| | |
|---|---|
| **COURSE TITLE** | **DISCRETE MATHEMATICS AND GRAPH THEORY** |
| **COURSE CODE** | **01CT0310** |
| **COURSE CREDITS** | **4** |

**Objective:**

1 Engineering Mathematics is one of the essential tools for learning Technology, Engineering and Sciences. In this course students will come across several theorems and proofs. This course is aimed to cover a variety of different problems in Graph Theory. Theorems will be stated and proved formally using various techniques. Various graphs algorithms will also be taught along with its analysis.

2 Engineering Mathematics is one of the very useful tools for learning Technology, Engineering and Sciences. In this course Learners will come across a number of standard concepts which helps them to solve core real world problems. This course is aimed to cover a variety of different concepts in Graph Theory. Theorems will be stated and proved formally using various Mathematical rules. Various graphs algorithms will also be discussed along with detail analysis.

**Course Outcomes:** After completion of this course, student will be able to:

1 Understand and apply logical propositions using logic & predicate and Boolean algebra.

2 Understand the properties of relations, equivalence and partial order relations

3 Apply concept of Boolean algebra in switching theory and building basic electronic circuits

4 Apply and analyze the concepts of shortest path algorithm to determine the solution to complex optimization problem.

5 Apply concepts of graph theory to solve real life problems.

**Pre-requisite of course:**NA

**Teaching and Examination Scheme**

| Theory Hours | Tutorial Hours | Practical Hours | ESE | IA | CSE | Viva | Term Work |
|---|---|---|---|---|---|---|---|
| 3 | 1 | 0 | 50 | 30 | 20 | 25 | 25 |

| Contents : Unit | Topics | Contact Hours |
|---|---|---|
| 1 | **Logic and Predicates**<br>Introduction, Logical expressions and Operators, , Predicates, Rules of quantifiers, rules of inference for predicates and propositions. | 6 |
| 2 | **Lattices**<br>Different types of Relations, Partially ordered set, Hasse diagram, Lattice as Partially ordered set, Lattice as an algebraic system, concept of duality | 6 |

| Contents : Unit | Topics | Contact Hours |
|---|---|---|
| 3 | **Boolean Algebra**<br>Introduction to Boolean algebra and properties, Sub-Boolean algebra, Atoms and anti-atoms, Boolean Expression and It's equivalences, Minterms and Maxterms, values of Boolean expressions, canonical forms, Karnaugh map | 6 |
| 4 | **Graphs and Trees**<br>Introduction to graph theory, degree and incidence, walks, paths, circuits, Hamilton Graphs and Euler Graphs, Acyclic Graph(Tree) and its properties, Spanning Tree and Minimal Spanning Tree., Dijkstra's Algorithm, Binary tree | 8 |
| 5 | **Representation Graph using Matrix**<br>Edge and vertex connectivity, Matrix form of graphs, Adjacency matrix, Incidence matrix, separability, fundamental cycles and cut sets graph isomorphism: 1-isomorphic and 2- isomorphic graphs, matrix form of graphs, Dijkstra's algorithm. | 8 |
| 6 | **Planar and Non-planar Graphs**<br>Planar and Non-planar Graphs,, Kurtowski's first and second graphs, Euler's formula, Detection of planarity and elementary reduction, stereographic graph embedding on a sphere, | 8 |
| **Total Hours** | | **42** |

**Suggested List of Experiments:**

| Contents : Unit | Topics | Contact Hours |
|---|---|---|
| 1 | **Tutorial**<br>Logic and Predicates, Lattices , Boolean Algebra , Graphs and Trees, Representation Graph using Matrix, Planar and Non-planar Graphs | 28 |
| **Total Hours** | | **28** |

**Textbook :**

1 Graph Theory with Applications to Engineering and Computer Science, PHI, 1974, Narsingh Deo, PHI, 1979

2 Discrete Mathematics and Its Applications (SIE) | 8th Edition, Rosen Kenneth, McGraw Hill, 2021

**References:**

1 Discrete Mathematics for Computer Science, Discrete Mathematics for Computer Science, Stanat and McAlister, Phi, 1977

2 Discrete Mathematics, Discrete Mathematics, S. Malik and M. K. Sen, Cengage Learning India Pvt. Ltd., 2012

3 Discrete Mathematical Structures for Computer Science,, Discrete Mathematical Structures for Computer Science,, B.Kolman and R.C. Busby:, Prantice Hall, New-Delhi,, 1984

MR. CHANDRASINH DHIRUBHA PARMAR
**Digitally signed by (Name of HOD)**

DR. RAJENDRASINH BAHADURSINH JADEJA
**Digitally signed by (Name of Dean/ Principal)**

**References:**

4 Discrete Mathematical Structures with Application to Computer Science,, Discrete Mathematical Structures with Application to Computer Science,, J.P. Tremblay and Manohar:, McGraw Hill Publication- New Delhi,, 2017

**Suggested Theory Distribution:**

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

| Distribution of Theory for course delivery | | | | | |
|---|---|---|---|---|---|
| **Remember / Knowledge** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Higher order Thinking / Creative** |
| 20.00 | 20.00 | 30.00 | 15.00 | 10.00 | 5.00 |

**Instructional Method:**

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Students will use supplementary resources such as online videos, NPTEL videos, E-courses.

4 Practical exam will be conducted at the end of semester for evaluation of learners in tutorial work.

**Supplementary Resources:**

1 http://www.tutorialspoint.com/graph_theory

2 http://www.ied.edu.hk/has/phys/de/de-ba.htm