Fr. Conceicao Rodrigues College of Engineering

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

Department of Computer Engineering

S.E. (AI&DS) (semester III)

(2022-2023)

Course Outcomes & Assessment Plan

Subject: Discrete Structures and Graph Theory (CSC 302) **Credits-3**

Syllabus:

Module	Detailed Contents		Hours
1	**Logic**		6
	1.1	Propositional Logic, Predicate Logic, Laws of Logic, Quantifiers, Normal Forms, Inference Theory of Predicate Calculus, Mathematical Induction.	
2	**Relations and Functions**		6
	2.1	Basic concepts of Set Theory	
	2.2	**Relations:** Definition, Types of Relations, Representation of Relations, Closures of Relations, Warshall's algorithm, Equivalence relations and Equivalence Classes	
	2.3	**Function**s: Definition, Types of functions, Composition of functions, Identity and Inverse function	
3	**Posets and Lattice**		5
	3.1	Partial Order Relations, Poset, Hasse Diagram, Chain and Anti chains, Lattice, Types of Lattice, Sub lattice	
4	**Counting**		6
	4.1	Basic Counting Principle-Sum Rule, Product Rule, Inclusion-Exclusion Principle, Pigeonhole Principle	
	4.2	Recurrence relations, Solving recurrence relations	
5	**Algebraic Structures**		8
	5.1	**Algebraic structures with one binary operation:** Semi group, Monoid, Groups, Subgroups, Abelian Group, Cyclic group, Isomorphism	
	5.2	**Algebraic structures with two binary operations:** Ring	
	5.3	**Coding Theory**: Coding, binary information and error detection, decoding and error correction	
6	**Graph Theory**		8
		Types of graphs, Graph Representation, Sub graphs, Operations on Graphs, Walk, Path, Circuit, Connected Graphs, Disconnected Graph, Components, Homomorphism and Isomorphism of Graphs, Euler and Hamiltonian Graphs, Planar Graph, Cut Set, Cut Vertex, Application	

Textbooks:	
1	Bernad Kolman, Robert Busby, Sharon Cutler Ross, Nadeem-ur-Rehman, "Discrete Mathematical Structures", Pearson Education.
2	C. L. Liu "Elements of Discrete Mathematics", second edition 1985, McGraw-Hill Book Company. Reprinted 2000.
3	K. H. Rosen, "Discrete Mathematics and applications", fifth edition 2003, Tata McGraw Hill Publishing Company

References:	
1	Y N Singh, “Discrete Mathematical Structures”, Wiley-India.
2	J. L. Mott, A. Kandel, T. P. Baker, “Discrete Mathematics for Computer Scientists and Mathematicians”, Second Edition 1986, Prentice Hall of India.
3	J. P. Trembley, R. Manohar “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw Hill Publishing Company
4	Seymour Lipschutz, Marc Lars Lipson, “Discrete Mathematics” Schaum‟s Outline, McGraw Hill Education.
5	Narsing Deo, “Graph Theory with applications to engineering and computer science”, PHI Publications.
6	P. K. Bisht, H. S. Dhami, “Discrete Mathematics”, Oxford press.

Online Resources:

https://www.youtube.com/watch?v=p2b2Vb-cYCs&list=PLBlnK6fEyqRhqJPDXcvYlLfXPh37L89g3&index=2
https://www.youtube.com/watch?v=I32MYMah0D0
https://www.youtube.com/watch?v=7ifHq5J58cE&list=PLmXKhU9FNesQrSgLxm6zx3XxH_M_8n3LA
https://www.youtube.com/watch?v=ebpR0-00aWw
https://www.youtube.com/watch?v=SUvdx0ntJ3I

Pre-requisite: Basic Mathematics	
Course Objectives: The course aims:	
1	Cultivate clear thinking and creative problem solving.
2	Thoroughly train in the construction and understanding of mathematical proofs.Exercise common mathematical arguments and proof strategies.
3	To apply graph theory in solving practical problems.
4	Thoroughly prepare for the mathematical aspects of other Computer Engineering courses
Course Outcomes: On successful completion, of course, learner/student will be able to:	
CSC302.1	Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving
CSC302.2	Ability to reason logically.
CSC302.3	Ability to understand relations, functions, Diagraph and Lattice. (Apply)
CSC302.4	Ability to understand and apply concepts of graph theory in solving real world problems. (Apply)
CSC302.5	Demonstrate use of groups and codes in Encoding-Decoding (Analyze)
CSC302.6	Analyze a complex computing problem to find solution using principles of discrete mathematics (Analyze)

Course outcomes Target:

CSC302.1 : 2.8
CSC302.2 : 2.8
CSC302.3 : 2.8
CSC302.4 : 2.8
CSC302.5 : 2.5
CSC302.6 : 2.6

Mapping of CO and PO/PSO

Relationship of course outcomes with program outcomes: Indicate 1 (low importance), 2 (Moderate Importance) or 3 (High Importance) in respective mapping cell.

	PO1 (Engg Know)	PO2 (Ana)	PO3 (De sign)	PO4 (inve stiga)	PO5 (tools)	PO6 (engg Soci)	PO7 (Env)	PO8 (Eth)	PO9 (ind Team)	PO10 (comm.)	PO11 (PM)	PO12 (life Long)	PSO	PSO2

CSC302.1	2	1	1										2	
CSC302.2	2	1											2	
CSC302.3	2	2	1										2	
CSC302.4	2	1	1										2	2
CSC302.5	2	1	1						3	3		3	2	2
CSC302.5	2	2	2											
Total	12	8	6						3	3		3	18	6
CO –PO Matrix	3	1.4	1.2						3	3		3	3	3

CO Assessment Tools:

CSC302.1 Direct Methods (80%): Test + Assignment + End sem

CO1dm = 0.3T + 0.3A + 0.4UTh .

Indirect Method (20%): Course Exit Survey

CSC302.1 = 0.8*CO1dm + 0.2* CO1idm

Direct Methods	Weightage	Target	Date	Marks
Test 1	0.3	80% students will score minimum 80% marks	05-09-2022	Descriptive(10M)
Assignment1	0.3	80% students will score minimum 70% marks (i.e. 7 or more out of 10)	13-08-2022	10M
Uni Theory Exam	0.4	70% students will score minimum 70% marks (i.6. 56or more out of 80)		80M

CSC302.2 Direct Methods (80%): Test + Assignment + End sem

CO2dm = 0.3T + 0.3A + 0.4UTh .

Indirect Method (20%): Course Exit Survey

CSC302.2 = 0.8*CO2dm + 0.2* CO2idm

Direct Methods	Weightage	Target	Date	Marks
Test 1	0.3	70% students will score minimum 70% marks	05-09-2022	Descriptive(10M)
Assignment1	0.3	80% students will score minimum 70% marks (i.e. 7 or more out of 10)	13-08-2022	10M
Uni Theory Exam	0.4	70% students will score minimum 70% marks (i.6. 56or more out of 80)		80M

CSC302.3 Direct Methods (80%): Test +Assignment+ End sem

CO3dm = 0.3T +0.3A+ 0.4UTh .

Indirect Method (20%): Course Exit Survey

CSC302.3 = 0.8*CO3dm + 0.2* CO3idm

Direct Methods	Weightage	Target	Date	Marks
Test 1	0.3	70% students will score minimum 70% marks	05-09-2022	Descriptive (5M)
Assignment 2	0.3	80% students will score minimum 70% marks (i.e. 7 or more out of 10)	03-10-2022	10M

Uni Theory Exam	0.4	70% students will score minimum 70% marks (i.6. 56or more out of 80)		80M

CSC302.4 Direct Methods (80%): Test + Module test + End sem

CO4dm = 0.6T + 0.4UTh .

Indirect Method (20%): Course Exit Survey

CSC302.4 = 0.8*CO4dm + 0.2* CO4idm

Direct Methods	Weightage	Target	Date	Marks
Test 2	0.6	70% students will score minimum 70% marks	17-10-2022	Descriptive (7M)
Uni Theory Exam	0.4	70% students will score minimum 70% marks (i.6. 56or more out of 80)		80M

CSC302.5 Direct Methods (80%): Test + End sem

CO5dm = 0.6A + 0.4UTh .

Indirect Method (20%): Course Exit Survey

CSC302.5 = 0.8*CO5dm + 0.2* CO5idm

Direct Methods	Weightage	Target	Date	Marks
Test 2	0.6	70% students will score minimum 70% marks (i.e. 7 or more out of 10)	17-10-2022	09M
Uni Theory Exam	0.4	70% students will score minimum 70% marks (i.6. 56or more out of 80)		80M

CSC302.6 Direct Methods (80%): Test + End sem

CO5dm = 0.6A + 0.4UTh .

Indirect Method (20%): Course Exit Survey

CSC302.6 = 0.8*CO5dm + 0.2* CO5idm

Direct Methods	Weightage	Target	Date	Marks
Test 2	0.6	70% students will score minimum 70% marks (i.e. 7 or more out of 10)	17-10-2022	04M
Uni Theory Exam	0.4	70% students will score minimum 70% marks (i.6. 56or more out of 80)		80M

Content Beyond Syllabus:

Graph Theory application

Curriculum Gap:

No Gap

Rubrics for Assignment Grading:

Indicator	Poor	Average	Good

Timeliness • Maintains assignment deadline (2)	Assignment not done (0)	One or More than One week late (1)	Maintains deadline (2)
Completeness and neatness • Complete all parts of assignment(3)	N/A	< 80% complete (1-2)	100% complete (3)
Originality • Extent of plagiarism(2)	Copied it from someone else(0)	Atleast few questions have been done without copying(1)	Assignment has been solved completely without copying (2)
Knowledge • In depth knowledge of the assignment(3)	Unable to answer all questions(0)	Unable to answer some questions (1 or 2)	Able to answer all questions (3)

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Lesson Plan: Discrete Structures and Graph Theory

Modes of Content Delivery:

I	Class Room Teaching	V	Self Learning Online Resources	Ix	Industry Visit
Ii	Tutorial	Vi	Slides	X	Group Discussion
Iii	Remedial Coaching	vii	Simulations/Demonstrations	Xi	Seminar
Iv	Lab Experiment	viii	Expert Lecture	Xii	Case Study

Name of subject Techer: Sarika Davare
Class: SE AI&DS (Sem- III)

Lecture No	Topics to be covered	Planned Dates	Actual Dates	Content Delivery Method/Learning Activities
Module 1: Logic				
1	Propositional Logic	26-07-2022	26-07-2022	Black board -Chalk and , PPT
2	Predicate Logic	27-07-2022	27-07-2022	Black board -Chalk and PPT
3	Laws of Logic	29-07-2022	29-07-2022	Black board -Chalk and PPT
4	Quantifiers, Normal Forms	02-08-2022	02-08-2022	Black board -Chalk and PPT
5	Inference Theory of Predicate Calculus	03-08-2022	03-08-2022	Black board -Chalk and PPT
6	Mathematical Induction.	05-08-2022	05-08-2022	Black board - Chalk and PPT
Module 2: Relations and Functions				
7	Basic concepts of Set Theory	10-08-2022	10-08-2022	Black board -Chalk and PPT
8	**Relations:** Definition, Types of Relations,.	12-08-2022	12-08-2022	Black board -Chalk and PPT
9	Representation of Relations, Closures of Relations, Warshall's algorithm	17-08-2022	17-08-2022	Black board -Chalk and PPT
10	Equivalence relationsand Equivalence Classes	19-08-2022	23-08-2022	Black board - Chalk and PPT
11	**Function**s: Definition, Types of functions	23-08-2022	24-08-2022	Black board - Chalk and PPT
12	Composition of functions, Identity and Inverse function	24-08-2022	26-08-2021	Black board -Chalk and PPT

Module 3: Posets and Lattice				
13	Partial Order Relations	26-08-2022	30-08-2021	Black board -Chalk and PPT
14	Poset.	30-08-2022	30-08-2021	Black board -Chalk and PPT
15	Hasse Diagram	13-09-2022	14-09-2022	Black board -Chalk and PPT
16	Chain and Antichains	14-09-2022	15-09-2022	Black board -Chalk and PPT
17	Lattice, Types of Lattice, Sub lattice	16-09-2022	16-09-2022	Black board -Chalk and PPT
Module 4: Counting				
18	Basic Counting Principle-Sum Rule	20-09-2022	20-9-2022	Black board -Chalk and PPT
19	Product Rule	21-09-2022	21-9-2022	Black board -Chalk and PPT
20	Inclusion-Exclusion Principle	08-09-2022	23-9-2022	Black board -Chalk and PPT
21	Pigeonhole Principle	23-09-2022	24-9-2022	Black board -Chalk and PPT
22	Recurrence relations, Solving recurrence relations	27-09-2022	27-09-2022	Black board -Chalk and PPT
23	Example on the recurrence relations	28-09-2022	28-09-2022	Black board -Chalk and PPT
Module 5 : Algebraic Structures				
24	Algebraic structures with one binary operation	30-09-2022	30-09-2022	Black board -Chalk and PPT
25	Semi group, Monoid	4-10-2022	4-10-2022	Black board -Chalk and PPT
26	Groups, Subgroups, Abelian Group	7-10-2022	4-10-2022	Black board -Chalk and PPT
27	Cyclic group	11-10-2022	7-10-2022	Black board -Chalk and PPT
28	Algebraic structures with two binary operations: Ring	12-10-2022	11-10-2022	Black board -Chalk and PPT
29	Coding Theory: Coding, binary information	14-10-2022	12-10-2022	Black board -Chalk and PPT
30	Error detection, decoding anderror correction	27-10-2022	27-10-2022	Black board -Chalk and PPT
Module 6: Graph Theory				
31	Types of graphs, Graph Representation	27 -10-2022	27 -10-2022	Black board -Chalk and PPT
32	Sub graphs, Operations on Graphs	28 -10-2022	27 -10-2022	Black board -Chalk and PPT
33	Walk, Path, Circuit	28 -10-2022	28 -10-2022	Black board -Chalk and PPT
34	Connected Graphs, Disconnected Graph	29 -10-2022	28 -10-2022	Black board -Chalk and PPT
35	Components	29 -10-2021	28 -10-2022	Black board -Chalk and PPT

36	Homomorphism of Graphs,	14 -11-2021	14-11-2022	Black board -Chalk and PPT
37	Isomorphism of Graphs,	14 -11-2021	14-11-2022	Black board -Chalk and PPT
38	Euler Graphs	15 -11-2021	14-11-2022	Black board -Chalk and PPT
39	Hamiltonian Graphs	15-11-2021	15 -11-2022	Black board -Chalk and PPT
40	Planar Graph with example	16-11-2021	15-11-2022	Black board -Chalk and PPT
41	Graph Theory Applications and University Question paper solve	16 -11-2021	16-11-2022	Black board -Chalk and PPT

No. of Lecture Conducted = 38

END