Third Semester					
Theory					
Sl. No.	**Category**	**Course Code**	**Course Title**	**L-T-P**	**Credit**
1	IT	19MC301	Computer Network	3-0-0	3
2	IT	19MC302	Object Oriented Programming using Java	3-0-0	3
3	IT	19MC303	Database Management System	3-0-0	3
4	MATH	19MC304	Math – III	3-0-0	3
Total Credit (Theory)					12
Practical					
1	LAB	19MC305	Computer Network Lab	0-0-4	2
2	LAB	19MC306	Object Oriented Programming Lab	0-0-4	2
3	LAB	19MC307	Database Management System Lab	0-0-4	2
4	BM	19MC308	Soft Skill Development - I	0-0-4	2
Total Credit (Practical)					8
Total Semester Credit					20

MCA 3rd Semester

Theory Course Syllabus

Course Code: 19MC301	Course Name : Computer Network	L-T-P: 3-0-0	Credit: 3

Course Objective:

1. Understand the concepts of data communication, layered model, wireless devices in computer networks.
2. Explain the various techniques used to access a shared channel in the network and IEEE specifications for LANs.
3. List types of networking devices, backbone networks and Internet Protocol (IP)addressing.
4. Explain the responsibilities of network, transport and application layers.

Module – I **(12 Hrs)**

Overview of Data Communication Networks, Protocols and standards, OSI Reference model, TCP/IP Protocol.

Physical Layer: Analog Signals, Digital Signals, Data Rate Limits, Transmission Impairment, Data rate limit, Digital Transmission: Digital-to-Digital conversion, Analog-to-Digital conversion, Transmission modes, Analog Transmission: Digital-to-Analog conversion, Analog-to-Analog conversion, Multiplexing: Frequency Division Multiplexing (FDM), Wave Division Multiplexing (WDM), Time Division Multiplexing (TDM), Transmission Media: Guided Media (Twisted-Pair Cable, Coaxial Cable and Fiber-Optic Cable) and unguided media (wireless), Switching: Circuit Switched Network, Datagram Network, Virtual-Circuit Network , Telephone Network, Dial-up Modems and Digital Subscriber Lines.

Module – II **(12 Hrs)**

Error Detection and correction: Types of Errors, Error Detection mechanism (Linear codes, CRC, Checksum), Error Correction mechanism: Hamming Encoding. Data Link Control and Protocols: Flow and Error Control, Stop-and-Wait ARQ. Go-Back-N ARQ, Selective Repeat ARQ, HDLC and Point-to-Point Protocol Multiple Access: Random Access (ALOHA, CSMA, CSMA/CD, CSMA/CA), Controlled Access (Polling, Reservation, Token Passing), Channelization (FDMA, TDMA, CDMA). Wired LANs (Ethernet): Traditional Ethernet, Fast Ethernet, Gigabit Ethernet.

Module – III **(06 Hrs)**

Wireless LANs: IEEE 802.11 and Bluetooth.

Connecting Devices: Passive Hub, Repeater, Active Hub, Bridge, Two layers Switch, Router, Three layers Switch, Gateway.

Virtual Circuit Networks: Frame Relay, Architecture & layers, ATM: Design goals, Architecture & layers.

Module – IV **(06 Hrs)**

Network Layer: IPV4 addresses, IPV6 addresses, Internet Protocol: Internetworking, IPV4 datagram, IPV6 packet format and advantages. Network Layer Protocols: ARP, RARP, IGMP and ICMP. Routing: Unicast Routing Protocols and Multicast Routing Protocols.

Transport Layer: Process to Process Delivery, User Datagram Protocol (UDP) and Transmission Control Protocol (TCP).

Module – V **(04 Hrs)**

Domain Name System (DNS): Name Space, Domain Name Space, DNS in Internet, Resolution and Dynamic Domain Name System (DDNS), Remote logging, Electronic Mail (SMTP) and file transfer (FTP), WWW: Architecture & Web document, HTTP: Transaction & Persistent vs. Non-persistent connection. Introduction to Wi-Fi and Li-Fi Technology.

Course Outcome:

1. Explain computer network reference models, networking devices and different transmission techniques.
2. Reason the need for flow and error control at the data link layer and explain the associated protocols; enumerate the shared channel access methods, associated protocols and Wired LAN standards and implementations.
3. Explain how network layer, transport layer and application layer facilitates the transfer of message from one node to another in a global network.

Suggested Books and Online Resources:

1. Data Communications and Networking, Behrouz A. Forouzan, Tata McGraw-Hill, 5th Edition(2013).
2. Computer Networks, A. S. Tannenbum, D. Wetherall, Pearson Education, 5th Edition(2014).

3. Data and Computer Communications, William Stallings, Pearson Education, 10thEdition(2018).
4. Computer Networking, A Top-Down Approach, James F. Kurose, Keith W. Ross, Pearson publication, 6thEdition(2017).

   http://www.nptelvideos.in/2012/11/computer-networks.html
   Prof. SujoyGhosh, IIT, Kharagpur.

   https://nptel.ac.in/courses/106105183/
5. Prof. SoumyaKantiGhosh, IIT, Kharagpur.

   https://www.classcentral.com/course/stanford-openedx-introduction-to-computer-networking-1578
   Prof. Philip Levis and Professor Nick McKeown, Stanford University.

Course Code: 19MC302	Course Name : Object Oriented Programming Using Java	L-T-P : 3-0-0	Credit: 3

Course Objective:

1. Learn the syntax, semantics and idioms of the Java programming language.
2. Gain confidence in object-oriented programming principles through lots of practical exercises that provide useful exposure to the core Java class libraries.

Module- I **(8 Hours)**

Introduction to Java and Java programming Environment. Object Oriented Programming Concepts: Encapsulation, Abstraction ,Inheritance ,Polymorphism.
Fundamental Programming Structure: Data Types, variable, keywords, typecasting, Arrays, Operators and their precedence.
Control Flow: Java's Control Statements (if, switch, iteration, statement, while, do-while, for, Nested loop).
Concept of Objects and Classes, Using Existing Classes building your own classes, constructor overloading, static , final, this keyword.

Module - II **(8 Hours)**

Inheritance: Introduction, types of inheritance. Use of super keyword. Method overriding, Dynamic method Dispatch, Using Abstract Classes, Using final with inheritance. The Object Class.

Packages & Interfaces: Packages, Access Protection, Importing package, Interface, Implementing Interfaces, variables in Interfaces, Interfaces can be extended.

Exception Handling: Fundamentals, Types Checked , Unchecked exceptions, Using try & catch, Multiple catch, throw , throws, finally, Java's Built in exceptions, user defined

exception.

Module –III **(8 Hours)**

Multi Threading: Java Thread Life Cycle, Thread Priorities, Synchronization, Creating a thread, Runnable interface, Creating Multiple threads, Using isAlive () and join (), wait () & notify().

String Handling: String constructors, String length, Character Extraction, String Comparison, Modifying a string.

Java I/O: Classes & Interfaces, Stream classes, Byte streams, Character streams, Serialization.

Module IV **(6 Hours)**

Wrapper Classes : Wrapper classes and its methods.

Collection Framework: Introduction, interfaces, List, Set, Map etc, List interfaces and its classes.

Introduction to Database: Introduction to DataBase. Driver Types, Registering Driver, Creating Connection, Executing SQL query using Statement, PreparedStatment. ResultSet methods.

Module V **(10 Hours)**

Event Handing: Event Delegation Model, Event Classes, Event Listener Interfaces, Adapter classes.

AWT: AWT Classes window fundamentals, component, container, panel, Window, Frame, working with Graphics , Control Fundamentals , Layout managers, Handling Events by Extending AWT components.

Swing: Icons & Labels, Text fields, Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees, Tables.

Course Outcome:

After completing this course, students will be able to:

1. Understand and implement various Object Oriented Concepts like inheritance, abstraction and polymorphism.
2. Work with Collection Classes and Files, Multiple Threads, & handle Exceptions.
3. Develop applications to interact with a Database.
4. Design and implement Graphical User Interface(GUI) Applications in Java using AWT and Swing.

Suggested Books and Reading Materials :

1. Java: One Step Ahead by Anita Seth (Author), B.L. Juneja (Author) Oxford University Press.
2. Head First Java 2nd edition Kathy Sierra & Bert Bates
3. JAVA Complete Reference (9th Edition) Herbert Schildt.
4. https://www.udemy.com/java-the-complete-java-developer-course/

5. Java Programming Masterclass for Software Developers Created by Tim Buchalka, Tim Buchalka's Learn Programming Academy, Goran Lochert

Course Code: 19MC303	Course Name : Database Management System	L-T-P: 3-0-0	Credit: 3

Course Objective:

1. Introducing basic database concepts like E-R Diagram, Relational Algebra,
2. Designing Normalized databases
3. Advantages, disadvantages and implementation of NoSQL database design in contrast to SQL based database.
4. Introducing database transactions

Module-1: (7 Hours)

Introductory concepts of DBMS: Introduction and applications of DBMS, Purpose of data base, Data, Independence, Database System architecture- levels, Mappings.
Entity-Relationship model: Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets. Reduction to E-R database schema.

Module-2: (7 Hours)

Database Programming:
Relational Algebra and calculus (Domain and Tuple relational calculus) Basics of SQL, DDL,DML,creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. Transaction control commands – Commit, Rollback, save point. Concepts, Cursors, Stored Procedures, Stored Function, and Database Triggers.

Module-3: (13 Hours)

Normalization of Databases:
Functional Dependency – definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization – 1NF, 2NF, 3NF, Decomposition using FD- dependency preservation, BCNF, Multi- valued dependency, 4NF, Join dependency and 5NF.

Module-4: (7 Hours)

Transaction Management:
Transaction concepts, properties of transactions, serializability of transactions, testing for serializability, System recovery, Two- Phase Commit protocol, Recovery and Atomicity, Log-based recovery, concurrent executions of transactions and related problems, Locking mechanism, solution to concurrency related problems, deadlock, , two-phase locking protocol.

User security, grants, privileges, roles, access control.

Module-5: **(10 Hours)**

Performance tuning and introduction to NOSQl

Overview of NOSQL databases, measures of query cost, selection operation, sorting, join,

Performance Tuning Overview, Basic Tuning Tools, Using Statspack, Identifying Problem SQL Statements, Query Optimization

Influencing the Optimizer (Indexes (B-tree, Bitmap, Function Based indexes and reverse key indexes).

Course Outcome:

1. Designing database solutions for different real life problems
2. Write efficient and optimised SQL queries
3. Designing and differentiating solutions using schema based database and NoSQL database methods.

Suggested Books:

1. Elmasari &Navathe, Fundamentals of Database System, Seventh Edition, Pearson Education Book .
2. Sudarshan, Korth, Database System Concepts, 6th edition, McGraw-Hill Education Book .
3. Prof. Partha Pratim Das, Department of Computer Science & Engineering, IIT Kharagpur *https://onlinecourses.nptel.ac.in/noc18_cs15/preview*
4. Prof. Arnab Bhattacharya, IIT Kanpur *https://nptel.ac.in/courses/106104135/*
5. Dr. Leo Mark, Georgia Institute of Technology, *https://in.udacity.com/course/database-systems-concepts-design--ud150*

Course Code: 19MC304	Course Name : MATHEMATICS-III	L-T-P: 3-0-0	Credit: 3

Module-1: Mathematical Logic **(08 Hours)**

Propositions and logical operators, truth table, logical connectives, conditionals and biconditionals, logical equivalence, predicate calculus.

Module-2: Graph Theory **(10 Hours)**

Basic terminology, Eulerian paths and circuits, Hamiltonian paths and circuits, planer graph, graph coloring, trees: definition and properties, tree traversals- preorder,

inorder, postorder, binary trees, spanning trees, minimum cost spanning trees-Prim's and Kruskal's algorithm.

Module-3: Basics of Probability **(08 Hours)**

Introduction, definitions of probability, probability of an event, addition rule & multiplication rule, conditional probability, Bayes' rule.

Module-4: Random Variable **(10 Hours)**

Definition of random variable, discrete and continuous probability distribution, mathematical expectation, variance and co-variance of random variables, binomial and Poisson distribution, uniform, normal, exponential distribution, Weibull's distribution.

Module-5: Statistics **(08 Hours)**

Random sampling, sampling distribution, correlation analysis, regression analysis, fitting straight lines.

Text Books:

1. Ronald E. **Walpole**, Raymond H. Myers, Sharon L. Myers & Keying Ye, "Probability & Statistics for Engineers & Scientists", Eighth Edition, 2007, Pearson Education Inc., New Delhi.

2. Kenneth H. Rosen "Discrete Mathematics and Its Applications", Tata McGraw Hill, FourthEdition, 2002 (Unit 1,2 & 3).

Reference Books:

1. Jay L. Devore, "Probability and Statistics for Engineering and Sciences", Seventh Edition, Thomson/CENGAGE Learning India Pvt. Ltd.

2. C. L. Liu, D. P. Mohapatra, "Elements of Discrete Mathematics: A computer Oriented Approach", McGraw Hill Education (India) Private Limited, 4th Edition, 2013.

Practical Course Syllabus

Course Code: 19MC305	Course Name : Computer Network Lab	L-T-P: 0-0-2	Credit: 3

Experiment-1. Introduction to LAN hardware and IP addresses configuration

Experiment-2. Understanding and use of networking tools: ifconfig, ping, traceroute, arp, dig and nslookup

Experiment-3. Configuration of CISCO Switches and Routers.

Experiment-4. Study of network traffic using Wireshark filters.

Experiment-5. Controlling of network scenario using Netam and tc.

Experiments- 6 to 8 are based on the following experiments:

1. Simulate a three node point to point network with duplex links between them. Set queue size and vary the bandwidth and find number of packets dropped.
2. Simulate a four node point to point network with the links connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0 – n3 and UDP agent between n1 – n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.
3. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
4. Simulate an Ethernet LAN using 'n' nodes, change error rate and data rate and compare throughput.
5. Simulate an Ethernet LAN using 'n' nodes and set multiple traffic nodes and plot congestion window for different source / destination.

Experiments- 9 to 10 are based on the following experiments to be implemented in C/Java:

1. Implementation of Distance Vector Algorithm to find suitable path for transmission.
2. Program for ERROR detecting code using CRC-CCITT (16bit).
3. Using TCP/IP Sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.
4. Program for CLIENT SERVER communication using message Queues or FIFOs as IPC channels that client sends the file name and the server to send back the contents of the requested file if present.
5. Program for Congestion control using Leaky Bucket Algorithm.

Course Code: 19MC306	Course Name : Object Oriented Programming Lab	L-T-P : 0-0-2	Credit: 2

Course Objective:

Learn and implement Programs with the syntax, semantics and idioms of the Java programming language. Gain confidence in object oriented programming principles through lots of practical exercises that provide useful exposure to the core Java class libraries.

List of Experiments:

1. Data types & variables, decision control structures: if, nested if etc Loop control structures: do, while, for etc.
2. Classes and objects.
3. Data Abstraction & Data hiding, Inheritance.
4. Interfaces and inner classes, wrapper classes.
5. Exception handlings
6. Threads
7. IO Files
8. Collections
9. Database Connectivity.
10. Applets AWT and Swing.

Course Outcome:

1. Understand and implement various Object Oriented Concepts like inheritance, abstraction and polymorphism.
2. Work with Collection Classes and Files, Multiple Threads, & handle Exceptions.
3. Develop applications to interact with a Database.
4. Design and implement Graphical User Interface(GUI) Applications in Java using AWT and Swing.

Suggested Books and Reading Materials :

1. Java: One Step Ahead by Anita Seth (Author), B.L. Juneja (Author) Oxford University Press.
2. Head First Java 2nd edition Kathy Sierra & Bert Bates
3. JAVA Complete Reference (9th Edition) Herbert Schildt.
   https://www.udemy.com/java-the-complete-java-developer-course/
4. Java Programming Masterclass for Software Developers Created by Tim Buchalka, Tim Buchalka's Learn Programming Academy, Goran Lochert

Course Code: 19MC307	Course Name : Database Management System Lab	L-T-P : 0-0-2	Credit: 2

1. Retrieving Data Using the SQL SELECT Statement.
2. Restricting and Sorting Data.
3. Manipulating Data.
4. Using DDL Statements to Create and Manage Tables.
5. Using Single-Row Functions to Customize Output.
6. Reporting Aggregated Data Using the Group Functions.
7. Displaying Data from Multiple Tables.
8. Using Sub queries to Solve Queries.
9. Creating Other Schema Objects (indexes, views).
10. User security (privileges, roles).
11. Cursors and composite data types...
12. Functions and procedures.
13. Packages.
14. Triggers.
15. Mini project (Application Development)

Suggested Books: *Murach's My SQL: Joel Murach , 2nd Edition.*

Course Code: 19MC308	**Course Name : Soft Skill Development - I**	**L-T-P : 0-0-2**	**Credit: 2**

1. Soft Skills – Self Analysis, Creativity, Attitude, and Goal Setting
2. Personality development - Interpersonal Skills, Leadership Skill, and Decision making
3. Business Writing- Structure and Impact of Business writing
4. Etiquette and Manners – Modern Etiquette, Benefits, Social Manners and Corporate Grooming
5. Stress Management - Kinds of Stress, Spotting stress, Emotional intelligence and managing emotions
6. Group Discussion – Group Dynamic, Lateral Thinking, Brainstorming and Negotiation Skills
7. Team Skills- Team Structure and Team Dynamic
8. Interview Skills – Concept and Process of Interview, Pre-preparation and Answering Strategies
9. Presentation Skills – Planning, Practicing and Delivering Presentation
10. Conflict Resolution – Conflict in Human Relations, Approaches to conflict resolutions.