# THIRD SEMESTER

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| --- | --- | --- | --- | --- |
| **Paper Code** | **Paper Title** | **L** | **P** | **Credit** |
| **THEORY** | | | | |
| MCA-201 | Software Engineering | 4 | 0 | 4 |
| MCA-203 | Database Management Systems | 4 | 0 | 4 |
| MCA-205 | Java Programming | 4 | 0 | 4 |
| MCA-207 | Data Communications and Networking | 4 | 0 | 4 |
| MCA-209 | Design and Analysis of Algorithms | 4 | 0 | 4 |
| **PRACTICALS** | | | | |
| MCA-251 | Software Engineering Lab | 0 | 2 | 1 |
| MCA-253 | Database Management Systems Lab | 0 | 2 | 1 |
| MCA-255 | Java Programming Lab | 0 | 2 | 1 |
| MCA-257 | Design and Analysis of Algorithms Lab | 0 | 2 | 1 |
| MCA-261 | Human Values and Professional Ethics\* | 0 | 2 | 1 |
|  | **TOTAL** | **20** | **10** | **25** |

\* Non-University Examination System (NUES)

# FOURTH SEMESTER

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| **Paper Code** | **Paper Title** | **L** | **P** | **Credit** |
| **THEORY** | | | | |
| MCA-202 | Computer Graphics and Multimedia  Technologies | 4 | 0 | 4 |
| MCA-204 | Network Security | 4 | 0 | 4 |
| MCA-206 | Theory of Computation | 4 | 0 | 4 |
| MCA-208 | Cloud Computing | 4 | 0 | 4 |
| MCA-210 | Business Intelligence | 4 | 0 | 4 |
| **PRACTICALS** | | | | |
| MCA-252 | Computer Graphics and Multimedia  Technologies Lab | 0 | 4 | 2 |
| MCA-254 | Network Security Lab | 0 | 2 | 1 |
| MCA-256 | Business Intelligence | 0 | 2 | 1 |
| MCA-258 | Cloud Computing Lab | 0 | 2 | 1 |
|  | **TOTAL** | **20** | **10** | **25** |

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| **Paper Code: MCA-201**  **Paper: Software Engineering** | **L T**  **4 0** | **C**  **4** |
| **INSTRUCTIONS TO PAPER SETTERS:** | **Max. Marks: 60** |  |
| 1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.** 2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit**   **should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks** | | |

# Course Outcomes:

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| * Outline the fundamentals of software engineering concepts and software process standards |
| * Analyse appropriate process model and software engineering practices |
| * Analyse requirements of software system and explore all requirements gathering approaches |
| * Creating an architectural design using design engineering process |
| * Apply software strategies and software testing tactics for testing real time projects effectively |

# UNIT - I

**Introduction:** Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models.

**Software Requirements analysis & specifications:** Requirement engineering, requirement elicitation techniques like FAST, QFD & Use case approach, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS, Requirement Management, IEEE Std. for SRS. **[10 Hrs]**

# UNIT - II

**Software Project Planning:** Size Estimation like lines of Code & Function Count, Cost Estimation Models, COCOMO, Putnam resource allocation model, Validating Software Estimates, Risk Management.

**Software Design:** Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design. **[10 Hrs]**

# UNIT -III

**Software Metrics:** Software measurements: What & Why, Token Count, Halstead Software Science Measures, Data Structure Metrics, Information Flow Metrics.

**Software Reliability:** Importance, Hardware Reliability & Software Reliability, Failure and Faults, Reliability Models- Basic Model, Logarithmic Poisson Model, Software Quality Models, CMM & ISO 9001. **[10 Hrs]**

# UNIT - IV

**Software Testing:** Testing process, Design of test cases, Introduction to functional testing & Structural testing, Unit Testing, Integration and System Testing, Debugging, Alpha & Beta Testing.

**Software Maintenance:** Management of Maintenance, Maintenance Process, Maintenance Models, Regression Testing, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation. **[10 Hrs]**

# TEXT BOOKS:

1. K. K. Aggarwal and Yogesh Singh, “Software Engineering”, New Age International, 3rd Ed., 2005.
2. R. S. Pressman, “Software Engineering – A Practitioner’s Approach”, McGraw Hill Int.

,5th Ed., 2001.

1. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa, 3rd Ed., 2005.

# REFERENCE BOOKS:

1. Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN,1996.
2. I. Sommerville, “Software Engineering”, Addison Wesley,8th Ed., 2009.
3. Frank Tsui and Orlando Karan, “Essentials of Software Engineering”, Joes and Bartlett,2nd Ed., 2010.
4. Kassem A. Saleh, “Software Engineering”, Cengage Learning, 2009.
5. Rajib Mall, “Fundamrntal of Software Engineering”, PHI, 3rd Ed., 2009.
6. Carol L. Hoover, Mel Rosso-Llopart and Gil Taran, “Evaluating Project Decision Case Studies in Software Engineering”, Pearson, 2010.

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| **Paper Code: MCA-203** | **L** | **T** | **C** |
| **Paper Title: Database Management System** | **4** | **0** | **4** |

**INSTRUCTIONS TO PAPER SETTERS:**

**Max. Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

# Course Outcomes:

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| * Outline the components of DBMS & design database using ER model |
| * Construct database using SQL and extract data from database using Relational algebra & SQL queries |
| * Apply the normalization process for effective database design |
| * Analyze components of transaction processing, recovery strategies of DBMS |
| * Examine different Concurrency control Mechanisms of DBMS |

# UNIT – I

**Basic concepts:** database & database users, characteristics of the database, database systems, concepts and architecture, date models, schemas & instances, DBMS architecture & data independence, database languages & interfaces, data modeling using the entity-relationship model-extended E-R features. Overview of hierarchical, Network & Relational Data Base Management Systems**. [10Hrs]**

# UNIT – II

**Relational model, languages & systems:** relational data model, relational algebra: translating E-R model into relational model, relational model concepts, relational model constraints, relational algebra. Relational calculus (tuple calculus)

**SQL- a relational database language:** data definition in SQL (DDL, DML & DCL), view and queries in SQL, specifying constraints and indexes in sql, practicing SQL commands using ORACLE. **[10Hrs]**

# UNIT – III

Oracle Architecture, Logical Data Structures Physical Data Structure, Instances, Table Spaces, Types of Tablespaces, Internal Memory Structure, Background Processes, Data Types, Roles & Privileges, Stored Procedures, User Defined Functions, Cursors, Error Handling, Triggers.

**[10Hrs]**

# UNIT – IV

**Relational data base design:** function dependencies & normalization for relational databases: functional dependencies, normal forms based on primary keys, (1NF, 2NF, 3NF & BCNF), lossless join and dependency preserving decomposition. Concurrency control & recovery techniques: concurrency control techniques, locking techniques, time stamp ordering, granularity of data items, recovery techniques: recovery concepts, database backup and recovery from catastrophic failures. Concepts of object oriented database management systems, Distributed Data Base Management Systems. **[10Hrs]**

# TEXT BOOKS:

* 1. Elmsari and Navathe, “Fundamentals of Database Systems”, Pearson Education, 5th Edition, 2006.
  2. Korth, Silberschatz, “Fundamentals of Database System Concepts”, TMH, 6th Edition, 2010.

# REFERENCE BOOKS:

1. Desai, B., “An Introduction to Database Concepts”, Galgotia Publications, 2002.
2. Sham Tickoo and Sunil Raina, “Oracle 11g with PL/SQL Approach”, Pearson, 2010.

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| **Paper Code: MCA-205**  **PaperTitle: Java Programming** | **L**  **4** | **T**  **0** | **C**  **4** |
| **INSTRUCTIONS TO PAPER SETTERS:** | **Max. Marks:** | **60** |  |
| 1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.** 2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks** | | | |

# Course Outcomes:

* Understand the object- oriented concepts and JAVA
* Analyse and implement the role of packages, interfaces and exception handling in program design using JAVA.
* Develop computer program to solve real world problems in java
* Develop simple GUI interfaces for a computer program to interact with users and to understand the event-based GUI handling principles using Applets and swings.
* Analyse the basic concepts of JDBC and networking to develop network-based applications.

# UNIT - I

Overview and characteristics of Java, Java program Compilation and Execution Process Organization of the Java Virtual Machine, JVM as an interpreter and emulator, Instruction Set, class File Format, Verification, Class Area, Java Stack, Heap, Garbage Collection. Security Promises of the JVM, Security Architecture and Security Policy. Class loaders and security aspects, sandbox model

**Introducing classes, objects and methods:** defining a class, adding variables and methods, creating objects, constructors, class inheritance. Arrays and String: Creating an array, one and two dimensional arrays, string array and methods, Classes: String and String Buffer classes, Wrapper classes: Basics types, using super, Multilevel hierarchy abstract and final classes, Object class, Packages and interfaces, Access protection, Extending Interfaces, packages.[10 Hrs]

# UNIT - II

**Exception Handling:** Fundamentals exception types, uncaught exceptions, throw, throw, final, built in exception, creating your own exceptions,

**Multithreaded Programming:** Fundamentals, Java thread model: priorities, synchronization, messaging, thread classes, Runnable interface, inter thread Communication, suspending, resuming and stopping threads.

**Input/Output Programming:** Basics, Streams, Byte and Character Stream, predefined streams, Reading and writing from console and files.

**Using Standard Java Packages (lang, util, io, net).** Networking: Basics, networking classes and interfaces, using java.net package, doing TCP/IP and Data-gram Programming, RMI (Remote Method Invocation)[10 Hrs]

UNIT - III

**Event Handling:** Different Mechanism, the Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter and Inner Classes, Working with windows, Graphics and Text, using AWT controls, Layout managers and menus, handling Image, animation, sound and video, Java Applet**.**

**The Collection Framework:** The Collection Interface, Collection Classes, Working with Maps & Sets

**JDBC:** Introduction to DBMS & RDBMS, DBC API, JDBC Application Architecture, Obtaining a Connection, JDBC Models: Two Tier and Three Tier Model, ResultSet, Prepared Statement, Callable Statement**.**

# [10 Hrs]

**UNIT - IV**

**RMI (Remote Method Invocation):** Introduction, Steps in creating a Remote Object, Generating Stub & Skeleton, RMI Architecture, RMI packages.

**Java Bean:** Introduction, Bean Architecture, Using the Bean Development Kit, Creating simple bean-properties, methods and events, Packing beans- the manifest & the jar, Java bean package, Introduction to NetBean.

**Swing:** Introduction to JFC (Java Foundation Classes), Features of Swing and Comparison with AWT, Advanced Control in swing (JTree, JTable)**[10 Hrs]**

# TEXT BOOKS:

1. Patrick Naughton and HerbertzSchildt, “Java-2: The Complete Reference”, TMH, 2007.
2. Bill Vanners, “Inside Java Virtual Machine”,TMH, 2nd Ed, 2000.
3. Rick Dranell, “HTML 4 unleashed”, Techmedia Publication, 2000.
4. Paul Dietel and Harvey Deitel, “Java How to Program”, PHI, 8th Ed., 2010.

# REFERENCE BOOKS:

1. E. Balaguruswamy, “Programming with Java: A Primer”, TMH, 4th edition 1998.
2. N.P Gopalan and J. Akilandeswari, “Web Technology- A Developer’s Perspective”, PHI, 2007.
3. Eric Jendrock, Jennfer Ball and Debbei Carson, “The Java #EE5 Tutorial”, Pearson, 3rd Ed., 2007.
4. Daniel Liang, “Introduction to Java Programming”, Pearson, 7th Ed., 2010.

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| **Paper Code: MCA-207** | **L** | **P** | **C** |
| **Paper Title: Data Communications & Networking** | **4** | **0** | **4** |

**INSTRUCTIONS TO PAPER SETTERS:**

**Max. Marks: 60**

**1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**

**2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

# Course Outcomes

* To distinguish the importance of different networking components.
* To understand the functionalities of each networking layers and standards.
* Outline the basic concepts of reference models and identify the functionality of physical layer in computer communications
* Examine the datalink layer, transport layer and application layer design and functionality issues
* To write networking based programs at real and simulator level.

# UNIT – I

**Introduction**: Goals and Applications of Networks, Layering Concept, OSI Reference Model vs TCP/IP Protocol Suite, Networks Topology.

**Physical Layer:** Signals, Digital Transmission – Analog to Digital & Digital to Digital, Analog Transmission – Digital to Analog & Analog to Analog, Multiplexing – FDM & TDM, Media – Guided and Unguided, Switching – Packet based & Circuit based. Hub & Repeater.

**Network Traffic Capturing:** Wireshark (windows) and tcpdump (linux). **[10Hrs]**

# UNIT – II

**Data Link Layer:** Addressing; Error Detection & Correction – General concepts, Checksum & CRC; Medium Access – Aloha, CSMA, CSMA/CD & CA; Protocols – Ethernet, ARP & RARP; Switch – Learning & Filtering Mechanism.

**Network Layer:** IP Addressing & Subnets; Basic Routing (or Forwarding) Mechanism; IPv4 frame format and functions; Routing protocols – RIP, OSPF & BGP and algorithms – Distance Vector & Link State.

**Linux Network Commands**: arp, route, ifconfig, netstat, traceroute, ping. **[10Hrs]**

# UNIT – III

**Transport Layer:** Port Addresses; Protocols - Simple, Stop n Wait, Go Back N & Selective Repeat; UDP – Services & Applications; TCP – header format, connection setup & termination, state transition diagram, flow control, error control, congestion control & timers.

**Socket Programming:** Socket definition, TCP client & server socket, UDP client & server socket, Problems related to Socket Programming. **[10Hrs]**

# UNIT – IV

**Application Layer:** Web & HTTP, FTP, Email, Telnet, SSH, DNS.

**Advanced Protocols:** SNMP, RTP, SIP, BitTorrent. **[10Hrs]**

**TEXT BOOKS:**

1. Forouzan, “Data Communication and Networking”, TMH, 5th Edition, 2013.
2. A.S. Tanenbaum, “Computer Networks”, PHI, 4th Edition, 2002.
3. W. Stallings, “Data and Computer Communication”, Macmillan Press, 2013.
4. Comer, “Computer Networks and Internet”, PHI, 2008
5. Comer, “Internetworking with TCP/IP”, PHI, 2008.

**REFERNCE BOOKS:**

1. W. Stallings, “Data and Computer Communication”, McMillan, 2010
2. J. Martin, “Computer Network and Distributed Data Processing”, PHI,2008.
3. W. Stallings, “Local Networks”, McMillan, 2013.
4. M.Schwertz, “Computer Communication Network Design and Analysis”, PHI, 1977.
5. S. Keshav, “An Engineering Approach to Computer Networking, Pearson”, 2001.

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| **Paper Code: MCA-209** | **L** | **T** | **C** |
| **Paper Title: Design and Analysis of Algorithms** | **4** | **0** | **4** |

**INSTRUCTIONS TO PAPER SETTERS:**

**Max. Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

# Course Outcomes

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| * Identify the basic properties and analysis methods of algorithms and design divide and conquer paradigm for solving a few example problems and analyze them. |
| * Design Greedy algorithms for knapsack problem, minimum cost spanning tree,single source shortest path problem and analyze them. |
| * Apply dynamic programming paradigm to solve travelling sales person problem,0/1 knapsack problem,Optimal binary search tree. |
| * Apply traversal methods on search trees and search methods on graphs and backtracking search methods on state space trees for few example problems. |
| * Analyse branch and Bound search methods through problems such as 0/1 knapsack problem,Travelling sales personn problem and evaluate P ,NP,NP hard,NP complete class of problems and algorithms |

# UNIT - I

**Introduction to Algorithms**: Need for algorithm, Growth of Functions, Exercises based on Asymptotic Notations, Solving Recurrence Relations – Iterative method, Substitution method & Master method. Space vs Time Complexity Tradeoff.

**Divide and Conquer Technique:** Merge Sort, Quick Sort, Median and Order Statistics, Maximum-subarray Problem, Strassen’s Matrix Multiplication. **[10 Hrs]**

# UNIT - II

**Dynamic Programming:** Elements of Dynamic Programming, Matrix Chain Multiplication, Longest Common Subsequence, 0/1 Knapsack and Optimal Binary Search Tree problems.

**Greedy Algorithms:** Elements of Greedy strategy, Activity Selection problem, Huffman Codes, 0/1 Fractional Knapsack, Task Scheduling problem. **[10 Hrs]**

# UNIT - III

**Graph Algorithms:** Representation of Graphs, Breadth First Search, Depth First Search, Topological Sort, Strongly Connected Components, Algorithm for Kruskal’s and Prim’s for finding Minimum cost Spanning Trees, Dijkstra’s and Bellman Fort Algorithm for finding Single source shortest paths. All pair shortest paths and matrix multiplication, Floyd – Warshall algorithm for all pair shortest paths. **[10 Hrs]**

# UNIT - IV

**String Matching:** The naïve String Matching algorithm, The Rabin-Karp Algorithm, String Matching with finite automata, The Knuth-Morris Pratt algorithm.

**NP-Completeness:** Polynomial-time verification, NP-Completeness and Reducibility, NP- Completeness Proof, NP-Complete problems. **[10 Hrs]**

# TEXT BOOKS:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, “Introduction to Algorithms” PHI, 3rd Ed., 2009.
2. Jon Kleinberg and Eva Tardos, “Algorithm Design”, Pearson Edition, 2006.

# REFERENCE BOOKS:

1. Johnsonbaugh, “Algorithms”, Pearson, 2004.
2. Anany Levitin, “Introduction to the Design and Analysis of Algorithm”, Pearson Education, 2003.
3. Sara Baase and Allen Van Gelder, “Computer Algorithms - Introduction to Design and Analysis”, Pearson Education, 2003.
4. A.V. Aho, J. E. Hopcroft and J.D.Ullman, “The Design and Analysis of Computer Algorithms”, Pearson Education, 2003.
5. R. S. Salaria, Khanna, “Data Structure & Algorithms”, Book Publishing Co. (P) Ltd., 2002.
6. R. Panneerselvam, “Design and Analysis of Algorithm”, PHI, 2007.
7. Steven S. Skiena, “Algorithm Design Manual”, Springer, 1998.
8. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “Fundamental of Computer Algorithms”, Orient Longman, 2006.

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| **Paper Code: MCA-251** | **L** | **T** | **C** |
| **Paper Title: Software Engineering Lab** | **0** | **2** | **1** |

**INSTRUCTIONS TO PAPER SETTERS:**

**Max. Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

# Course Outcomes

* Able to prepare SRS document, design document, test cases and software configuration management and risk management related document.
* Develop function oriented and object oriented software design using tools like rational rose.
* Able to perform unit testing and integration testing.
* Apply various white box and black box testing techniques
* Able to track the progress of a project using modern tools and techniques.

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| **Paper Code: MCA-253** | **L** | **T** | **C** |
| **Paper Title: Database Management Systems** **Lab** | **0** | **2** | **1** |

**INSTRUCTIONS TO PAPER SETTERS:**

**Max. Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

# Course Outcomes

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| * Design & implement a database schema for a given problem-domain |
| * Create database using SQL and implement various integrity constraints |
| * Apply PL/SQL Programming for problem solving |

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| **Paper Code: MCA-255** | **L** | **T** | **C** |
| **Paper Title: Java Programming** **Lab** | **0** | **2** | **1** |

**INSTRUCTIONS TO PAPER SETTERS:**

**Max. Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

# Course Outcomes

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| * Write programs using OOP principles and proper program structuring. * Develop Java programs using packages, inheritance and interface. * Create multithreaded programs. * Write JAVA programs to implement error handling techniques using exception handling. |
|  |