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| | **Course name:** MATH 114 Discrete Mathematics | | | **Department:** Mathematics | | | Semester 2 | |
| | Methods of Education | | | | | | Credit (ECTS) | |
| | Lecture | Recitation/ (Etud) | Lab | Project/Field Study | Homework | Other | Total | 6 |
| | 42 | 0 | 0 | 0 | 42 | 84 | 168 | |
| Language | English | | | | | | | |
| Compulsory/Elective | Compulsory | | | | | | | |
| Prerequisites | MATH 113 Abstract Mathematics | | | | | | | |

**Course Contents**

| Week | Subjects |
|---|---|
| **1** | ▪ Basics of counting, permutations, combinations.<br>▪ Distribution problems. |
| **2** | ▪ Generalized permutations and combinations.<br>▪ Binomial coefficients and identities. |
| **3** | ▪ The principle of inclusion-exclusion.<br>▪ The pigeonhole principle. |
| **4** | ▪ Mathematical induction.<br>▪ Strong induction. |
| **5** | ▪ Discrete probability, conditional probability.<br>▪ Independence, binomial distribution. |
| **6** | ▪ Bayes' theorem.<br>▪ Discrete random variables, expectation and variance. |
| **7** | ▪ Divisibility, modular arithmetic.<br>▪ Primes, greatest common divisor. |
| **8** | ▪ Fermat's theorem, Euler function, Euler's theorem.<br>▪ Solving congruences. |
| **9** | Exam Week (No classes) |
| **10** | ▪ Recurrence relations.<br>▪ Solving linear recurrence relations. |
| **11** | ▪ Fibonacci sequence.<br>▪ Generating functions. |
| **12** | ▪ Graph terminology, degrees, paths, cycles.<br>▪ Complete graphs, bipartite graphs. |
| **13** | ▪ Isomorphism of graphs.<br>▪ Connectivity. |
| **14** | ▪ Planar graphs, Euler's formula.<br>▪ Trees. |

**Course Objectives**

The purpose of this course is

- to teach fundamental techniques and methods in counting,
- to give a basic background in probability,
- to provide an introduction to graph theory,
- to reinforce proof techniques.

**Learning Outcomes and Competences**

Upon completion of this course students will

- learn how to approach basic combinatorial problems,
- strengthen their mathematical thinking skills,
- have the basic knowledge on discrete structures.

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|---|---|---|---|
| Textbook and /or References | 1) Rosen, K. H., *Discrete Mathematics and its Applications*, 7th edition McGraw Hill<br>2) Johnsonbough, R. , *Discrete Mathematics*, 8th edition Pearson. | | |
| Assessment Criteria | | If any, mark as (X) | Percentage (%) |
| | Midterm Exams | X | 40 |
| | Quizzes | | |
| | Homework | | |
| | Projects | | |
| | Term Paper | | |
| | Laboratory work | | |
| | Other | | |
| | Final Exam | X | 60 |
| Instructors | | | |