

Course Code: CSE 236 **Credits:** 2 **Course Title:** Math for Computer Science **CIE Marks:** 60 **SEE Marks:** 40 **Course Description** (from syllabus)/Rational:

This course emphasizes mathematical definitions and proofs and applicable methods to solve and analyse problems that arise in computer science. It trains students in developing the ability to think quantitatively and analyze problems critically. Topics include: Proofs: Propositions; Pattern of proof; Induction; Number theory; Structures: Graph theory, Directed graphs, Relations and partial orders, State machines; Counting: Sums and Asymptotics, Recurrences, Cardinality rules, Generating functions, Infinite sets, Probability, Conditional probability, Random variables and distributions, expectation, deviation, random walks

Course Learning Outcome: (at the end of the course, student will be able to do:)

CO1	Able to solve computational problem using mathematical models
CO2	Able to implement basic mathematical reasoning techniques and logical operations for engineering problems
CO3	Able to apply graph theory and other mathematical methods to both data structures and analysis of algorithms, and some other analytical problems in computer science

Mapping of Course Learning Outcomes to Program Learning Outcomes [attainment level used for COs from 1(weak)-3(strong) correlation]

PLO's	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO's												
CLO1	3											
CLO2	3	2										
CLO3	2	3										1

Teaching and Learning Activities (TLA)

TLA1	Interactive discussion through question answer session using Online/multimedia or whiteboard.
TLA2	Activity monitoring of multiple problem solving group for peer learning and assigned task completion

TLA3	Evaluation of individual class performances to address each student activity
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Course Delivery Plan

Week/Lesson (hour)	Discussion Topic & Book Reference	Student Activities during Online and Onsite and TLA	Mapping with CLO
Wk 1 Lesson 1 & 2 (1.5 each)	Lesson 1: Course introduction, Objective and outcome of course, Assessment policies, etc. Lesson 2: Concept of Logic and logical sense, the foundations of math with logic	Online/Onsite discussion; Question answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1	CLO 1
Wk 2 Lesson 1 & 2 (1.5 each)	Lesson 1: Introduction to mathematical proofs using axioms and propositions, Propositional logic, propositional equivalence, Logic Puzzle, Laws of Logic Lesson 2: Predicates, Quantifiers I, Quantifiers II	Online/Onsite discussion; Question answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1	CLO 1
Wk 3 Lesson 1 & 2 (1.5 each)	Lesson 1: Sets: Concept, type, Finite and Infinite sets Lesson 2: Set Operations: Union, Intersection etc. and rules of set operations	Online/Onsite discussion; Question answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1 <u>Student Submit Assignment-1 in LMS or BLC (online)</u>	CLO 1
Wk 4	Lesson 1: Functions I: Function – “Machines” Definition,	Online/Onsite discussion; Question	CLO 1

Lesson 1 & 2 (1.5 each)	Representation of function, Function Vs. non Function, Properties of functions Lesson 2: Functions II: Composition of Functions, An Application of Functions: The Pigeonhole Principle	answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1	Class Test# 1 (Either online or onsite based on Wk1-Wk3 discussion) based on CLO1)
Wk 5 Lesson 1 & 2 (1.5 each)	Lesson 1: Mathematical reasoning, The basics of counting Lesson 2: Induction: An introduction to proof techniques, covering proof by contradiction and induction	Online/Onsite discussion; Question answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1	CLO 1
Wk 6 Lesson 1 & 2 (1.5 each)	Lesson 1: Rules of Inference Lesson 2: Review	Online/Onsite discussion; Question answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1	CLO 1 Assignment 2 (will be due by Wk 8)
Wk 7	Midterm Exam Week (Topics: Week 2 – Week 6)		

Wk 8 Lesson 1 & 2 (1.5 each)	Lesson 1: Introduction to graphs, graph terminologies and application Lesson 2: Representing graphs, Connectivity, Directed and Undirected graphs	Online/Onsite discussion; Question answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA2 <u>Student Submit Assignment-2 in LMS or BLC (online)</u>	CLO 1,2
Wk 9 Lesson 1 & 2 (1.5 each)	Lesson 1: Euler paths: Concept and application Lesson 2: Hamilton paths Concept and application	Online/Onsite discussion; Question answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA2	CLO 2, 3

Wk 10 Lesson 1 & 2 (1.5 each)	Lesson 1: Shortest path problem and application Lesson 2: Planar graphs and use of planar graphs	Online/Onsite discussion; Question answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA2	CLO 2, 3
Wk 11 Lesson 1 & 2 (1.5 each)	Lesson 1: Introduction to trees, applications of trees Lesson 2: Tree traversal, Minimum Spanning Trees	Online/Onsite discussion; Question answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA2	CLO 2, 3 Class Test# 3 (either online or onsite based on Wk 8, Wk 9 and Wk 10 discussion) based

			on CLO2
Wk 12 Lesson 1 & 2 (1.5 each)	Lesson 1: Probability Introduction: Basic definitions, the Monty Hall problem, and strange dice games Lesson 2: Relations and their properties, representation of relations, Partial Order	Online/Onsite discussion; Question answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA2, TLA3	CLO 1,2,3
Wk 13 Lesson 1 & 2 (1.5 each)	Lesson 1: Expectations: Random Variables Lesson 2: Review	Online/Onsite discussion; Question answer session; Review Class Response online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA3	CLO 1,2
Wk 14	Final Exam Week (Topics: Week 8-Week 12)		

Text Book:

Discrete Mathematics and Its Applications by Kenneth H. Rosen, 7th edition.

Reference Books:

1. Epp, S., Discrete Mathematics with Applications, 3rd edition, PWS Publishing Company.
2. Bauer, D., Lecture Notes in Discrete Math, Stevens Tech edition.
3. J.P. Tremblay, R.Manohar, Discrete Mathematical structures with Applications to Computer Science

CIE – Breakup (Theory) [60 marks]

Bloom's Criteria	Attendance (07)	Class Test (15)	Assignment (05)	Presentation (08)	Mid Exam (25)
Remember		05			
Understand		05	02	02	05

Apply		05		03	05
Analyze			03		05
Evaluate					05
Create				03	05

SEE – Semester End Examination [40 marks] {Theory}

Bloom Criteria	Score for the Test
Remember	05
Understand	05
Apply	15
Analyze	05
Evaluate	05
Create	05

Appendix-1: Program outcomes

POs	Category	Program Outcomes
PO1	Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis	Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.
PO3	Design/Development of Solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.

PO4	Investigations	Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO5	Modern tool usage	Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO7	Environment and sustainability	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.
PO9	Individual work and teamwork	Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.
PO10	Communication	Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.
PO11	Project management	Demonstrate knowledge and understanding of the engineering and

	and finance	management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.
PO12	Life Long Learning	Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.