Semester:		
Graph Theory		
Course Code:		**CIE Marks: 50**
Credits:	**L: T:P:S: 2:2:0:0**	**SEE Marks: 50**
Hours:	**30L+10T**	**SEE Duration: 3 Hrs.**
Course Learning Objectives: The students will be able to		
Understand the basics of graph theory and their various properties, usage of recurrence relations and generating functions.		

UNIT-I	
Introduction to Graph Theory: Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits, Planar Graphs, Hamilton Paths and Cycle.	**8 Hrs**
UNIT-II	
Trees: Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes, Dijkstra's Shortest Path Algorithm, Minimal Spanning Trees.	**8 Hrs**
UNIT-III	
Fundamental Principles of Counting: The Rules of Sum and Product, Permutations, Combinations – The Binomial and multinomial Theorem, Combinations with Repetition.	**8 Hrs**
UNIT-IV	
The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements – Nothing is in its Right Place, Rook Polynomials.	**8 Hrs**
UNIT-V	
Recurrence Relations: First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients, The Non-homogeneous Recurrence Relation, The Method of Generating Functions.	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply graph theory-based tools in solving practical problems.
CO2	Demonstrate algorithms used in interdisciplinary engineering domains.
CO3	Demonstrate the application of discrete structures in different fields of computer. Science.
CO4	Develop a facility at combinatorial reasoning and strengthen proof-writing skills.
CO5	Solve problems using recurrence relations and generating functions.

Reference Books	
1.	Chartrand Zhang: Introduction to Graph Theory, TMH, 2006.
2.	Richard A. Brualdi: Introductory Combinatorics, 4th Edition, Pearson Education, 2004.

3.	D.S. Chandrasekharaiah: Graph Theory and Combinatorics, Prism, 2005.
4.	Geir Agnarsson & Raymond Geenlaw: Graph Theory, Pearson Education, 2007.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**3**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
CO2	**3**	**3**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
CO3	**3**	**3**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
CO4	**3**	**3**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
CO5	**3**	**2**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**