4th SEMESTER MCA

F.M -70

MCA – 206 **Programming With Java(3-1-0)Cr.-4**

Module-1

Introduction to Java Programming Language, Java Evolution, Naming Conventions and Datatypes, Operators in Java, Control Statements in Java, Decision Making and Looping.

Module-2

Methods, Method Abstraction and Stepwise refinement. Arrays: One-Dimensional Arrays, Two-Dimensions Arrays.,etc..
Strings: String Arrays, String Methods, String Buffer class. Object Oriented Programming: Classes and Objects, Constructors, Implementing & Designing Classes. Use of keywords: static, final, this, Class Abstraction and Encapsulation, String and Text I/O, Inheritance and Polymorphism, Use of super keyword,Overriding vs. Overloading.

Module-3

Abstract classes and Interfaces, Packages, Object Oriented Design a patterns, Multi-threaded Programming: Creating Threads, Extending the thread class, stopping and blocking, life-cycle of a thread.

Module-4

GUI Programming: GUI Basics,Graphics,Event-Driven Programming, Creating User Interfaces, Applets and Multimedia, Exception Handling, Binary I/O,Files & Streams,Recursion,Dynamic Binding, Generic & Generic Programming, Java Conventions Frame Work, Algorithm Efficiency, Searching & Sorting,JDBC,New features in JAVA

Books :

1. Y. Daniel Liang “Introduction to Java Programming: Comprehensive Version” 7th edition,2009,Pearson Education Inc.,New Delhi
2. Cay S. Horstmann, “Big Java”,3rd Edition,Willey India Pvt. Ltd.,New Delhi
3. E. Balagurusamy “Programming with JAVA : A Primer” 3rd Edition, Tata McGraw Hill

4th SEMESTER MCA

F.M : 70

MCA 207 FORMAL LANGUAGE &AUTOMATA THEORY (3-1-0)Cr.-4

Module – I

Introduction to Automata: The Methods Introduction to Finite Automata, Structural Representations, Automata and Complexity.

Proving Equivalences about Sets, The Contrapositive, Proof by Contradiction,

Inductive Proofs: General Concepts of Automata Theory: Alphabets Strings, Languages, Applications of Automata Theory.

Module – II

Finite Automata: The Ground Rules, The Protocol, Deterministic Finite Automata: Definition of a Deterministic Finite Automata, How a DFA Processes Strings, Simpler Notations for DFA's, Extending the Transition Function to Strings, The Language of a DFA

Nondeterministic Finite Automata: An Informal View. The Extended Transition Function, The Languages of an NFA, Equivalence of Deterministic and Nondeterministic Finite Automata.

Finite Automata With Epsilon-Transitions: Uses of $\in$-Transitions, The Formal Notation for an $\in$-NFA, Epsilon-Closures, Extended Transitions and Languages for $\in$-NFA's, Eliminating $\in$-Transitions.

Module – III

Regular Expressions and Languages: Regular Expressions: The Operators of regular Expressions, Building Regular Expressions, Precedence of Regular-Expression Operators, Precedence of Regular-Expression Operators

Finite Automata and Regular Expressions: From DFA's to Regular Expressions, Converting DFA's to Regular Expressions, Converting DFA's to Regular Expressions by Eliminating States, Converting Regular Expressions to Automata.

Algebraic Laws for Regular Expressions:

Properties of Regular Languages: The Pumping Lemma for Regular Languages, Applications of the Pumping Lemma Closure Properties of Regular Languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata,

Module – IV

Context-Free Grammars and Languages: Definition of Context-Free Grammars, Derivations Using a Grammars Leftmost and Rightmost Derivations, The Languages of a Grammar,

Parse Trees: Constructing Parse Trees, The Yield of a Parse Tree, Inference Derivations, and Parse Trees, From Inferences to Trees, From Trees to Derivations, From Derivation to Recursive Inferences,

Applications of Context-Free Grammars: Parsers, Ambiguity in Grammars and Languages: Ambiguous Grammars, Removing Ambiguity From Grammars, Leftmost Derivations as a Way to Express Ambiguity, Inherent Anbiguity

Module – V

Pushdown Automata: Definition Formal Definition of Pushdown Automata, A Graphical Notation for PDA's, Instantaneous Descriptions of a PDA,

The Languages of a PDA: Acceptance by Final State, Acceptance by Empty Stack, From Empty Stack to Final State, From Final State to Empty Stack

Equivalence of PDA's and CFG's: From Grammars to Pushdown Automata, From PDA's to Grammars

Deterministic Pushdown Automata: Definition of a Deterministic PDA, Regular Languages and Deterministic PDA's, DPDA's and Context-Free Languages, DPDA's and Ambiguous Grammars

Module – VI

Properties of Context-Free Languages: Normal Forms for Context-Free Grammars, The Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages, Decision Properties of CFL's

Module - VII

Introduction to Turing Machines: The Turing Machine: The Instantaneous Descriptions for Turing Machines, Transition Diagrams for Turing Machines, The Language of a Turing Machine, Turing Machines and Halting

Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Restricted Turing Machines, Turing Machines and Computers,

Module - VIII

Undecidability: A Language That is Not Recursively Enumerable, Enumerating the Binary Strings, Codes for Turing Machines, The Diagonalization Language

An Undecidable Problem That Is RE: Recursive Languages, Complements of Recursive and RE languages, The Universal Languages, Undecidability of the Universal Language

Undecidable Problems About Turing Machines: Reductions, Turing Machines That Accept the Empty Language

Post's Correspondence Problem: Definition of Post's Correspondence Problem, The "Modified" PCP

Other Undecidable Problems: Undecidability of Ambiguity for CFG's

Text Book:

1. Introduction to Automata Theory Languages, and Computation, by J.E.Hopcroft, R.Motwani & J.D.Ullman (3rd Edition) – Pearson Education
2. Theory of Computer Science (Automata Language & Computations), by K.L.Mishra & N. Chandrashekhar, PHI

4th SEMESTER MCA

F.M.- 70

MCA-208 **RELATIONAL DATABASE MANAGEMENT SYSTEM (3-1-0)Cr.-4**

Module I (10 hrs)

Database System Architecture – Data Abstraction, Data Independence, Data Definitions and Data Manipulation Languages.

Data models – Entity Relationship (ER), Mapping ER Model to Relational Mode, Network. Relational and Object Oriented Data Models, Integrity Constraints and Data Manipulation Operations.

Module II (10 hrs)

Relation Query Languages, Relational Algebra, Tuple and Domain Relational Calculus, SQL and QBE.
Relational Database Design: Domain and Data dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless design, Comparison of Oracle & DB2.

Module III (8 hrs)

Query Processing and Optimization: Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Optimization Algorithms.

Module IV (12 hrs)

Storage Strategies: Indices, B-Trees, Hashing, Transaction processing: Recovery and Concurrency Control, Locking and Timestamp based Schedulers, Multiversion and Optimistic Concurrency Control Schemes.
Advanced Topics: Object-Oriented and Object Relational databases. Logical Databases, Web Databases, Distributed Databases, Data Warehouse and Data Mining.

Books:

1. Elmasri, Navathe, Somayajulu and Gupta, Fundamentals of Database Systems, 4th Edition, Pearson Education.
2. C.J.Data – An introduction to Database Systems, Pearson Education.
3. Bipin Desai – An introduction to Database Systems, Galgotia Publication.
4. G.W.Hansen and J.V.Hansen, Database Management and Design, 2nd Edition, PHI
5. Patrick O'Nell and Elizabeth O'Nell – Data Base – Principles Programming and Performance, Morgan Kaufmann.

4th SEMESTER MCA

F.M.- 70

MCA-209 **ANALYSIS AND DESIGN OF ALGORITHM (3-1-0)Cr.-4**

Module I (10 hrs)

Algorithms and Complexity – asymptotic notations, orders, worst-case and average-case, amortized complexity. Basic Techniques – divide & conquer, dynamic programming, greedy method, backtracking.

Module II (10 hrs)

Branch and bound, randomization. Data Structures – heaps, search trees, union-find problems. Applications – sorting & searching, combinatorial problems.

Module III (10 hrs)

Optimization problems, computational geometric problems, string matching. Graph Algorithms – BFS and DFS, connected components.

Module IV (10 hrs)

Spanning trees, shortest paths, max-flow. NP – completeness. Approximation algorithms.

Books:

1. Horowitz E. & Sahni S and S.Rajasekaran - Fundamentals of Computer Algorithms, 2nd Edition Universities Press.
2. Aho, Hopcroft & Ullman, The Design and Analysis of Algorithm, Addison – Wesley.
3. T.H.Coremen, C.E Leiserson, R.L.Rivest and C.Stein, Introduction to Algorithms, 2nd Edition, PHI.
4. D.E. Knuth, Fundamental Algorithms, Norosa Publishing House.

4th SEMESTER MCA

F.M.- 70

MCA-210 **COMPUTER NETWORKS (3-1-0)Cr.-4**

Module I (10 hrs)
Overview of Data Communications and Networking
Physical Layer : Analog and Digital, Analog Signals, Digital Signals, Analog versus Digital, Data Rate Limits, Transmission Impairment, More about signals.
Digital Transmission: Line coding, Block coding, Sampling, Transmission mode.
Analog Transmission: Modulation of Digital Data; Telephone modems, modulation of Analog signals.
Multiplexing: FDM 150, WDM 155, TDM 157
Transmission Media: Guided Media, Unguided media (wireless)
Circuit switching and Telephone Network: Circuit switching, Telephone network.

Module II (10 hrs)
Data Link Layer:Error Detection and correction: Type of Errors, Detection, Error Correction.Data Link control and protocols:Flow and error Control, Stop-and-wait ARQ. Go-Back. N ARQ, Selective Repeat ARQ, HDLC.
Point-to-Point Access: PPP
Point-to Point Protocol, PPP Stack
Multiple Access:Random Access, Controlled Access, Channelizsation.
Local area Network: Ethernet
Traditional Ethernet, Fast Ethernet, Gigabit Ethernet
Wireless LANs: IEEE 802. 11, Bluetooth virtual circuit: Frame Relay and ATM

Module III (10 hrs)
Network Layer: Host to Host Delivery: Internetworking, addressing and Routing
Network Layer Protocols: ARP, IPVA, ICMP, IPV6 ad ICMPR6
Transport Layer; Process to process Delivery: UDP; TCP congestion control and Quality of service.

Module IV (10 hrs)
Application Layer:
Client Server Model, Socket Interface Domain Name System (DNS):
Electronic Mail (SMTP) and file transfer (FTP) HTTP and WWW
Security:Cryptography, Message security, User Authentication

Text Books:

1. Data Communication and Networking – B.A. Forouzan, TMH.
2. Computer Networks: Third Edition, A systems Approach, Larry L/Peterson & Bruce S. Davie ELSEVIER.
3. Computer Networks, A.S. Tannenbaum PHI.
4. Data and Computer Communications, William Stallings, 5th Edition, PHI.
5. Data Communications and Computer Networks – by P.C.Gupta, PHI.

4th SEMESTER MCA

SESSIONALS

MCA-293 **RDBMS LABORATORY (0-0-6)**

(10 Classes for 10 Different Programs)

1. Installation of Oracle or MYSQL
2. Insertion, deletion, updating to a table using SQL commands.
3. Working with Dual table.
4. Data retrieval using select and where clause.
5. Oracle in-built functions. Date, aggregate, group by etc..
6. Use of join and sub-queries.
7. Views, sequences and indexes.
8. Managing user's privileges and roles.
9. PL/SQL – Data types, control structures.
10. Creating procedures with PL/SQL
11. Error handling in PL/SQL
12. Cursor management in PL/SQL
13. Sub program design in PL/SQL
14. Writing programs on packages and triggers.

4th SEMESTER MCA

SESSIONALS

MCA-294 PROGRAMMING WITH JAVA LABORATORY (0-0-3)

Basic Java Programming (Application & Applet)

1. Introduction, compiling & execution a java program.
2. Program with Data types and variables.
3. Program with decision control structure: if, nested if.
4. Program with loop control structure: do while, while, for loops etc..
5. Usage of constructors.
6. Usage of method overriding
7. Usage of method overloading
8. Incorporating the Concept of Inheritance
9. Usage of String related operations.
10. Usage of exception handling
11. Multi-threading Programming
12. Programs involving event-handling in AWT.
13. Thread communication & Signals.
14. Use of various layout managers.
15. Graphics Programming in AWT.
16. Data base Programming in Java using JDBC