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| 0 | **Course name**: MATH 113 Abstract Mathematics | | | **Department:** Mathematics | | | Semester | |
| | | | | | | | 1 | |
| | Methods of Education | | | | | | Credit (ECTS) | |
| | Lecture | Recitation/ (Etud) | Lab | Exams | Homework / Quiz | Other | Total | 5 |
| | 42 | 0 | 0 | 25 | 5 | 78 | 150 | |
| Language | English | | | | | | | |
| Compulsory/Elective | Compulsory | | | | | | | |
| Prerequisites | None | | | | | | | |

**Course Contents**

| Weeks | Subjects |
|---|---|
| 1 | Propositional Logic, Applications of Propositional Logic, Propositional Equivalences |
| 2 | Predicates and Quantifiers, Nested Quantifiers, Rules of Inference |
| 3 | Introduction to Proofs, Proof Methods and Strategy |
| 4 | Sets, Venn diagrams, Subsets, Power sets, Cartesian Products, Using Set Notation with Quantifiers, Truth Sets and Quantifiers, Set Operations |
| 5 | Functions. Injective (on-to-one), surjective (onto) and bijective functions, Inverse Functions, Compositions of Functions, The Graphs of Functions |
| 6 | Sequences, Recurrence Relations, Cardinality of Sets, Countable Sets |
| 7 | Divisibility and Modular Arithmetic, Primes, Greatest Common Divisors, Least Common Multiples |
| 8 | Mathematical Induction, Strong Induction and Well-Ordering, Recursively Defined Functions |
| 9 | Recursively Defined Sets and Structures, Structural Induction, Generalized Induction |
| 10 | Relations and Their Properties |
| 11 | n-ary Relations and Their Applications |
| 12 | Representing Relations, Closures of Relations |
| 13 | Equivalence Relations |
| 14 | Partial Orderings |

**Course Objectives**

The purpose of this course is to

- give the standard knowledge of logic, sets, functions, and relations.
- apply the technical tools to solve the problems related to abstract mathematics.

**Learning Outcomes and Competences**

Upon completion of this course students will be able to

- acquire mathematical thinking skills (problem solving, generating ways of thinking, forming correspondence, generalizing etc.) and use them in related fields.
- design mathematics related problems, devise solution methods and apply them when appropriate.

**Textbook and /or References**

**Textbook :** Kenneth H. Rosen, Discrete Mathematics and Its Applications, Seventh Edition, McGraw-Hill, 2012.

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| | **References:**<br>1. Steven G. Krantz, Discrete Mathematics 2009.<br>2. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics 5th Edition.<br>3. Gallian, Contemporary Abstract Algebra, 7 Edition 2010.<br>4. David S. Dummit, Richard M. Foote, Abstract Algebra, 3rd Edition, Wiley (2003).<br>5. Fraleigh Victor, J. Katz, A first course in abstract algebra, Addison Wesley (2003). | | |
| Assessment Criteria | | If any, mark as (X) | Percentage (%) |
| | Midterm Exams | X | 40 |
| | Quizzes | | |
| | Homeworks | | |
| | Projects | | |
| | Laboratory work | | |
| | Other | | |
| | Final Exam | X | 60 |