Study program: Applied Mathematics (M2)

Course Title: Discrete Mathematics (M241)

Teacher: Olga Bodroža-Pantić

Status: obligatory

Number of ECTS: 8

Condition: no

Course objectives:
Acquisition of basic knowledge in combinatorics and graph theory. Introduction to the problems from other sciences where this knowledge is applied. To train students to use the techniques and methods of combinatorics independently.

Learning outcomes:
Minimum: After the course, the student should be able to count the number of certain combinatorial objects with relatively simple combinatorial description using adopted techniques of enumeration and be acquainted with elementary properties of the combinatorial objects that are familiar in practice.
Desired: The successful student should be able to apply independently some more complex techniques of enumeration in problems that are familiar in practice and be able to analyze in detail combinatorial objects described by relations between elements of a system.

Course Content:
Lectures: Basic concepts of enumeration (principles of bijection, sum and product, permutations, combinations). Binomial and polynomial formulas. Inclusion-exclusion formula. Stirling numbers. Permutation and inversions**.** Stirling's approximation. Recurrence relations. Fibonacci and Lucas numbers. Generative functions. Basic concepts of graph theory. Trees. Eulerian and Hamiltonian graphs. Planar graphs. Graph coloring. Basic concepts and properties of digraphs. Strongly connected digraph. Tournaments.
Blackboard exercises: Basic principles of counting. Permutations. Combinations. Binomial and polynomial coefficients. Derangement, subfactorial. Modeling combinatorial and geometrical problems with recurrence relations. Linear homogeneous recurrence relations with constant coefficients. Basic concepts of graph theory. Eulerian and Hamiltonian graphs. Planar graphs. Graph coloring.
Digraphs. Tournaments.

References

1. Р.Тошић, *Комбинаторика*, Универзитетски уџбеник 88, Н.Сад, 1999.
2. В.Петровић, *Теорија графова*, Универзитетски уџбеник 69, Н.Сад, 1998.
3. Д. Машуловић, *Одабране теме дискретне математике*, Департман за математику и информатику ПМФ у Новом Саду, 2007 (уџбеник одобрен на седници Научно-наставног већа ПМФ у Новом Саду од 27.12.2006.)
4. Д. Цветковић, *Теорија графова и њене примене*, Научна књига, Београд, 1990
5. Д. Вељан, *Комбинаторика с теоријом графова*, Школска књига, Загреб, 1989
6. И.Бошњак, Д.Машуловић, В.Петровић, Р.Тошић , *Збирка задатака из теорије графова*, Департман за математику и информатику, Н.Сад, 2006

Number of active	**Lectures:** 3	**Blackboard exercises:** 3

Methods of teaching
Conventional methods of teaching (PowerPoint Presentation) are used during the lectures.
Meanwhile, students practice their skills to understand the problems and find possible solutions during the blackboard exercises. Acquired knowledge and ability to solve the problems are continuously checked by tests and two colloquiums (preliminary exams). At the final, oral exam, the student demonstrates a comprehensive understanding of the presented material.

Evaluation of knowledge (maximum score 100)

activity during the lectures	**-**	**oral exam**	**40**
activity during blackboard exercise	**-**		
Colloquium (preliminary exam)	**60 (30+30)**		
Tests	**-**		
Pre-exam activities	**points**	**Final exam**	**points**