Course Name : Discrete Mathematics

Course Code	Course Type	Regular Semester	Lecture (hours/week)	Seminar (hours/week)	Lab. (hours/week)	Credits	ECTS
CMP 130	B	Spring	3.00	1.00	0.00	3.50	5.00

Lecturer	Anjeza Pasku, PhD
Assistant	
Course language	Albanian
Course level	Bachelor
Description	This is an introductory course in discrete mathematics. The aim of this course is to introduce students to ideas and techniques from discrete mathematics that are widely used in science and engineering. This course teaches students how to think logically and mathematically and apply these techniques in problem solving. To achieve this goal, students will learn logic and mathematical reasoning, communities, induction and recursion, relations, functions. Counting techniques, permutations, combinations, recurrences, algorithms for their generation.
Objectives	At the end of the course, the student will be able to understand and apply the elementary logic and algebra of the sets, in the construction of inductive reasoning, in combinatorics, in solving recursive relations.
Core Concepts	1. Propositional Logic 2. Predicates and Quantifiers 3. Proof Methods 4. Sets, functions, matrices 5. Arithmetic algorithms 6. The growth of functions 7. Complexity of Algorithms 8. Divisibility 9. Mathematical induction 10. Recursion 11. Sequences and sums 12. Relations 13. Correctness of programs

Course Outline

Week	Topic
1	Elements of mathematical logic: statements and logical connections. Propositional Equivalences. Applications propositional logic. (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 1-21)
2	Predicates and quantifiers. Rules of logical deduction, methods of proofs. (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 22-35)
3	Sets, sets operations. Functions. Sequences and rrecurence relations. (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 36-57)
4	Sums, zero-one matrices. Algorithms and the growth of functions. Complexity of algorithms (Lectures adapted in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 57-88)
5	Number Theory: Divisibility and Modular Arithmetic. Primes, lcm and gcd of numbers (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 89-111)
6	Solving congruences. Applications of congruences (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 111-125)
7	Mathematical induction. Strong induction and well ordering (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 125-138)
8	Midterm
9	Recursive definitions and structural induction. Recursive Algorithms (Adapted Lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 138-149)
10	Relations and their properties. Representation of relations. Equivalence relations. (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 150-178)

11	Partial orderings. Hasse diagrams. Lexicographical order and topological classification (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pp 178-194)
12	The Basics of counting. The Pingeonhole principle. Permutations and combinations. (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pp 195-214)
13	Binomial coefficients and identities. Generalized permutations and combinations. (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 214-228)
14	Advanced counting techniques. Applications of recurrence relations in problem modeling. Solving linear recurrent relations (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 228-243)
15	Divide and Conquer algorithms and recurrence relations. Repetition. (Adapted lectures in Albanian: Discrete Mathematics-Anjeza Pasku, Pages 243-250)
16	Final Exam

Prerequisites	The student must attend the course at a minimum rate of 75%.
Literature	• Leksione te pershtatura ne shqip: Matematika Diskrete-Anjeza Pasku
References	• Discrete Mathematics, (Sixth Edition)-Richard Johsonbaugh • Discrete Mathematics and it's Applications, (Seventh Edition)-Kenneth H. Rosen

Course Outcome

1	In terms of knowledge and understanding, at the end of the course, the student is expected to be able to: • Explain basic models of discrete mathematics and technology. • Explain how these models can be applied to the respective problems.
2	In terms of competencies and skills at the end of the course, the student is expected to be able to: • Analyze the given problems logically. • To express problems in formal language • Solve problems using recursive methods • Solve combinatorial problems

Course Evaluation

In-term Studies	Quantity	Percentage
Midterms	1	35
Quizzes	2	30
Projects	0	0
Term Projects	0	0
Laboratory	0	0
Class Participation	0	0
Total in-term evaluation percent		**65**
Final exam percent		**35**
Total		**100**

ECTS Workload (Based on Student Workload)

Activities	Quantity	Duration (hours)	Total (hours)
Course duration (Including the exam week: 16x Total hours of the course)	16	4	64
Study hours outside the classroom (Preparation, Practice, etc.)	14	4	56
Duties	0	0	0
Midterms	1	2	2
Final Exam	1	2	2
Other	0	0	0
Total Work Load			**124**
Total Work Load / 25 (hours)			**4.96**
ECTS			**5.00**