Course Title	Discrete Structures				
Course Code	MAT170				
Course Type	Compulsory				
Level	Bachelor (1st Cycle)				
Year / Semester	1st Year / 2nd Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	3 hours / 14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	Provide students with the necessary mathematical foundations for their subsequent computer science courses. This will extend students' mathematical maturity and ability to deal with abstraction.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving. • Apply formal methods of propositional and predicate logic. • Recall the basic terminology of functions, relations, sets, and graphs and use it to solve problems associated with these. • Recognize the different proof techniques and implement these for a given problem. • Calculate permutations and combinations of a set and discuss the meaning for the specific problem • Understand the basics of generating functions and recurrence relations, and be able to apply the methods from these subjects in problem solving. • Understand basic properties of graphs and related discrete structures, and be able to relate these to practical examples.				
Prerequisites	MAT140	Co-requisites	None		
Course Content	Set Theory: Sets, subset and set operations. Laws of set theory. Venn diagrams. Cartesian product. Power sets. Fundamentals of Logic: Basic connectives and Truth Tables. Logical Equivalence and logical implication. Predicate logic. Modus ponens and modus tollens. The use of quantifiers. Relations: Cartesian product and relations, binary relations. Properties of relations: symmetric, antisymmetric, reflexive, transitive. Inverse and composition of relations. Partial orders and equivalence relations.				

<table>
<tr><td></td><td>Functions: plain, one-to-one and onto. Composition and inverse function.

Proofs: The structure of mathematical proofs; Direct proofs; Proof by counterexample; Proof by contradiction; Mathematical induction; Strong induction; Recursive mathematical definitions; Well orderings.

Counting: General counting methods for arrangements and selections. Permutations and combinations with or without repetition. Binomial theorem; Pascal’s identity. Inclusion-exclusion principle. The Pigeonhole principle.

Recurrence relations, solving recurrences using generating functions.

Graphs: Basic graph properties, representations of Graphs. Paths and cycles, Hamiltonian Cycles and the Traveling Salesperson Problem, the Shortest-Path problem and algorithm. Isomorphisms of Graphs. Planar Graphs, Problem-Solving using Graphs

Recent developments and contemporary issues pertaining to the subject matter of the course.</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>Richard Johnsonbaugh, DISCRETE MATHEMATICS, Pearson (Latest edition)

Kenneth H Rosen Discrete Mathematics and Its Applications McGraw-Hill (Latest edition)

Susanna S. Epp, DISCRETE MATHEMATICS WITH APPLICATIONS, Brooks/Cole (Latest edition)

Chartrand G., Zhang P., DISCRETE MATHEMATICS, Waveland Pr. Inc. (Latest edition)</td></tr>
<tr><td>Assessment</td><td><table><tr><td>Examinations</td><td>75%</td></tr><tr><td>Assignments/Lab</td><td>15%</td></tr><tr><td>Class Participation and Attendance</td><td>10%</td></tr><tr><td></td><td>100%</td></tr></table></td></tr>
<tr><td>Language</td><td>English</td></tr>
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