



SYLLABUS

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|---|---|--------------------------------|
| Course Title | | Mathematical Foundation |
| Course Code | | MCAL004 |
| Course Credit | Theory(Hrs) | : 4 |
| | Practical(Hrs) | : 0 |
| | Tutorial(Hrs) | : 0 |
| | Credits | : 4 |
| Course Objective | | |
| <p>The objectives of the course are:</p> <ul style="list-style-type: none"> • To develop Professional Skills through effective communication • To introduce a number of Mathematical Foundation to be serving as tools even today in the development of theoretical computer science • To gain some confidence on how to deal with problems • To develop logical thinking and its application to computer science • To apply basic counting techniques to solve combinatorial problems • To specify and manipulate basic mathematical objects such as sets, functions, and relations and verify simple mathematical properties that these objects possess | | |
| Detailed Syllabus | | |
| Sr. No. | Name of chapter & details | Hours Allotted |
| Section – I | | |
| 1 | Number Systems Decimal System, Binary, Octal and Hexadecimal numbers, Number Base conversions, Binary Addition, Subtraction, Multiplication, Division Complements: Use of complements to represent Negative Numbers, Binary Number | 06 |

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| | Complements, Complements in other Number Systems | |
| 2 | Set Theory Introduction, Definition and Concepts, Representation of Sets, Finite Sets, Infinite Sets (Definition), Set Operations: Union, Intersection, Addition theorem, difference, Symmetric difference, D' Morgons Law, Subsets, Power Sets, Partitions Sets, Mathematical inductions, computing Principles, Permutations, Combinations | 08 |
| 3 | Functions Introduction: Definitions and Concepts, One to One, Onto functions, Invertible Functions, Mathematical Functions: Floor and ceiling functions, Integer and Absolute value functions, Remainder functions, Exponential functions, logarithmic functions, Sequences and Series: Definitions, Different between sequences and series; (Arithmetic Progression & Geometric Progression) To find nth term and sum of n terms, Recursive functions: Definition and Examples | 08 |
| 4 | Graph Theory Basic concepts of Graph theory, paths, reach ability and connectedness, matrix representation of graph, trees. | 06 |
| Section – II | | |
| 4 | Lattices and Boolean Algebra Relation and ordering, partially ordered sets, Lattices as poset, properties of lattices, Lattices as algebraic systems, sub-lattices, direct product and homomorphism, complete lattices, bounds of lattices, distributive lattice, complemented lattices. Introduction, definition and important properties of Boolean Algebra, Sub Boolean algebra, direct product and homomorphism, join-irreducible, meet-irreducible, atoms, anti atoms, Stone's representation theorem. Note: No proof is required for Theorems or Results on lattices and Boolean Algebra. Theorems should be justified and explained by suitable examples | 12 |
| 5 | Applications of Boolean Algebra Boolean expressions and their equivalence, Minterms and Maxterms, Free Boolean algebra, Values of Boolean expression, canonical forms, Boolean functions, representation of Boolean function, Karnaugh maps, minimization of Boolean function, Quine-Mccluskey algorithm | 09 |
| 6 | Group Theory : Definition and examples of groups, abelian group, cyclic groups, permutation groups, subgroups & Homomorphism, Cosets and Lagrange's Theorem (without proof), Normal subgroups, Quotient Groups. | 07 |

Instructional Method and Pedagogy:

- Lectures will be conducted on the basis of Classroom Response Systems with the use of multimedia projector and black board.
- Assignments based on course contents will be given at the end of each unit/topic and will be evaluated at regular interval.

Course Learning Outcomes:

On the completion of the course, students will be able to:

- **Develop** Problem-solving skills
- **Enhance** Analytical skills
- **Learn** Collaborative skills

Text books:

- Title: Discrete Mathematical Structures with Applications to computer science
Authors: J.P. Tremblay and R.Manohar ,Tata McGraw- Hill.
- Title : Discrete Mathematical Structure
Authors : D.S.Malik , M.K.Sen , Cengage Learning

Reference Books:

- Title: Discrete Mathematics and its applications, Tata McGraw-Hill, 6th edition
Authors: K.H. Rosen
- Title : Discrete Mathematical Structure, Pearson Education 6th edition
Author : Bernard Kolmann
- Title : Discrete Mathematics with Graph Theory, PHI,
Authors: Edgar G. Goodaire, Michael M. Parmenter.

Additional Resources

- Title: Logic and Discrete Mathematics, Pearson Education
Authors: J. P. Tremblay and W. K. Grassman