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**BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI**

1. **WORK-INTEGRATED LEARNING PROGRAMMES DIVISION**
2. **B Tech(Information Systems) in collaboration with WIPRO**
3. **Second Semester 2022-2023(July 2023)**
4. **COURSE HANDOUT**
5. **Part A: Content Design**

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| **Course Title** | Discrete Structures for Computer Science |
| **Course No(s)** | SEWI ZC252 |
| **Credit Units** |  |
| **Course Author** | Prof. Dr YVK Ravi Kumar |
| **Version No** |  |
| **Date** |  |

**Course Description**

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| Introduction to discrete mathematical structures; Formal logic and predicate calculus; Sets, relations and functions; Proof techniques; Graphs and trees; Primes, factorization, greatest common divisor, residues and application to cryptology; Permutations, combinations and partitions; Recurrence relations. |

**Course Objectives**

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| **No** | **Course Objective** |
| **CO1** | To understand the logic which is the basis for programming |
| **CO2** | To understand techniques for analysis of algorithms- Recurrence relations |
| **CO3** | To learn the basics required for cryptology and Graph Theory |

**Text Books**

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| T1 | Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw Hill, 5th Ed., 2004. |

**Reference Books**

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| --- | --- |
| R1 | Kolman, Busby, Ross and Rehman, Discrete Mathematical Structures for Computer Science, Pearson Education, 5th Edition, 2003. |
| R2 | D.S. Malik and M.K. Sen, Discrete Mathematical Structures: Theory and Applications, Thomson, 2004. |
| R3 | Goodaire & Parmenter : Discrete Mathematics & Graph Theory, Pearson Education, 2000. |
| R4 | C.L. Liu, Elements of Discrete Mathematics, 2nd Edition, McGraw Hill, 1986. |

**Modular Structure**

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| No | Title of the Module |
| M1 | Mathematical Logic – Propositional logic, propositional equivalence, predicate logic |
| M2 | Inference Rules, Proof Methods, Strong & Weak induction |
| M3 | Sets, Functions and Relations |
| M4 | Combinatorics, Recursion, Recurrence relation |
| M5 | Graph Theory |
| M6 | Introduction to Cryptography |

**Learning Outcomes**

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| **No** | **Learning outcome** |
| **LO1** | Student will be able to understand the logic behind the validation of statements in programming |
| **LO2** | Student should be confident of analysing algorithms in particular using recurrence relations |
| **LO3** | Students are confident of Graph theory concepts so that understanding data structures becomes very simple |

**Part B: Contact Session Plan**

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| **Academic Term** |  |
| **Course Title** | Discrete Structures for Computer Science |
| **Course No** |  |
| **Lead Instructor** |  |

**Course Contents**

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| **Contact Sessions(#)** | **List of Topic Title**  **(from content structure in Course Handout)** | **Text/Ref Book/external resource** |
| 1 | **M1: Mathematical Logic**  Introduction to Discrete structures  Propositional Logic | T1-Chapter 1 |
| 2 | **M1: Mathematical Logic**  Propositional Equivalence  Predicates and Quantifiers  Nested Quantifiers | T1-Chapter 1 |
| 3 | **M2: Inferences**  Inference rules | T1-Chapter 1 |
| 4 | **M2: Inferences**  Introduction to proofs  Strong and weak induction | T1-Chapter 1 |
| 5 | **M3: Sets, Relations & Functions**  Sets, operations on Sets  Venn diagrams , theorems on sets | T1-Chapter 2 |
| 6 | **M3: Sets, Relations & Functions**  Relations  Representing relations  Equivalence relations & partial order relations | T1-Chapter 7 |
| 7 | **M3: Sets, Relations & Functions**  Functions ,types of functions  Operations on functions  Properties with examples | T1-Chapter 2 |
| 8 | **Review** |  |
| 9 | **M4: Combinatorics, Recursion, Recurrence relation**  Combinatorics | T1-Chapter 5 |
| 10 | **M4: Combinatorics, Recursion, Recurrence relation**  Recurrence relations - Introduction  Types of Recurrence relations | T1-Chapter 6 |
| 11 | **M4: Combinatorics, Recursion, Recurrence relation**  Solution of recurrence relations  Generating functions | T1-Chapter 6 |
| 12 | **M5: Graph Theory**  Introduction to Graph Theory  Representation of Graphs | T1-Chapter 8.1 & 8.2 |
| 13 | **M5: Graph Theory**  Graph Isomorphism  Connectivity  Euler and Hamilton Paths | T1-Chapter 8.3 ,8.4 & 8.5 |
| 14 | **M5: Graph Theory**  Trees  Spanning tress  Minimum spanning trees | T1-Chapter 9.1 to 9.5 |
| 15 | **M6: Introduction to Cryptography**  Primes, GCD  Integers and Algorithms  RSA Cryptosystem | T1-Chapter 3 |
| 16 | **Review** |  |