



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE PLAN – PART I			
Name of the program and specialization	B.TECH / CSE		
Course Title	Discrete Structure		
Course Code	CSPC11	No. of Credits	4
Course Code of Pre-requisite subject(s)		Semester	2 <sup>nd</sup>
Session	January 2020	Section (if, applicable)	Compulsory
Name of Faculty	Dr. S. Nath	Department	CSE
Official Email	<a href="mailto:sayantan@nitt.edu">sayantan@nitt.edu</a>	Telephone No.	9477033935
Name of Course Coordinator(s) (if, applicable)	--		
Course Type (please tick appropriately)	<input checked="" type="checkbox"/> - Core course <input type="checkbox"/> Elective course		
<b>Syllabus (approved in Senate)</b>			
<p><b>UNIT-I Set Theory and Logic</b> Sets, Functions Relations, Equivalence Relation, Poset. Functions Logic: Propositional Logic, Truth Tables, Tautologies, Resolution Proof System, Predicate Logic.</p> <p><b>UNIT-II Induction and Combinatorics-</b> Peano's Axioms – Mathematical Induction – Pigeon Hole Principle – Principle of Inclusion and Exclusion –Review of Permutations and Combinations – Distribution Problems – Derangements – Bijection Principle.</p> <p><b>UNIT-III Algebraic Structures –</b> Semi-Groups, Monoids, Groups, Subgroups and their properties – Cyclic groups – Cosets – Permutation Groups – Lagrange's Theorem – Cayley's Theorem – Normal Subgroups – Homomorphism of Groups – Quotient Groups – Introduction to Rings and Fields.</p> <p><b>UNIT-IV Linear Algebra and Recurrence relations –</b> Linear Algebra: Vector space, Basis, Dimension, Orthogonally, Recurrence Relations: Homogenous and Inhomogenous Recurrences and their solutions – Solving Recurrences using Generating functions.</p> <p><b>UNIT-V Graph Theory</b> Definitions and basic results – Representation of a graph by a matrix and Adjacency list – Trees – Cycles – Properties – Paths and Connectedness – Subgraphs – Graph Isomorphism – Operations on Graphs – Vertex and Edge cuts – Vertex and Edge connectivity</p>			
<b>TEXTBOOKS</b>			



1. C.L.Liu and D.P.Mohapatra, 'Elements of Discrete Mathematics: A Computer Oriented Approach', McGraw Hill, Third Edition, 2012.
2. Kenneth H.Rosen, 'Discrete Mathematics and its Applications', McGraw Hill, Seventh Edition, 2012 (Indian Adaptation by Kamala Krithivasan, IIT Madras).

**COURSE OBJECTIVES**

- To get familiar and understand the fundamental notions in discrete mathematics.
- To describe binary relations between two sets; determine if a binary relation is reflexive, symmetric, or transitive or is an equivalence relation; combine relations using set operations and composition
- To understand and demonstrate the basic concept of an algorithm and its application in combinatorial mathematics.
- To identify the base step and the recursive or inductive step in applied problems and give a recursive and a non-recursive definition for an iterative algorithm.
- To identify the basic properties of graphs and trees and model simple applications

**MAPPING OF COs with POs**

Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
1. Distinguish between the notion of discrete and continuous mathematical structures	1,2,3
2. Prove basic set equalities	1,2,3
3. Construct and interpret finite state diagrams and DFSA	2,3,5
4. Apply induction and other proof techniques towards problem-solving	2,3
5. Solve problems in Computer Science using graphs and trees	1,3,5

**COURSE PLAN – PART II**

**COURSE OVERVIEW**

**This course covers DISCRETE STRUCTURE is the study of mathematical structures that are fundamentally discrete rather than continuous. In contrast to real numbers, the objects studied in discrete mathematics – such as integers, graphs, and statements in logic.**

**COURSE TEACHING AND LEARNING ACTIVITIES**

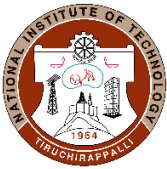
( Add more rows)

S. No.	Week/Contact Hours	Topic	Mode of Delivery
<b>Unit – I</b>			
1.	06/01/2020 to 10/01/2020 1 hour per class	Sets, subset	Chalk and Talk
2.	06/01/2020 to 10/01/2020 1 hour per class	Functions Relations	Chalk and Talk
3.	06/01/2020 to 10/01/2020 1 hour per class	Equivalence Relation	Chalk and Talk
4.	06/01/2020 to 10/01/2020 1 hour per class	Superset, poset	Chalk and Talk



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5.	13/01/2020 to 17/01/2020 1 hour per class	functional logic	Chalk and Talk with PPT Presentation
6.	13/01/2020 to 17/01/2020 1 hour per class	Propositional Logic	Chalk and Talk
7.	13/01/2020 to 17/01/2020 1 hour per class	Truth Tables, Tautologies	Chalk and Talk
8.	20/01/2020 to 25/01/2020 1 hour per class	Resolution Proof System	Chalk and Talk
9.	20/01/2020 to 25/01/2020 1 hour per class	Predicate Logic	Chalk and Talk
<b>Unit – II</b>			
10.	20/01/2020 to 25/01/2020 1 hour per class	Peano's Axioms	Chalk and Talk
11.	27/01/2020 to 31/01/2020 1 hour per class	Mathematical Induction	Chalk and Talk
12.	27/01/2020 to 31/01/2020 1 hour per class	Pigeon Hole Principle	Chalk and Talk with PPT Presentation
13.	27/01/2020 to 31/01/2020 1 hour per class	Mathematical inequalities	Chalk and Talk
14.	27/01/2020 to 31/01/2020 1 hour per class	Principle of Inclusion and Exclusion	Chalk and Talk
15.	03/02/2020 to 07/02/2020 1 hour per class	Permutations and Combinations	Chalk and Talk with PPT Presentation
16.	03/02/2020 to 07/02/2020 1 hour per class	Distribution Problems	Chalk and Talk
17.	03/02/2020 to 07/02/2020 1 hour per class	Binomial distribution	Chalk and Talk
18.	03/02/2020 to 07/02/2020 1 hour per class	Derangements	Chalk and Talk
19.	10/02/2020 to 14/02/2020 1 hour per class	Bijection Principle	Chalk and Talk
<b>Unit – III</b>			
20.	10/02/2020 to 14/02/2020 1 hour per class	Groups, sub-group	Chalk and Talk
21.	10/02/2020 to 14/02/2020 1 hour per class	Cosets	Chalk and Talk
22.	17/02/2020 to 21/02/2020 1 hour per class	Permutation Groups	Chalk and Talk with PPT Presentation
23.	17/02/2020 to 21/02/2020 1 hour per class	Cyclic groups	Chalk and Talk
24.	17/02/2020 to 21/02/2020 1 hour per class	Semi-groups, monied	Chalk and Talk
25.	17/02/2020 to 21/02/2020 1 hour per class	<b>Cycle test – I</b>	
26.	24/02/2020 to 28/02/2020 1 hour per class	Cayley's Theorem	Chalk and Talk with



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			PPT Presentation
27.	24/02/2020 to 28/02/2020 1 hour per class	Normal and Quotient Groups	Chalk and Talk
28.	24/02/2020 to 28/02/2020 1 hour per class	Rings and Fields	Chalk and Talk
<b>Unit – IV</b>			
29.	02/03/2020 to 06/03/2020 1 hour per class	Vector space	Chalk and Talk
30.	02/03/2020 to 06/03/2020 1 hour per class	Curl, grad	Chalk and Talk
31.	02/03/2020 to 06/03/2020 1 hour per class	Dimensionality	Chalk and Talk
32.	16/03/2020 to 20/03/2020 1 hour per class	Orthogonally	Chalk and Talk
33.	16/03/2020 to 20/03/2020 1 hour per class	Diff, curl, and converge	Chalk and Talk
34.	16/03/2020 to 20/03/2020 1 hour per class	Homogenous Recurrences	Chalk and Talk
35.	16/03/2020 to 20/03/2020 1 hour per class	Heterogenous Recurrences	Chalk and Talk
36.	23/03/2020 to 27/03/2020 1 hour per class	Solving Recurrences	Chalk and Talk
37.	23/03/2020 to 27/03/2020 1 hour per class	Function generation	Chalk and Talk
<b>Unit – V</b>			
38.	23/03/2020 to 27/03/2020 1 hour per class	Basic graphs	Chalk and Talk
39.	30/03/2020 to 03/04/2020 1 hour per class	graph by matrix	Chalk and Talk
40.	30/03/2020 to 03/04/2020 1 hour per class	<b>Cycle Test – II</b>	
41.	30/03/2020 to 03/04/2020 1 hour per class	Trees – Cycles	Chalk and Talk
42.	06/04/2020 to 10/04/2020 1 hour per class	Paths and Connectedness	Chalk and Talk with PPT Presentation
43.	06/04/2020 to 10/04/2020 1 hour per class	Type of graphs	Chalk and Talk
44.	06/04/2020 to 10/04/2020 1 hour per class	Interoperation-connectivity	Chalk and Talk
45.	13/04/2020 to 17/04/2020 1 hour per class	Subgraphs	Chalk and Talk
46.	13/04/2020 to 17/04/2020 1 hour per class	Graph Isomorphism	Chalk and Talk
47.	13/04/2020 to 17/04/2020 1 hour per class	Vertex and Edge cuts	Chalk and Talk
<b>COURSE ASSESSMENT METHODS</b> (shall range from 4 to 6)			



S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test – I	17/02/2020 to 21/02/2020	1 hour per class	15
2	Cycle Test – II	30/03/2020 to 03/04/2020	1 hour per class	15
3	Assignment	16/03/2020 to 20/03/2020	1 week	20
CPA	Compensation Assessment*			
5	Final Assessment *	As per academic schedule	3 hours	50

**\*mandatory; refer to guidelines on page 4**

**COURSE EXIT SURVEY** (mention the ways in which the feedback about the course shall be assessed)

- 1. Students' feedback through PAC meetings**
- 2. Feedbacks are collected before final examination through MIS or any other standard format followed by the institute**
- 3. Students, through their Class Representatives, may give their feedback at any time to the course faculty which will be duly addressed.**

**COURSE POLICY** (including compensation assessment to be specified)

**MODE OF CORRESPONDENCE (email/ phone etc)**

Email, in-person – after 4.00 pm.

**COMPENSATION ASSESSMENT POLICY**

- 1. One compensation assessment will be given after completion of the Cycle Test – I and Cycle test – II for the students who are absent for any assessment due to genuine reason.**
- 2. Compensatory assessments would cover the syllabus of Cycle test – I & Cycle test – II**
- 3. The prior permission and required documents must be submitted for absence signed by HoD / CSE.**

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

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under the On Duty (OD) 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 marks to be awarded for the offenders. For copying from another student, both students get the same penalty of zero marks.
- 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.



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- The above policy against academic dishonesty shall be applicable to all the programs.

### ADDITIONAL INFORMATION, IF ANY

1. The Course Coordinator is available for consultation during the time intimated to the students then and there.
2. Relative grading adhering to the instructions from the office of the Dean (Academic) will be adopted for the course.

### FOR APPROVAL

Course Faculty  CC- Chairperson  HOD  11/2/2020

### Guidelines

- a) The number of assessments for any theory course shall range from 4 to 6.
- b) Every theory course shall have a final assessment of the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) Average/2) lower	or (Class) whichever is	40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.