will focus on implementing concept-oriented problem situations in the classroom through a structured, step-by-step problem-based learning (PBL) process. The lesson will center around the core stages of effective PBL practice—problem introduction, problem analysis, information gathering, solution generation, sharing outcomes, and reflection—illustrated through model activities. Students will collaboratively implement problems they previously designed for specific mathematical learning domains by planning them in accordance with these stages. The instructor will take on a facilitator role, guiding student groups by posing questions that support conceptual development and monitoring group dynamics to offer targeted scaffolding when needed. Following the group implementations, whole-class discussions and peer feedback sessions will be conducted to critically evaluate the instructional quality and effectiveness of the problem scenarios. At the conclusion of the session, students will engage in reflective writing to analyze their own instructional decisions, thereby deepening their understanding of how to plan and implement problem-based learning experiences in a coherent and pedagogically sound manner.	Ö.Ç.4 Ö.Ç.5 Ö.Ç.6 Ö.Ç.7 Ö.Ç.4 Ö.Ç.5 Ö.Ç.6 Ö.Ç.7 Ö.Ç.4 Ö.Ç.5 Ö.Ç.6 Ö.Ç.7
15.Week	*Solving mixed problems and evaluating problem posing			*Before starting this week, students are expected to be ready to integrate and apply various problem-solving and problem-posing strategies discussed in previous weeks. Solving mixed problems requires the ability to combine multiple strategies and to evaluate which approach is most effective for a given problem type. Therefore, students should develop flexibility in strategy selection and be capable of matching strategies to different problem structures. Additionally, students should be familiar with the key criteria for evaluating problem posing—such as mathematical accuracy, relevance, clarity, originality, and applicability—and be prepared to apply these criteria to actual student-generated problems in order to conduct critical assessments. In preparation, it is recommended that students revisit the “Problem Posing Approaches and Strategies” and “Product Evaluation” sections of Ersoy, E. (Ed.) (2024). Mathematics Problem Solving: For Undergraduate and Graduate Students. Reviewing sample problems developed earlier in the course will also provide a strong foundation for this week’s activities.	*This week’s instructional process is designed as an integrative experience, allowing students to apply all previously learned problem-solving and problem-posing strategies while also developing their critical evaluation skills. The session will begin with collaborative group work on solving mixed problems that require multiple strategies. Each group will be asked to articulate which strategies they used and why, encouraging reflection on strategic choice and effectiveness. In the second part of the lesson, students will exchange the problem scenarios they previously created and evaluate each other’s work using a set of predetermined criteria (accuracy, relevance, clarity, originality, and applicability). The instructor will explain the evaluation standards and facilitate peer feedback sessions, guiding students in giving and receiving constructive feedback. Model evaluations will also be presented to help establish consistency and shared understanding of quality. To conclude the session, students will complete an individual reflective writing activity aimed at deepening their strategic awareness and enhancing their ability to assess instructional quality in problem design.	Ö.Ç.3 Ö.Ç.4 Ö.Ç.5 Ö.Ç.6 Ö.Ç.7 Ö.Ç.3 Ö.Ç.4 Ö.Ç.5 Ö.Ç.6 Ö.Ç.7 Ö.Ç.3 Ö.Ç.4 Ö.Ç.5 Ö.Ç.6 Ö.Ç.7 Ö.Ç.3 Ö.Ç.4 Ö.Ç.5 Ö.Ç.6 Ö.Ç.7

Assesment Methods %

1 Ara Sınav : 40.000
3 Final : 0.000
4 Ödev : 60.000

ECTS Workload

Activities	Count	Time(Hour)	Sum of Workload
Vize	1	1.00	1.00
Ara Sınav Hazırlık	7	2.00	14.00
Ödev	7	2.00	14.00
Ders Öncesi Bireysel Çalışma	14	3.00	42.00
Derse Katılım	14	2.00	28.00
Rapor	1	1.00	1.00
		Total :	100.00
		Sum of Workload / 30 (Hour) :	3
		ECTS :	3.00

Program And OutcomeRelation

	P.O. 1	P.O. 2	P.O. 3	P.O. 4	P.O. 5	P.O. 6	P.O. 7	P.O. 8	P.O. 9	P.O. 10	P.O. 11	P.O. 12	P.O. 13	P.O. 14	P.O. 15	P.O. 16	P.O. 17	P.O. 18	P.O. 19	P.O. 20	P.O. 21	P.O. 22	P.O. 23	P.O.
L.O. 1	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
L.O. 2	4	0	4	0	0	4	0	0	4	4	0	0	0	0	0	4	0	0	0	0	0	0	0	4
L.O. 3	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	4	0	0	0
L.O. 4	4	0	0	0	0	4	0	4	0	0	0	4	0	0	0	4	0	4	0	0	0	0	0	4
L.O. 5	4	0	4	0	4	4	5	0	0	0	0	0	0	0	0	5	4	0	0	0	4	0	0	4
L.O. 6	4	0	0	0	4	0	0	4	5	0	0	0	5	0	0	4	4	0	0	0	0	0	0	4
L.O. 7	4	0	4	0	4	0	4	4	4	0	0	0	0	0	0	0	0	4	0	4	0	0	0	4
Avarage	3.43	0	2.86	0	1.71	1.71	1.86	1.71	1.86	0.57	0	0.57	0.71	0	0	3.00	1.71	1.71	0	0.57	1.14	0	0	2.8

BEWARE OF PLAGIARISM! Please pay attention to proper academic citation rules and avoid plagiarism, an unethical and academically fraudulent behavior, when completing reports, assignments, or other academic works, and it is treated with the same disciplinary action as cheating in a classroom setting. It is imperative to refrain from presenting another person s ideas, language, expressions, or any other form of intellectual property as your own. Regardless of quality, your assignments/projects/research should reflect your original work. Perfection is not a requirement, and in case of any uncertainties regarding academic writing guidelines, you may seek clarification from your course instructor.

Engel Durumu/Uyarlama Talebi : Engel durumuna ilişkin herhangi bir uyarlama talebinde bulunmak isteyen öğrenciler, dersin öğretim elemanı ya da Nevsehir Engelli Öğrenci Birimi ile en kısa sürede iletişime geçmelidir.