

MTH 122.3 Mathematical Foundation of Computer Science (3-2-1)

Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	80	-	100

Course Objectives:

1. The main objective of this course is to buildup the mathematical foundation for the study of computational science and computer technology.
2. This course introduces the student to discrete mathematics and finite state automata through an algorithmic approach and focuses on various problems solving technique.
3. It helps the target student in gaining fundamental and conceptual clarity in the area of Logic Reasoning. Algorithms, Recurrence relation. Graph Theory, and Theory of Automata.

Course Contents:

1. **Graph Theory** (15 hrs)
Definitions, Directed and Undirected Graphs. Walk, Path, Circuits, Connected Components. Connected Component Algorithm, Shortest –Path Algorithm. Computer representation a graph (Static Representation only, like Adjacency Matrix, Incidence Matrix, Path Matrix): Bi-partite graphs. Regular graphs, Planar graphs. Euler graph. Hamilton graph and their properties and characterization.
Application of graph theory in computer science (with example).
 2. **Logic and Induction** (8 hrs)
Propositions and Truth functions, Predicates and Quantification, Propositional and Predicate Logic, Expressing statement in the language of Logic. Deduction in Predicate Logic, Elementary Step-wise Induction and Complete Induction.
 3. **Introduction to Mathematical Reasoning** (7 hrs)
Formal Languages and Inductive Definitions: Axioms, Rules of Inference and Proofs, Direct Proof and Indirect Proof. Formal Proof and Informal Proof.
 4. **Recurrence Relations** (7 hrs)
Recursive Definition of Sequences. Differencing and Summation, Solution of Linear Recursive Relation, Solution of Non-linear Recurrence Relation.
 5. **Finite State Automata** (8 hrs)
Alphabets and Language, Notion of a State. State Machine (FSM and DFA). Regular Expression, Equivalence Relation.
- Reference Books:**

1. Richard Johnsonbaugh, Discrete Mathematics, Fifth Edition, Addison Wesley, Pearson Education Asia (LPE), ISBN: 81-780-82799, 2000
2. Mott, Joe L., Kandel Abraham and Baker, Theodoe P., Discrete Mathematics for Computer Scientists and Mathematicians, Second Edition, Prentice-Hall, ISBN: 81-[203-1502](#)-2
3. Liu, C.L., Elements of Discrete Mathematics, TMH, 2000, ISBN: 0-07-043476-X
4. Trus, J., Discrete Mathematics for Computer Scientists, Second Edition, Addison Wesley ISBN: 0-201-36061,1999