SYLLABUS FOR M.C.A. 2nd SEMESTER

PAPER : IT 21 : Object Oriented Programming using JAVA.
Full marks: 75, Pass Marks: 30, Time : 3 Hrs. Credits: 3

12 Questions will be set two from each module and students will be required to answer six (06) question one from each module.

Course Objectives
This course enables the students:

1.	Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2.	Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.
3.	Understand the principles of inheritance, packages and interfaces.

Course Outcomes
After the completion of this course, students are expected to

A.	The Students will learn to create Classes and their Objects
B.	Learn and implement principles and concepts of Object Orientation such as Abstraction, Data Hiding, and polymorphism.
C.	Develop programs by using inbuilt libraries and importing Packages.
D.	The student will learn to create and handle threads, interfaces and applets

Module 01 (Lecture 08)
Basics of Java: Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements If, else, nested if, if-else ladders, Switch, while, do-while, for, break, continue. Single and Multidimensional Array, String class, String Buffer class, Operations on string, Command line argument, Use of Wrapper Class.

Module 02 (Lecture 06)
Classes, Objects and Methods: Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize () method, Access control, modifiers, Nested class, Inner class, Abstract class.

Module 03 (Lecture 06)
Inheritance: Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding Handle multilevel constructors – super keyword, Stop Inheritance - Final keywords.

Module 04 (Lecture 04)
Interfaces: Creation and Implementation of an interface, Interface reference, instance of operator, Interface inheritance, Dynamic method dispatch, Understanding of Java Object Class, Comparison between Abstract Class andinterface.

Module 05 (Lecture 06)
Multithreaded Programming: Use of Multithread programming, Thread class and Runnable interface, Thread priority, Thread synchronization, Thread communication, Deadlock. Introduction to Stream, Byte Stream, Character stream, Readers and Writers, File Class, File Input Stream, File Output Stream, Input Stream Reader, Output Stream Writer, File Reader, File Writer, BufferedReader.

Module 06 (Lecture 10)
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scroll pane, dialogs, menu bar, graphics, layout manager – layout manager types – boarder, grid, flow. Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Text books: -

1. Herbert Schildt, Java the Complete Reference, 11th,McGraw-Hill/Osborne.
2. E. Balaguruswamy Programming with Java A Primer, 3rd **,**McGrawhill.

Reference books: -

1. Horstmann&Cornell,CoreJava Volume-I Fundamentals, 8th, PearsonEducation.
2. Herbert Schildt, Java: A Beginner's Guide, 8th, McGraw-HillEducation

PAPER : IT 22 : Computer CommunicationNetworks
Fullmarks: 75, Pass Marks: 30, Time : 3 Hrs. Credits:3

12 Questions will be set two from each module and students will be required to answer six (06) question one from each module.

Course Objectives
This course enables the students:

1.	Build an understanding of the fundamental concepts of computer networking.
2.	Familiarize the student with the basic taxonomy and terminology of the computernetworking area.
3.	Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4.	Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.
5.	Build an understanding of the fundamental concepts of computer networking.

Course Outcomes

After the completion of this course, students are expected to

A.	Build an understanding of the fundamental concepts of computer networking.
B.	Familiarize the student with the basic taxonomy and terminology of the computer networking area.
C.	Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
D.	Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.
E.	Build an understanding of the fundamental concepts of computer networking.

Module 01 (Lecture 06)

Introduction to Computer Networks and Physical Layer: Personal Area Network, Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks, Network software, protocol hierarchies. Reference Models, Open System Interconnection (OSI), TCP/IP Reference models, Architecture of Internet. Networking Devices, Network Standardization and Examples of Networks.

Module 02(Lecture 06)

Data Transmission Concepts: Guided Transmission Media, Magnetic Media, Twisted Pairs, Coaxial Cable, Fiber Optics, Wireless Transmission, Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared Transmission, Public Switched Telephone Networks. Modulation techniques (FDMA, TDMA, CDMA).

Module 03(Lecture 08)

Data Link layer: Data link layer design issues, Error Detection and Correction Codes, Data Link Protocols (Simplex Stop-and-wait protocol for Error free and noisy channel) and Sliding window protocols. The Channel Allocation Problem, Multiple access protocols and Examples, Wireless LAN, Bluetooth.

Module 04(Lecture 08)

Network layer : Network Layer Design issues, Routing algorithms, Congestion Control Algorithms, Quality of Service, Internetworking and The Network Layer in the Internet.

Module 05(Lecture 08)

The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control, The Internet Transport Protocol: UDP, The Internet Transport Protocols – TCP.

Module 06(Lecture 06)

The application Layer : Domain name system, Electronic Mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks. the World Wide Web, HTTP

Text books:

1. Forouzen, "Data Communication and Networking", TMH, 5th Edition.
2. A.S. Tanenbaum, Computer Networks, Pearson Education, 5th Edition.

Reference books:

1. W. Stallings, Data and Computer Communication, Pearson Education, 8th Edition.
2. Computer Networking by James F. Kurose and Keith W. Ross, Pearson Education, 3rd Edition.

PAPER : IT 23 : OPERATING SYSTEMS
Full marks: 75, Pass Marks: 30, Time: 3 Hrs. Credits: 3

12 Questions will be set two from each module and students will be required to answer six (06) question one from each module.

Course Objectives
This course enables the students:

1.	To understand the main components of an OS & their functions
2.	To study the process management and scheduling.
3.	To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.
4.	To understand the concepts and implementation Memory management policies and virtual Memory
5.	To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the differentparts of OS

After the completion of this course, students are expected to

A.	Describe the important computer system resources and the role of operating system in their management policies and algorithms.
B.	Understand the process management policies and scheduling of processes by CPU
C.	Evaluate the requirement for process synchronization and coordination handled by operating System
D.	Describe and analyze the memory management and its allocation policies.
E.	Identify use and evaluate the storage management policies with respect to different storage management technologies. 6. Identify the need to create the special purpose operating system.

Module 01 (Lecture 06)
Operating system concepts: OS definition and services; Types and features: batch systems, multiprogramming, multitasking, parallel systems, distributed systems, real-time systems, time-sharing systems, PC systems; System Calls types, System Programs.

Module 02 (Lecture 08)
Process vs. Thread: process states, process control block; Inter-process communication; Process Synchronization, Critical section problems and their solutions, Semaphores, Classical problems of synchronization;

Module 03 (Lecture 06)
CPU Scheduling: Criteria; Algorithms: FCFS, SJF, Priority, Round-Robin, Multilevel Queue Scheduling. Deadlocks: necessary conditions, prevention, avoidance and recovery, banker's algorithm.

Module 04 (Lecture 10)
Memory Management: Logical, Physical Addressing, Memory management techniques, Paging and Segmentation approaches, virtual memory, Demand Paging and Page Replacement algorithms

Module 05 (Lecture 07)
File management: File system Structure, allocation methods free space management: Bit vector, linked list, grouping, counting: Directory implementation: Linear List, Hash table. Device Management: Disk structure, Disk scheduling: Selecting Disk Scheduling algorithm.

Module 06 (Lecture 07)
Networks, Security and Design Principles: Network operating system, distributed operating system, external security, operational security, password protection, access control, security kernels, hardware security, layered approach, design principle.

Text books:

1. Silberschatz and Galvin, Operating System Concepts, 9th Edition, Wiley,2015
2. Andrew S. Tannenbaum, Distributed Operating Systems, 2nd Edition, Pearson

Education Reference books:

1. J. Archer Harris, Operating Systems, Publisher, 4th Edition, McGraw HillProfessional
2. Williams Stallings, Operating systems internal and design principals, 9thedition, Pearson,2018.

PAPER : IT 24 : THEORY OF COMPUTATION
Full marks: 75, Pass Marks: 30, Time : 3 Hrs. Credits: 3

12 Questions will be set two from each module and students will be required to answer six (06) question one from each module.

Course Objectives
This course enables the students:

1.	The objective of this course is to explore the theoretical foundations of computer sciencefrom the perspective of formal languages
2.	classify machines by their power to recognize languages.

Course Outcomes
After the completion of this course, students are expected to

A.	Classify machines by their power to recognize languages.
B.	Understand differentiate regular, context-free and recursively enumerable languages
C.	Demonstrate the usage of grammars to produce strings from a specific language.
D.	Apply acquire concepts relating to the theory of computation and computationalmodels including decidability and intractability.

Module 01 (Lecture 04)
Fundamentals: Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non-deterministic finite automaton, transition diagrams and Language recognizers.

Module 02 (Lecture 08)
Finite Automata: NFA with Î transitions - Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without Î transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Melay machines.

Module 03 (Lecture 06)
Regular Languages: Regular sets, regular expressions, identity rules, constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs notrequired).

Module 04 (Lecture 04)
Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings.

Module 05 (Lecture 10)
Context Free Grammars: Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted).
Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL andDPDA.

Module 06 (Lecture 10)
Turing Machine: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines (proofs not required).
Computability Theory: Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR(0) grammar, decidability of, problems, Universal Turing Machine, undecidability of posts. Correspondence
problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

Text books:

1. Hopcroft H.E. and Ullman J. D ,"Introduction to Automata Theory Languages and Computation. July 2006, 3rd Edition, PearsonEducation
2. Michael Sipser," Introduction to Theory of Computation", – January 2012 2ndedition Thomson

Reference books:

1. Daniel I.A. Cohen , Introduction to Computer Theory, 1996 2nd edition , JohnWiley.
2. Theory of Computer Science – Automata languages and computation -Mishraand Chandrashekaran, Jan 2006, 2nd edition,PHI

PAPER : SH 21 : STATISTICAL & NUMERICALCOMPUTATION
Fullmarks: 75, Pass Marks: 30, Time : 3 Hrs. Credits:3

12 Questions will be set two from each module and students will be required to answer six (06) question one from each module.

Course Objectives
This course enables the students:

1.	Distinguish types of studies and their limitations and strengths,
2.	Describe a data set including both categorical and quantitative variables to support or refute a statement,

3.	Apply laws of probability to concrete problems,
4.	Perform statistical inference in several circumstances and interpret the results in an applied context,
5.	Use a computer for the purpose of simulation in probability and statistical inference

Course Outcomes

After the completion of this course, students are expected to

A.	Mathematical statistics open doors in engineering, business, finance, computing, data sciences, health sciences, environmental sciences and public policy
B.	Recent discoveries in the statistical methods have played an essential role in internet search algorithms, disease control, communications technology, climate modelling and much more.
C.	These methods are among the most important disciplines in today's complex world, in part because they serve as the common language of science.
D.	Derivenumerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
E.	It Analyse and evaluate the accuracy of common numerical methods.

Module 01 (Lecture 06)

Concept of Probability: Experiment and Sample Space, Events and Operations with Events, Probability of an Event, Basic probability Rules, Application of Probability Rules, ConditionalProbability.

Random Variables: How Random Variable Arise, Probability Distribution of a Random Variable, Mean or Expected Value of a Random Variable, Probability Histogram value of a Random Variable, Variance and Standard Deviation of a random Variable.

Module 02 (Lecture 06)

Binomial Experiments: Structure of a Binomial Experiment, Binomial Probability Distribution, Use of Binomial Probability Table.

Normal Curve and Normal Distribution: Motivation behind a Normal Curve, properties of a Normal curve, Normal probability Distribution, Areas under a Normal Curve.

Module 03 (Lecture 06)

Errors in Numerical calculations: Errors & their computation-absolute, relative &percentage.

Solution of algebraic & transcendental equations: Introduction, Bisection method, Iterative method, False position method, Newton's Raphson method, Lin Bairstows method. Error analysis & convergence study

Module 04 (Lecture 08)

Interpolation with equal & unequal intervals: Introduction, finite differences-forward, backward & central, difference tables, differences of polynomials, Newton's formula for interpolation, Gauss's central difference interpolation formula, divided difference & their properties-Newton's divided differences formula, Lagrange's interpolation formula, Inverse interpolation.

Module 05 (Lecture 06)

Numerical differential & integration: Introduction, derivatives using forward &backward difference formula, Numerical Integration-Trapezoidal rule, Simpson's 1/3 & 3/8 rules Weddle'srule.

Module 06 (Lecture 10)
Numerical solution of linear system of equations: Direct Method-Gauss elimination, Guass-Jordan, LU decomposition methods. Iterative methods-Gauss-Jacobi & Gauss Seidel methods.

Numerical solution ordinary differential equations: Taylor series method, Euler's method, Modified Euler's method, Runga-Kutta methods of 2^{nd}& 4^{th} order.

Text books**:**

1. Nabendu Pal &Sahadeb Sarkar, Statistics : Concepts and Applications, PHI , New Delhi-2013..
2. B.S. Grewal Numerical Methods in Engineering & Science (Programs in C, C++ and Introduction to MATLAB) Khanna Publishers,2014.

Reference books:

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics Sultan Chand and Sons, 2002.
2. S.S Sastry, Introductory methods of numerical analysis, PHI Learning Private Limited, New Delhi2012

LABORATORY SYLLABUS FOR M.C.A. 2ND SEMESTER

PAPER: IT-21P: JAVA LAB

Full marks: 75(25(INTERNAL)+50(EXTERNAL)), Pass Marks: 30, Time: 3 Hrs. Credits: 3

Sl. No.	Name of Experiments
01.	Introduction, Compiling & Executing a Java Program.
02.	Data types & Variables, Decision Control Structures: if, nested if etc.
03.	Program on Decision Control Structures: if, nested if etc.
04.	Loop Control Structures: do while, for etc.
05.	Classes and Objects.
06.	Data Abstraction & Data Biding, Inheritance, Polymorphism.
07.	Using Concept of Package.
08.	Programs on Threads.
09.	Programs on Exception Handlings
10.	Programs on Applet Programs.
11.	Interfaces and Inner classes, Wrapper Classes, Generics.
12.	Programs on JDBC.
13.	Creating GUI.

Tools Required: JDK 1.5

IDE : NetBeans, BlueJ, Eclipse

Operating System Required: Windows 7/10

PAPER: IT-22P: NETWORK LAB

Full marks: 75(25(INTERNAL)+50(EXTERNAL)), Pass Marks: 30, Time: 3 Hrs. Credits: 3

SL. No	Name of Experiment
01.	Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
02.	Study of Network Devices in Detail.
03.	Study of network IP.
04.	Connect the computers in Local Area Network.
05.	Study of basic network command.
06.	Study of Network configuration commands.
07.	Configure a Network topology using packet tracer software.
08.	Configure a Network topology using packet tracer software.
09.	Configure a Network using Distance Vector Routing protocol.
10.	Configure Network using Link State Vector Routing protocol.

Tools Required: Compiler Turbo C++/GCC

IDE : Turbo C++ IDE, DEV C++ IDE

Operating System Required: Windows 7/10

PAPER: IT-23P: OPERATING SYSTEM LAB

Full marks: 75(25(INTERNAL)+50(EXTERNAL)), Pass Marks: 30, Time: 3 Hrs. Credits: 3

SL.No.	Name of Experiment
01.	Study of hardware and software requirements of different operating systems (UNIX, LINUX, WINDOWS XP, WINDOWS 7/8
02.	Execute various UNIX system calls for i. Process management ii. File management iii. Input/output Systems calls
03.	Implement CPU Scheduling Policies: i. SJF ii. Priority iii. FCFS iv. Multi-level Queue
04.	Implement file storage allocation technique: i. Contiguous (using array) ii. Linked –list (using linked-list) iii. Indirect allocation (indexing)
05.	Implementation of contiguous allocation techniques: i. Worst-Fit ii. Best- Fit iii. First- Fit
06.	Calculation of external and internal fragmentation i. Free space list of blocks from system ii. List process file from the system
07.	Implementation of compaction for the continually changing memory layout and calculate total movement of data
08.	Implementation of resource allocation graph RAG
09.	Implementation of Banker's algorithm
10.	Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11.	Implement the solution for Bounded Buffer (producer-consumer) problem using inter process communication techniques-Semaphores
12.	Implement the solutions for Readers-Writers problem using inter process communication technique – Semaphore

Tools Required: Compiler Turbo C++/GCC

IDE : Turbo C++ IDE, DEV C++ IDE

Operating System Required: Windows 7/10