DEPARTMENT OF COMPUTER APPLICATIONS

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	Master of Science (Computer Science)		
Course Title	Mathematical Foundations of Computer Science		
Course Code	CAS 711	No. of Credits	3
Course Code of Pre-requisite subject(s)	-		
Session	July 2022	Section (If applicable)	-
Name of Faculty	Mr. G. Appasami	Department	Computer Applications
E-mail	405119052@nitt.edu	Mobile No.	9786554175
PAC Chairperson	Dr. S. Domnic		
E-mail	domnic@nitt.edu	Telephone No.	0431-2503745
Course Type	Core course		

SYLLABUS (approved in BoS)

Set Theory: Sets and operations, properties - power set - methods of proof - relations, graph, and matrix of a relation - partial and total orders, well ordering - equivalence relations, classes and properties - functions, 1-1, onto and bijective - composition of relations and functions - inverse functions.

Mathematical Logic: Propositions and logical operators – Truth table – Equivalences and implications – Basic laws– Some more connectives – Functionally complete set of connectives – Review of Propositional Calculus - Validity - Satisfiability related concepts - CNF and DNF forms - Conversion of arbitrary propositional formula to CNF or DNF.

Graph Theory: Definitions and basic results - Representation of a graph by a matrix and adjacency list - Trees - Cycles - Properties - Paths and connectedness - Sub graphs - Graph Isomorphism - Operations on graphs - Vertex and edge cuts - Vertex and edge connectivity, Spanning Trees, Euler circuits, Hamiltonian graphs.

Probability Theory: Sample Spaces- Events - Axioms – Counting – Conditional Probability and Bayes' Theorem – The Binomial Theorem – Random variable and distributions: Mean and Variance of a Random variable - Binomial-Poisson-Exponential and Normal distributions, Correlation and Regression.

Sampling Distributions and Descriptive Statistics: The Central Limit Theorem, Distributions of the sample mean and the sample variance for a normal population, Sampling distributions (Chi Square, t, F, z). Test of Hypothesis- Testing for Attributes – Mean of Normal Population – One-tailed and two-tailed tests, F-test, and Chi-Square test - Analysis of variance ANOVA – One way and two-way classifications.

REFERENCES

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", 8th Edition, McGraw Hill, 2018.
2. Kolman, Busby and Ross, "Discrete Mathematical Structures", 6th Edition, PHI, 2013.
3. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 6th edition, Academic Press, 2020.

COURSE OBJECTIVES

- To acquire skills in solving mathematical and logical problems.
- To comprehend mathematical principles and logic.
- To understand fundamental concepts and tools in discrete mathematics with emphasis on their applications to computer science.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
Students will be able to:	
1. Apply the concepts of discrete mathematics in the modelling and design of computational algorithms.	1, 2, 3

COURSE PLAN – PART II

COURSE OVERVIEW

The Mathematical Foundations of Computer Science course, which covers topics like sets, relation, functions, propositional logic, connectives, conjunctive and Disjunctive normal forms, graph theory, probability, sampling distributions, and descriptive statistics. This course introduces first-year students to the fundamental concepts of discrete mathematics and basic probability. The course provides essential background knowledge for those pursuing a M.Sc. Computer science degree.

COURSE TEACHING AND LEARNING ACTIVITIES

S. No.	Week/ Contact Hours	Topic	Mode of Delivery
1	Week 1 (4 Classes)	Sets and operations, properties, power set, methods of proof, relations, graph, and matrix of a relation.	Chalk and Talk
2	Week 2 (4 Classes)	partial and total orders, well ordering, equivalence relations, classes and properties.	Chalk and Talk
3	Week 3 (4 Classes)	functions, 1-1, onto and bijective, composition of relations and functions, inverse functions.	Chalk and Talk
4	Week 4 (4 Classes)	Propositions and logical operators, Truth table, Equivalences and implications, Basic laws, Some more connectives.	Chalk and Talk

5	Week 5 (4 Classes)	Functionally complete set of connectives, Review of Propositional Calculus, Validity.	Chalk and Talk
6	Week 6 (4 Classes)	Satisfiability related concepts, CNF and DNF forms, Conversion of arbitrary propositional formula to CNF or DNF	Chalk and Talk
7	Week 7 (4 Classes)	Definitions and basic results, Graph representation by matrix and adjacency list, Trees, Cycles, Paths, connectedness, Sub graphs.	PPT, Chalk and Talk
8	Week 8 (4 Classes)	Graph Isomorphism, Operations on graphs, Vertex and edge cuts, connectivity, Spanning Trees.	PPT, Chalk and Talk
9	Week 9 (4 Classes)	Euler circuits, Hamiltonian graphs, Sample Spaces, Events, Axioms, Counting.	PPT, Chalk and Talk
10	Week 10 (4 Classes)	Conditional Probability and Bayes' Theorem, The Binomial Theorem, Random variable.	PPT, Chalk and Talk
11	Week 11 (4 Classes)	distributions: Mean and Variance of a Random variable, Binomial, Poisson, Exponential and Normal distributions, Correlation and Regression.	PPT, Chalk and Talk
12	Week 12 (4 Classes)	The Central Limit Theorem, Distributions of the sample mean and the sample variance for a normal population.	PPT, Chalk and Talk
13	Week 13 (4 Classes)	Sampling distributions (Chi Square, t, F, z). Test of Hypothesis, Testing for Attributes, Mean of Normal Population	PPT, Chalk and Talk
14	Week 14 (4 Classes)	One-tailed and two-tailed tests, F-test, and Chi-Square test, Analysis of variance ANOVA, One way and two-way classifications.	PPT, Chalk and Talk

COURSE ASSESSMENT METHODS

S.No	Mode of Assessment	Week/Date	Duration	Weightage%
1	Cycle Test 1	As per academic schedule	1 Hour	20%
2	Cycle Test 2	As per academic schedule	1 Hour	20%
3	Assignment	End of the 12th Week	-	10%
4*	Compensation Assessment	As per academic schedule	1 Hour	20%
5	Final Assessment	As per academic schedule	2 Hours	50%

COURSE EXIT SURVEY

- The students may give their feedback at any time to the course teacher.
- The students may also give their feedback during Class Committee Meetings.

COURSE POLICY

- Classroom Behavior: Ensure that the classroom atmosphere conductive for learning. Participate in discussions but do not dominate or abusive. Be considerate of your fellow students and avoid disruptive behavior.
- Exam Policy: Each student is required to take all exams at the scheduled times. All exceptions must be cleared with the professors prior to the exam time. Exams missed for insufficient reason and without being cleared with the professor (prior to the exam time) will be assigned a score of zero mark.
- Assignments: All assignments must be submitted on or before the due date. Late submissions of assignments will not be allowed.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- 75% of attendance has to be maintained..
- 10% shall be allowed under on duty category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' Grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another students, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

FOR APPROVAL

Course Faculty	PAC Chairperson	HOD
(Mr. G. Appasami)	(Dr. S. Domnic)	(Dr. P. J. A. Alphonse)