

**BMS COLLEGE OF ENGINEERING, BANGALORE – 560019**  
**MATHEMATICS DEPARTMENT**  
**SYLLABUS (2011 - 2012)**

<b>Course Name</b>	<b>Graph Theory (Institutional Elective)</b>	<b>Course Code</b>	<b>11MA7IEGRT</b>
<b>Credits</b>	<b>04</b>	<b>L – T - P</b>	<b>4 - 0 - 0</b>
<b>Contact hours</b>	<b>52 hours</b>		

**Course outcomes:**

Students on completion of the course will

- i) Use graphs and trees as tools to visualize and simplify situations.
- ii) Identify minimum weighted spanning trees using algorithms.
- iii) Apply the concept of Max Flow/Min cut algorithm for networks.
- iv) Express graphs in terms of matrix notations and to find chromatic polynomial for a graph.
- v) Compute maximum matching in a bipartite graph.
- vi) Demonstrate an understanding for digraphs.

**UNIT-1**

Graphs – Application of graphs – Finite and Infinite graphs – Incidence and Degree – Isolated Vertex, Pendant Vertex and Null Graph – Isomorphism – Sub graphs – Walks, Paths and Circuits – Connected Graphs, Disconnected graphs and Components – Euler Graphs – Operations on Graphs – Hamiltonian Paths and Circuits.

**[12 hours]**

**UNIT-2**

Trees – Pendant Vertices in a Tree – Distance and Centers in a Tree – Rooted and Binary Trees – Spanning Trees – Fundamental Circuits – Finding All Spanning Trees of a Graph– Spanning Trees in a Weighted Graph. Cut-Sets –Some Properties of cut sets- All Cut-Sets in a Graph – Fundamental Circuits and Cut-Sets –Connectivity and Separability – Network Flows.

**[12 hours]**

**UNIT-3**

Planar Graphs –Kuratowski’s graphs-Detection of Planarity – Geometric Dual. Incident Matrix – Circuit Matrix – Cut-Set Matrix – Relationship among Reduced incidence matrix, fundamental circuit matrix and fundamental cut-set matrix. Path Matrix – Adjacency Matrix.

**[10 hours]**

**UNIT-4**

Chromatic Number –BiChromatic– Chromatic Polynomial – Matchings –Perfect Matchings-Coverings-edge covering –vertex covering-Four Color Problem –Maximal Matching-independent set-Maximal Independent set.

**[9 hours]**

## UNIT-5

Directed Graph –Asymmetric Digraphs-Symmetric Digraphs-Complete digraphs- Directed Paths and Connectedness – Euler Digraphs Introduction – Trees with Directed Edges –Arborescence-Adjacency Matrix of a Digraph. [9 hours]

**NOTE: -No Proofs for the theorems.**

### **Text Books:**

1. Graph Theory by NarsingDeo. – Twenty – first Printing May, 2001

### **Reference Books:**

1. Discrete and combinatorial mathematics by Ralph. P. Grimaldi and B V Ramana, 5<sup>th</sup> Edition, PHI/ Perason Education, 2004.

### **Question Paper Pattern:**

1. Each unit consists of one full question.
2. Each full question consists of two, three or four subdivisions.
3. Five full questions to be answered.
4. Internal choice in Unit 2 and Unit 3.