

**Course: OE**  
**Discrete Mathematics**

<b>Semester: I</b>	<b>Credits: 2</b>	<b>Subject Code: OE2-12308</b>	<b>Lectures: 30</b>
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**Course Outcomes:**

At the end of this course, the learner will be able to:

- CO1-Define and understand the basics of logic. Write an argument using logical notation and determine validity of the argument.
- CO2-Determine properties of relations, identify equivalence and partial order relations and represent them diagrammatically.
- CO3-Apply among various counting principles and apply them appropriately.
- CO4-Understand the basic concepts of Graph Theory and its types.

<b>Unit 1: Logic and Boolean Algebra</b>	<b>15</b>
<ul style="list-style-type: none"> <li>• Revision - Propositional Logic, Propositional Equivalences</li> <li>• Predicates and Quantifiers - Predicate, n-Place Predicate or n-ary Predicate, Universal Quantifier and Existential Quantifier</li> <li>• Rules of Inference - Argument in propositional Logic, Rules of Inference for Propositional Logic, Constructing Arguments, Validity of Argument using Direct and Indirect method</li> <li>• Relations – Definition, Types of relations, Equivalence relations, Digraphs of relations, matrix representation of relation. Partial Order Relations – Definition, Poset, Hasse diagram</li> <li>• Lattices - Definition and terminologies, Properties of Lattices (without proof) Types of Lattices: Complemented Lattice, Bounded Lattice and Distributive Lattice – Definition and examples, Theorem on existence and uniqueness of complement of an element in a distributive lattice. (with proof)</li> <li>• Boolean Algebra - Introduction to Boolean Variable and Boolean Function, Boolean Identities, Definition of Boolean Algebra, Representation of Boolean Functions: Minterm, Maxterm, Disjunctive Normal Form and Conjunctive Normal Form</li> <li>• Test/Assignment</li> </ul>	

<b>Unit 2: Counting Principles and Graphs</b>	<b>15</b>
<ul style="list-style-type: none"> <li>• Cardinality of Set - Cardinality of a finite set, Basics of Counting - The Product Rule, The Sum Rule</li> <li>• The Inclusion- Exclusion Principle (with proof – for 2 sets and 3 sets) (without proof for n sets)</li> <li>• The Pigeonhole Principle – Statement, The Generalized Pigeonhole Principle and its Applications</li> <li>• Problems based on all above-mentioned Principles</li> <li>• Results and Problems based on Permutations &amp; Combinations, Permutations with repetition &amp; without repetition, Combinations with repetition &amp; without repetition.</li> <li>• Introduction to Graphs – Undirected Graphs, Elementary Terminologies and Results,</li> </ul>	

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Chairperson (HoD)	B.Sc(Comp.Sci.)	Gitanjali Phadnis	<i>H.M Phadnis</i> 02/06/2023



- Handshaking lemma, Corollary of Handshaking lemma
- Types of graphs, Isomorphism- Definition and Problems
- Adjacency & Incidence Matrix
- To check degree sequence (Sequence is graphical or not) -Havel - Hakimi Theorem (Only Statement)
- Subgraphs- Definition, Examples, Types of subgraphs -Vertex deleted subgraphs, Edge deleted subgraphs, Induced subgraphs, Spanning Subgraphs
- Complement of Graph and Self Complementary graphs
- Union, Intersection and Product of Graphs, Fusion of vertices
- Directed Graphs: Definition, Examples, Elementary terminologies and Properties, Types of digraphs.
- Assignment

**Recommended: Text books**

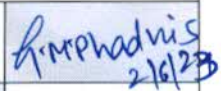
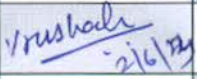

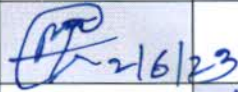
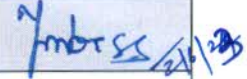
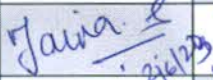

- Gupta S. C. and Kapoor V. K. 1987, *Fundamentals of Applied Statistics* (3rd Edition) S. Chand and Sons, New Delhi.
- Sarma K.V.S. 2001 *Statistics Made Simple. Do it Yourself on P.C.* Prentice Hall

**Reference Books:**

- C. L. Liu, *Elements of Discrete Mathematics*, Tata McGrawHill
- Harary, *Graph Theory*, Narosa Publishing House Pvt. Ltd., New Delhi, 2013.
- Kolman, Busby, Rehman, *Discrete Mathematical Structures*, Prentice Hall
- Narsingh Deo, *Graph Theory with applications to computer science and Engineering*, Prentice Hall..

**Websites:**

- [https://www.tutorialspoint.com/discrete\\_mathematics/index.htm](https://www.tutorialspoint.com/discrete_mathematics/index.htm)
- <https://nptel.ac.in>
- <https://swayam.gov.in>

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