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**COURSE STRUCTURE**

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| **Course Code** | **MST1PF07A** | | | |
| **Course Category** | *Program Foundation* | | | |
| **Course Title** | Discrete Mathematics with Graph Theory | | | |
| **Teaching Scheme and Credits**  **Weekly load hrs.** | **L** | **T** | **Laboratory** | **Credits** |
| **03** | **--** | **--** | **3+0+0=3** |
| **Pre-requisites**:   * Basic Mathematics | | | | |
| **Course Objectives:**  **1. Knowledge (i)** To understand the logic for solving problems using set theory.  **2. Skills (i)** To acquire skills of using Graph Theory for modelling computer science problems  **(ii)**  To acquire relations and functions to solve relevant problems in computer science  **(iii)** To apply Number Theory in Computer Application  **3. Attitude (i)** A positive attitude for learning Discrete Mathematics | | | | |
| **Course Outcomes:**  After completion of this course students will be able to:   1. Analyze and articulate the logic to solve problem using set theory. 2. Apply knowledge of relations and functions to solve relevant problems in computer science 3. Model computer science problems using Graph theory 4. Demonstrate the concepts and applications of Number Theory in Computer Science. | | | | |
| **Course Contents:**  **Set Theory:** Sets, Combinations of sets, Venn Diagrams, Finite and Infinite sets: Uncountable and Countable, Principle of inclusion and exclusion, Multisets, Cartesian Product and Power Set  Fuzzy sets, Basic concepts and types of Fuzzy sets, Operations on Fuzzy sets  **Relations and Functions:** Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Warshall’s Algorithm to find transitive closure, Equivalence Relations, Partial Orderings - Chain, Anti chain and Lattices.  Function: surjective, injective and bijective functions, Inverse Functions and Compositions of Functions, Recursive Function.  **Graphs:** Graph and Graph Models, Graph Terminology and Types of Graph, Representing Graph and Graph Isomorphism, vertex and edge Connectivity, Eulerian and Hamiltonian, Single source shortest path- Dijkstra’s algorithm, Planar Graph, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem, digraphs.  **Trees:** Introduction, properties of trees, Binary search tree, decision tree, prefix codes and Huffman coding, cut sets, Spanning Trees and Minimum Spanning Tree, Kruskal‘s and Prim‘s algorithms, The Max flow- Min Cut Theorem.  **Number Theory and Its Applications:** Modular Arithmetic & its properties, The Euclidean Algorithm, Extended Euclidean algorithm, Solving Congruence equations, The Chinese Remainder Theorem, Fermat's Theorem, Primitive Roots and Discrete Logarithms.  **Assignments:**   1. Problem Solving on Set Theory 2. Relations, equivalence, partial order relation and functions 3. Adjacency matrix and shortest path problems using Graph 4. Graph coloring, planar graphs, digraphs 5. Trees, spanning tree, Huffman coding, Max flow –min cut theorem . 6. Problem solving on Number Theory. | | | | |
| **Learning Resources:** | | | | |
| **Text Books:**   1. Kenneth H. Rosen, ―Discrete Mathematics and its Applications‖, Tata McGraw-Hill, ISBN 978-0-07-288008-3, 7th Edition. 2. C. L. Liu, ―Elements of Discrete Mathematics‖, TMH, ISBN 10:0-07-066913-9. 3. George J. Klir and Bo Yuan - Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall   **Reference Books:**   1. Bernard Kolman, Robert C. Busby and Sharon Ross, ―Discrete Mathematical Structures‖, Prentice-Hall of India /Pearson, ISBN: 0132078457, 9780132078450. 2. Dr. K. D. Joshi, ― Foundations of Discrete Mathematics‖, New Age International Limited, Publishers, January 1996, ISBN: 8122408265, 9788122408263   **Supplementary Reading:**   1. N. Biggs,“Discrete Mathematics”, 2ndEdition, Oxford University Press 2. Data Structures – Seymour Lipschutz, Shaum’s outlines, MCGraw – Hill Inc.   **Web Resources:**  https://learn.saylor.org/course/cs202  https://www.mooc-list.com/tags/discrete-mathematics  **Web links:**  https://www.tutorialspoint.com/discrete\_mathematics/index.htm  **MOOCs:**  http://nptel.ac.in/courses/106106094/3  <https://www.coursera.org/learn/discrete-mathematics> | | | | |
| **Pedagogy:**   * Chalk and Board * PPT * Two Teacher Method * Video Lectures | | | | |
| **Assessment Scheme:**  **Class Continuous Assessment (CCA)- 60 Marks**   |  |  |  |  | | --- | --- | --- | --- | | Class test/ Group activity | Assignments | Mid Term Test | Total | | 10 Marks | 30 Marks | 20 Marks | 60 Marks |   **Term End Examination: 40 marks (100%)** | | | | |

**Syllabus:**

**Theory:**

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| Module  No. | Contents | Workload in Hrs | | |
| *Theory* | *Tut* | *Assess* |
| **1** | **Set Theory:** Sets, Combinations of sets, Venn Diagrams, Finite and Infinite sets: Uncountable and Countable, Principle of inclusion and exclusion, Multisets, Cartesian Product and Power Set  Fuzzy sets, Basic concepts and types of Fuzzy sets, Operations on Fuzzy sets | **07** |  |  |
| **2** | .  **Relations and Functions:** Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Warshall’s Algorithm to find transitive closure, Equivalence Relations, Partial Orderings - Chain, Anti chain and Lattices.  Function: surjective, injective and bijective functions, Inverse Functions and Compositions of Functions, Recursive Function. | **10** |  |  |
| **3** | **GRAPHS:** Graph and Graph Models, Graph Terminology and Types of Graph, Representing Graph and Graph Isomorphism, vertex and edge Connectivity, Eulerian and Hamiltonian, Single source shortest path- Dijkstra’s algorithm, Planar Graph, Graph Coloring, digraphs. | **10** |  |  |
| **4** | **Trees:** Introduction, properties of trees, Binary search tree, decision tree, prefix codes and Huffman coding, cut sets, Spanning Trees and Minimum Spanning Tree, Kruskal‘s and Prim‘s algorithms, The Max flow- Min Cut Theorem.  . | **09** |  |  |
| **5** | **Number Theory and Its Applications:** Modular Arithmetic & its properties, The Euclidean Algorithm, Extended Euclidean algorithm, Solving Congruence equations, The Chinese Remainder Theorem, Fermat's Theorem, Primitive Roots and Discrete Logarithms | **09** |  |  |

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