Course Number and Title: *MATH111 – Discrete Mathematics*
Number of Credits: 3
Prerequisites: *None*
Co-Requisites: *None.*

Course Description: *The course examines topics including: propositional logic, Boolean algebra; introduction to set algebra, infinite sets; relations and functions; methods of proof; introduction to number theory; introduction to graph theory, trees; combinatorics; applications to computer science. Students should be able to apply practical numerical methods to solve problems which arise in computational sciences. Students are required to demonstrate a rudimentary foundation in mathematical modeling through solving problems arising in computational science through analytical and numerical methods. Six hours of instructor-led class time per week including discussions and problem sets.*

Required Materials: 1. Mathematics: A Discrete Introduction 3rd Edition, 2012 by Edward A. Scheinerman.

2. Discrete Mathematics for Computer Science, by G. Haggard et al.

Schedule & Topics

Week	Topic	Reading	Non-Reading Home Tasks
1	**Introduction to the course. Foundations**. The language of mathematics, definition, theorem, if-then, iff Proof Numbers, basic number theory		
2	**Sets** Collections. Set operations. Infinity, countable and uncountable sets		
3	**Relations** Equivalence, partial order Closure Relation algebra		
4	**Functions as relations** Bijective, injective and surjective functions. Inverse function. Set cardinality.		
5	**Combinatorics** Recurrence relations		
6	**Pigeonhole principle** Revision & catch-up		
7	Discrete Probability		

8	Propositional logic		
9	Boolean algebra Boolean functions Completeness of {¬,∧,∨ }		
10	Graphs		
11	Trees		
12	Rooted trees Graphs		
13	Planar Graphs, Euler's Formula		
14	Graph algorithms		
15	Revision & catch-up		

Learning Objectives & Outcomes:

The following chart shows alignment between course-specific learning objectives and program learning outcomes and goals as identified in Program Curriculum Map. *[Note: in determining course-specific objectives, it is important to review the curriculum map to relate the appropriate skill level if specified (e.g. beginner, intermediate, and advanced).*

General Education / University-wide Program Goals:

Program Goals ***Common to all programs***	**Student learning outcomes** ***Common to all programs***	**Course Learning Outcomes** ***To be filled in by course instructor based on assignments/assessment***
Equip students with knowledge and advanced skills in mathematical reasoning, problem solving, modeling and scientific computation	1.1) Use concepts and methods of mathematical disciplines relevant to mathematical modeling. (Beginner Level)] 1.2) Have in-depth knowledge of analytical and numerical methods and be able to apply it to solving problems arising in computational sciences. (Beginner Level)]	Read and write mathematical proofs, and appreciate beauty in mathematical proofs. Frame mathematical axioms and theorems in the language of set theory and symbolic logic. Read, write and analyze mathematical algorithms. Understand generalizations of mathematical concepts that they have already encountered in special cases, such as equality, inequality, ordering, equivalence, divisibility, infinitude, etc. Apply mathematical reasoning in domains with which they were probably previously unfamiliar, such as planar graphs.