Fr. Conceicao Rodrigues College of Engineering

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

Department of Computer Engineering

S.E. (Computer) (semester III)

(2022-2023)

Course Outcomes & Assessment Plan

Subject: Discrete Structures and Graph Theory DIV A

Subject code: (CSC 302)

Teacher-in-charge: Prof. Supriya Kamoji

Academic Term: July – October 2022

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	Ability to reason logically. (Apply)
CSC302.2	Ability to explain relations, functions, Diagraph and Lattice. (Apply)
CSC302.3	Ability to apply concepts of graph theory in solving real world problems. (Apply)
CSC302.4	Demonstrate use of groups and codes in Encoding-Decoding (Analyze)
CSC302.5	Analyze a complex computing problem to find solution using principles of discrete mathematics (Analyze)

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)	PSO1	PSO2
CSC302.1	1													
CSC302.2	1	1												
CSC302.3	1													
CSC302.4	1	1												
CSC302.5	1	1								1		1	1	
Total	5	3											1	
CO –PO Matrix														

Justification of PO to CO mapping

Course Outcome	Competency	Performance Indicator
CSC302.1	1.1 Demonstrate competence in mathematical modelling	1.1.1 Apply the knowledge of discrete structures, linear algebra, statistics, and calculus to solve problems
CSC302.2	1.1 Demonstrate competence in mathematical modelling	1.1.1 Apply the knowledge of discrete structures, linear algebra, statistics, and calculus to solve problems
	2.1 Demonstrate an ability to identify and formulate complex engineering problem	2.1.3 Identify an algorithm that applies to a given problem
CSC302.3	1.1 Demonstrate competence in mathematical modelling	1.1.1 Apply the knowledge of discrete structures, linear algebra, statistics, and calculus to solve problems
CSC302.4	1.1 Demonstrate competence in mathematical modelling	1.1.1 Apply the knowledge of discrete structures, linear algebra, statistics, and calculus to solve problems
	2.2 Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.3 Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions.
CSC302.5	1.1 Demonstrate competence in mathematical modelling	1.1.1 Apply the knowledge of discrete structures, linear algebra, statistics, and calculus to solve problems
	2.1 Demonstrate an ability to identify and formulate complex engineering problem	2.1.2 Identify processes/modules of a computer-based system and parameters to solve a problem
	10.2 Demonstrate competence in listening, speaking, and presentation	10.2.2 Deliver effective oral presentations to technical and non-technical audiences
	12.2 Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1 Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current

Justification of CO to PSO mapping:

CSC302.5	1.1 Demonstrate competence in mathematical modelling, and engineering fundamentals.	1.1.1 Develop mathematical concepts required for ML and AI algorithms.

CO Assessment Tools:

Course Outcomes	***Direct Method 80%***								***Indirect Method (20%)***
	Unit Tests		Assignments				Presentation	End Sem Exam	Course exit survey
	1	2	1	2	3	4			
CSDC7022.1	30%	--	30%	--	--	--	-	40%	100%
CSDC7022.2	30%	--	--	30%	--	--	-	40%	100%
CSDC7022.3	--	30%	--	--	30%	--	-	40%	100%
CSDC7022.4	--	30%	--	--	---	30%	-	40%	100%
CSDC7022.5	--	--	--	--	--	--	60%	40%	100%

Curriculum Gap:

No Gap

Rubrics for Assignment Grading:

Indicator	Very Poor	Poor	Average	Good	Excellent
Timeline (2)	Assignment not submitted (0)	More than two session late (0.5)	Two sessions late (1)	One session late (1.5)	Early or on time (2)
Organization (2)	N/A	Very poor readability and not structured (0.5)	Poor readability and somewhat structured (1)	Readable with one or two mistakes and structured (1.5)	Very well written and structured without any mistakes (2)
Level of content (4)	N/A	Major points are omitted or addressed minimally (1)	All major topics are covered, the information is accurate.(2)	Most major and some minor criteria are included. Information is Accurate (3)	All major and minor criteria are covered and are accurate. (4)
Depth and breadth discussion (2)	N/A	None in evidence; superficial at most (0.5)	Minor points/information may be missing and discussion is minimal (1)	Discussion centers on some of the points and covers them adequately (1.5)	Information is presented in depth and is accurate (2)

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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: Supriya Kamoji
Class: SE COMP – A (Sem- III)

Lecture No	Topics to be covered	Planned Dates	Actual Dates	Content Delivery Method/Learning Activities
Module 1: Logic				
1	Propositional Logic	25/7/2022	25/7/2022	Class Room Teaching/ slides
2	Predicate Logic	26/7/2022	26/7/2022	Class Room Teaching/ slides
3	Laws of Logic	29/7/2022	29/7/2022	Class Room Teaching/ slides
4	Quantifiers, Normal Forms	1/8/2022	1/8/2022	Class Room Teaching/ slides
5	Inference Theory of Predicate Calculus	4/8/2022	4/8/2022	Class Room Teaching/ slides
6	Mathematical Induction.	5/8/2022	5/8/2022	Class Room Teaching/ slides and Self Learning Resources
Module 2: Relations and Functions				
7	Basic concepts of Set Theory	8/8/2022	8/8/2022	Self-Learning Resources Class Room Teaching/ slides
8	**Relations:** Definition, Types of Relations,	11/8/2022	11/8/2022	Class Room Teaching/ slides
9	Representation of Relations, Closures of Relations, Warshall's algorithm	12/8/2022	12/8/2022	Class Room Teaching/ slides
10	Equivalence relations and Equivalence Classes	18/8/2022	17/8/2022	Class Room Teaching/ slides
11	**Function**s: Definition, Types of functions	22/8/2022	22/8/2022	Class Room Teaching/ slides
12	Composition of functions, Identity and Inverse function	25/8/2022	24/8/2022	Class Room Teaching/ slides

Module 3: Posets and Lattice				
13	Partial Order Relations	26/8/2022	26/8/2022	Class Room Teaching/ slides
14	Poset.	29/8/2022	29/8/2022	Class Room Teaching/ slides
15	Hasse Diagram	8/9/2022	8/9/2022	Class Room Teaching/ slides
16	Chain and Antichains	9/9/2022	12/9/2022	Class Room Teaching/ slides
17	Lattice, Types of Lattice, Sub lattice	12/9/2022	15/9/2022	Class Room Teaching/ slides
Module 4: Counting				
18	Basic Counting Principle-Sum Rule	15/9/2022	16/9/2022	Self Learning Resources
18	Product Rule	15/9/2022	16/9/2022	Class Room Teaching/ slides and Self Learning Resources
19	Inclusion-Exclusion Principle	16/9/2022	19/9/2022	Class Room Teaching/ slides
19	Pigeonhole Principle	16/9/2022	19/9/2022	Class Room Teaching/ slides
20	Recurrence relations, Solving recurrence relations	19/9/2022	22/9/2022	Class Room Teaching/ slides
20	Example on the recurrence relations	19/9/2022	22/9/2022	Class Room Teaching/ slides
Module 5 : Algebraic Structures				
21	Algebraic structures with one binary operation	22/9/2022	23/9/2022	Class Room Teaching/ slides
21	Semi group, Monoid	22/9/2022	23/9/2022	Class Room Teaching/ slides
22	Groups, Subgroups, Abelian Group	23/9/2022	26/9/2022	Class Room Teaching/ slides
23	Cyclic group	29/9/2022	29/9/2022	Class Room Teaching/ slides
23	Isomorphism	29/9/2022	29/9/2022	Class Room Teaching/ slides
24	Algebraic structures with two binary operations: Ring	30/9/2022	30/9/2022	Class Room Teaching/ slides
24	Coding Theory: Coding, binary information	30//9/2022	30/9/2022	Class Room Teaching/ slides
25	Error detection, decoding anderror correction	3/10/2022	3/10/2022	Class Room Teaching/ slides
Module 6: Graph Theory				
26	Types of graphs, Graph Representation	6/10/2022	6/10/2022	Self-Learning resources
27	Sub graphs, Operations on Graphs	7/10/2022	7/10/2022	Class Room Teaching/ slides
28	Walk, Path, Circuit	10/10/2022	7/10/2022	Class Room Teaching/ slides
28	Connected Graphs, Disconnected Graph	10/10/2022	7/10/2022	Class Room Teaching/ slides
29	Homomorphism of Graphs,Isomorphism of Graphs,	13/10/2022	10/10/2022	Class Room Teaching/ slides

30	Euler Graphs	14/10/2022	13/10/2022	Class Room Teaching/ slides
31	Hamiltonian Graphs Planar Graph with example	20/10/2022	14/10/2022	Class Room Teaching/ slides
31	Graph Theory Applications. University Question paper solve	20/10/2022	27/10/2022	Class Room Teaching/ slides

No. of Lecture Conducted = 31

END