LECTURE PLAN

Institute/Department	UNIVERSITY INSTITUTE OF ENGINEERING (UIE)	**Program**	**Bachelor of Engineering - Computer Science & Engineering (CS201)**
Master Subject Coordinator Name:	Sitaram Patel	**Master Subject Coordinator E-Code**:	**E13285**
Course Name	Discrete Mathematics and Graph Theory	**Course Code**	**20CST-352**

Lecture	Tutorial	Practical	Self Study	Credit	Subject Type
3	1	0	0	4.0	T

Course Type	Course Category	Mode of Assessment	Mode of Delivery
Program Core	Graded (GR)	Theory Examination (ET)	Theory (TH)

Mission of the Department	MD1: To provide practical knowledge using state-of-the-art technological support for the experiential learning of our students. MD2: To provide an industry-recommended curriculum and transparent assessment for quality learning experiences. MD3: To create global linkages for interdisciplinary collaborative learning and research. MD4: To nurture an advanced learning platform for research and innovation for students' profound future growth. MD5: To inculcate leadership qualities and strong ethical values through value-based education.
Vision of the Department	"To be recognized as a leading Computer Science and Engineering department through effective teaching practices and excellence in research and innovation for creating competent professionals with ethics, values, and entrepreneurial attitude to deliver service to society and to meet the current industry standards at the global level."

Program Educational Objectives(PEOs)	
PEO1	PEO1 Graduates of the Computer Science and Engineering will contribute to the Nation's growth through their ability to solve diverse and complex computer science and engineering problems across a broad range of application areas. (PEO1 is focused on Problem Solving)
PEO2	PEO2 Graduates of the Computer Science and Engineering will be successful professionals, designing and implementing Products & Services of global standards in the field of Computer Science & Engineering, becoming entrepreneurs, Pursuing higher studies & research. (PEO 2 is focused on Professional Success)
PEO3	PEO3 Graduates of the Computer Science and Engineering Program will be able to adapt to changing scenario of dynamic technology with an ability to solve larger societal problems using logical and flexible approach in decision making. (PEO 3 is focused on Attaining Flexibility and Adaptability)

Program Specific OutComes(PSOs)	
PSO1	PSO1 Exhibit attitude for continuous learning and deliver efficient solutions for emerging challenges in the computation domain.
PSO2	PSO2 Apply standard software engineering principles to develop viable solutions for Information Technology Enabled Services (ITES).

Program OutComes(POs)	
PO1	PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	PO2 Problem analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	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 the public health and safety and the cultural, societal, and environmental considerations.
PO4	PO4 Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
PO5	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	PO6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7	PO7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	PO9 Individual or teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	PO10 Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO11	PO11 Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	PO12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context to technological change.

Text Books

Sr No	Title of the Book	Author Name	Volume/Edition	Publish Hours	Years
1	Elements of Discrete Mathematics	C.L. Liu	3rd Edition	McGraw Hill	2008

Reference Books

Sr No	Title of the Book	Author Name	Volume/Edition	Publish Hours	Years
1	Discrete Mathematics and its Applications with Combinatorics and Graph Theory	Kenneth H. Rosen	7th Edition	McGraw Hill Education (India) Private Limited	2017

Course OutCome

SrNo	OutCome
CO1	Apply mathematical logic to solve logical problems
CO2	Understand the concepts and perform the operations related to sets, relations and functions.
CO3	Gain the conceptual background needed and identify structures of algebraic nature
CO4	Apply basic counting techniques to solve combinatorial problems.
CO5	Apply Graph Theory in solving computer science problems

Lecture Plan Preview-Theory

Unit No	LectureNo	ChapterName	Topic	Text/ Reference Books	Pedagogical Tool**	Mapped with CO Numer (s)
1	1	Mathematical Logic	Introduction ,overview and Application of discrete Structure	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO1

1	2	Mathematical Logic	Mathematical Logic Introduction, Statements and Notation	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO1
1	3	Mathematical Logic	Basic logical operation, truth tables	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO1
1	4	Mathematical Logic	Algebra of Proposition	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO1
1	5	Mathematical Logic	Types of Connectives	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	PPT	CO1
1	6	Mathematical Logic	Well-formed formulas, of proposition and identify Tautology	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	PPT	CO1
1	7	Mathematical Logic	Identify Contradictions from statement	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	PPT,Video Lecture	CO1
1	8	Mathematical Logic	Discuss logical implications, How does logical implication work	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	PPT	CO2
1	9	Mathematical Logic	Logical Equivalence ? Properties of Logical Equivalence	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	PPT,Video Lecture	CO2
1	10	Mathematical Logic	Find out Normal Forms from any statement	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	PPT,Video Lecture	CO2
1	11	Mathematical Logic	Type of normal form Disjunctive Normal Form (DNF) Conjunctive Normal Form	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	PPT,Video Lecture	CO2
1	12	Mathematical Logic	Functionally complete set of connectives.	T-Elements of Discrete Mathemati	PPT,Video Lecture	CO2
1	13	Inference Theory	Inference Theory of Statement Calculus	T-Elements of Discrete Mathemati	PPT,Video Lecture	CO1
1	14	Inference Theory	Inference theory of Predicate Calculus	T-Elements of Discrete Mathemati	PPT,Video Lecture	CO1

1	15	Inference Theory	Predicate Calculus	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO2
1	16	Inference Theory	Example of Predicate Calculus	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO3
1	17	Mathematical Logic	Pigeon hole principle and its application	T-Elements of Discrete Mathemati	PPT,Video Lecture	CO2
1	18	Inference Theory	Example of Pigeon hole theorem	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	PPT,Video Lecture	CO4
1	19	Mathematical Logic	Revision	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO1
1	20	Inference Theory	Revision	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO2
1	32	Algebraic structures	What is Algebraic structures?	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO3
2	21	Set theory	Basic Concepts of Set	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO2

2	22	Set theory	Basic Concepts of Relations	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports, Simulation,Video Lecture	CO2
2	23	Set theory	Combination of sets	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports, Simulation,Video Lecture	CO2
2	24	Set theory	Cardinality of sets	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports, Simulation,Video Lecture	CO2
2	25	Set theory	Finite , Infinite sets and power set	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports, Simulation,Video Lecture	CO2
2	26	Set theory	Overview of Ordering	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports, Simulation,Video Lecture	CO2
2	27	Set theory	Functions; composition of functions	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	PPT,Video Lecture	CO2
2	28	Set theory	Inverse Functions	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	PPT,Video Lecture	CO2
2	29	Set theory	Recursive Functions	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports, Simulation,Video Lecture	CO2

2	30	Set theory	Cartesian product	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO2
2	31	Set theory	The Principle of Inclusion-Exclusion	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO2
2	33	Algebraic structures	Algebraic systems-Examples and General Properties.	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO3
2	34	Algebraic structures	Properties of Algebraic structures	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO3
2	35	Algebraic structures	Groups, sub groups	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO3
2	36	Algebraic structures	Semi groups ,Monoids	T-Elements of Discrete Mathemati	PPT,Video Lecture	CO3
2	37	Algebraic structures	Homomorphism	T-Elements of Discrete Mathemati	PPT,Video Lecture	CO3
2	38	Algebraic structures	Isomorphism	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO3

2	39	Algebraic structures	Automorphism	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO3
2	40	Algebraic structures	Revision	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO3
3	41	Elementary Combinatorics	Basics of Counting,	T-Elements of Discrete Mathemati	PPT,Video Lecture	CO4
3	42	Elementary Combinatorics	Combinations	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO4
3	43	Elementary Combinatorics	Permutations	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO4
3	44	Elementary Combinatorics	Enumeration of Combinations and Permutations	R-Discrete Mathematics and its A	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO4
3	45	Elementary Combinatorics	Enumerating Combinations and Permutations with Repetitions	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO4

3	46	graph theory	Basic Concepts Graphs	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	47	graph theory	Multigraphs and Euler Circuits, Hamiltonian Graphs	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	48	graph theory	Isomorphism and Sub graphs	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	49	graph theory	Planar Graphs, Euler's Formula	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	50	graph theory	Graph traversing	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	51	graph theory	Chromatic Numbers, The Four Color Problem	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	52	graph theory	Trees and their Properties	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5

3	53	graph theory	Spanning Trees,Directed Trees	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	54	graph theory	Binary Trees	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	55	graph theory	Tree traversal	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	56	graph theory	Shortest path in weighted graphs	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	57	Boolean	Boolean expression	,T-Elements of Discrete Mathemati,R-Discrete Mathematics and its A	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	58	Boolean	Representation & Minimization of Boolean function	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5
3	59	graph theory	Revision unit-3	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO5

3	60	graph theory	Surprise test	T-Elements of Discrete Mathemati	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Reports,Simulation,Video Lecture	CO1

Assessment Model			
Sr No	Assessment Name	Exam Name	Max Marks
1	20EU01	External Theory	60
2	20EU01	Assignment	10
3	20EU01	Attendance Marks	2
4	20EU01	Mid-Semester Test-1	40
5	20EU01	Quiz	4
6	20EU01	Surprise Test	12
7	20EU01	Mid-Semester Test-2	40

CO vs PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	NA	NA	NA	NA	NA	NA	NA	2	2	2
CO2	3	3	3	2	NA	NA	NA	NA	NA	NA	NA	2	3	1
CO3	2	2	2	2	NA	NA	NA	NA	NA	NA	NA	3	1	NA
CO4	2	2	3	2	NA	NA	NA	NA	NA	NA	NA	2	3	1
CO5	3	3	2	3	NA	NA	NA	NA	NA	NA	NA	2	2	2
Target	2.6	2.4	2.4	2.4	NA	NA	NA	NA	NA	NA	NA	2.2	2.2	1.5