Semester - III

CBCS Course Outline MCA Semester-III

Semester-III(24 Credit Semester)						
Course Code	**Course name**	**Paper category**	**Hours / Week**			**Credits**
			L	T	P	
16 Core Credit Units						
MCA-3T1-C	Design and Analysis of Algorithms	Core	3	0	2	4
MCA-3T2-C	Computer Graphics	Core	3	0	2	4
MCA-3T3-C	Advanced Computer Networks	Core	4	0	0	4
MCA-3T4-C	Software Engineering	Core	4	0	0	4
6 Elective Credit Units						
MCA-3E1-DCE	Open Source Technologies	DCE	3	0	0	3
MCA-3E2-DCE	Green Technologies	DCE	3	0	0	3
MCA-3E3-DCE	Advanced Operating Systems	DCE	3	0	0	3
MCA-3E4-DCE	Microprocessor and Assembly Language Programming	DCE	3	0	0	3
2 credit units to be taken from outside departments						

Course No: MCA-3T1-C
Course Title: Design and Analysis of Algorithms

UNIT I

Algorithms, Algorithm Specification: Pseudo-code Conventions, Recursive algorithms. Performance Analysis: Analysis of Algorithms, Designing Strategies and algorithms, Time & Space Complexity, Trade Off, Asymptotic Notations, Calculations and Operations on Asymptotic Notations. Data Analysis and visualization, Review of Growth of functions, Recurrences: The substitution method, the iteration method, the master method. Review of Stacks, Queues, Heaps, Hashing, trees, graphs.

UNIT II

Randomized algorithms: Basics of Probability Theory, Description of Randomized Algorithms, Identifying the repeated element, primarily testing, Advantages and Disadvantages. Divide & Conquer: General Method, Binary Search, Max & Min, Merge Sort, Quick sort. Greedy Method: Elements of Greedy strategy ,General Method, Optimal Storage on Tapes, Knapsack Problem, Optimal Merge Pattern, Single Source Shortest Paths.

UNIT III

Dynamic Programming: Elements of Dynamic Programming, General Methods, Multistage Graphs, All pair Shortest Paths, Traveling Salesman Problem. Backtracking, General Method, 8-Queen Problem, Generalized algorithm For N-Queen problem, Knapsack Problem. Branch & Bound, General Method, Basic Concepts of BFS & DFS, Least Cost Branch & Bound, 8 Queen Problem, Traveling Salesperson Problem.

UNIT IV

Lower Boundary Theory: Comparison Trees for Sorting & Searching, Lower bound theory through reductions, P and NP problems. NP hard and NP complete problems: basic concepts, Parallel Algorithms, Parallel Computation Model, Parallelism-PRAM & Other Models, Effect of Parallelism on Efficiency. Illustrations of Problems Suitable for Parallel Implementation.

REFERENCES:

1. Horowitz, Sahni, “Fundamentals Of Computer Algorithms”, Galgotia Publications
2. Coremen, Leiserson, Rivest, Stein, “Introduction To Algorithms”, PHI
3. Brassard &Bratley, “Fundamentals Of Algorithms”, PHI
4. Sedgewick, “Algorithms In C”, Addison Wesley
5. Baase, “Computer Algorithms Introduction to Design & Analysis”, Pearson
6. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford Stein, “Introduction to Algorithms”, PHI
7. A. V. Aho, J. E. Hopcroft, J. D. Ullman, “The Design and Analysis of Computer Algorithms”, Addition Wesley

Course No: MCA-3T2-C
Course Title: Computer Graphics

UNIT I

Introduction to Computer Graphics. Applications of Computer Graphics. Graphic Display Devices_ Raster, Refresh, Random. Display Buffer, Concept of Double Buffering and Segmentation of Display Buffer. Use of Lookup tables.

UNIT II

2-D Graphics. Cartesian and Homogeneous Coordinate Systems. Line drawing algorithms (Bressenhams and DDA). Circle and Ellipse Drawing Algorithms. 2-Dimensional Transformations.Concepts of Window & Viewport, Window to Viewport Transformations. Filling, Boundary and Floodfill algorithms.

UNIT III

Clipping, Line Clipping Algorithms (Cohen-Sutherland Algorithm), 3-D Graphics, Projections: perspective and parallel projection transformations. 3-Dimensional Transformations. Hidden Surface Removal Techniques, Z-Buffer Algorithm, Back Face Detection.

UNIT IV

Curves and Surfaces, Splines, Spline specification, Interpolated & Approximated Splines. Bezier Splines, Bezier Curves, Cubic Bezier Curves, Bezier Surfaces. B-Splines curves and surfaces. Fractals - Fractal Generation Procedure. Introduction to Illumination models and Surface rendering methods.

TEXT BOOK : Hearn and Baker " Computer Graphics" 2nd Edition , Pearson Education.

REFERENCES:

1. W.M.Newman and Sproull. "Principles of interactive Computer Graphics" ,TMH 2.
Steven Harrington." Computer Graphics a Programming Approach" McGraw Hill.
3. Plastock and Kelley. "Schaums outline of theory and problems of computer Graphics"
4. David F Frogers and J Alan Adams. "Procedural Elements of Computer Graphics" McGraw Hill
5. David F Rogers and J Alan Adams. "Mathematical Elements of Computer Graphics" McGraw Hill
6. James. D. Foley, A Vandametal "Computer Graphics" Pearson.

Course No: MCA-3T3-C
Course Title: Advanced Computer Networks

UNIT I

Goals & Applications of Network, LAN, WAN & MAN Architectures, Concept of WAN Subnet, WAN Technologies (Circuit Switching & Packet Switching). Overview of Existing Networks. OSI Reference Model Architecture, TCP/IP Model & their Comparison. Virtual LANs: Concepts and Characteristics. Virtual Private Networks: Concepts and Characteristics. Adhoc Networks: Concepts and Characteristics.

UNIT II

Internetworking Concept & Architectural Model, Connection Oriented & Connectionless Approaches, Concept of Autonomous Systems & Internetwork Routing. Internet Layer Protocol: IP (Addressing: Classful& Classless IP Addresses, Subnetting IP Multicasting & Routing). Internet Protocol (IP): Connectionless Delivery of Datagrams (MTU, Fragmentation, Reassembly).

UNIT III

Internet Control Protocols: ICMP, ARP, & RARP. Routing Protocols: Interior (OSPF), Exterior (BGP). Transport Layer: UDP & TCP Concepts. Datalink Layer Protocols: SLIP & PPP. Application Layer: DNS, WWW, ELECTRONIC MAIL, MULTIMEDIA.

UNIT IV

Socket API for Network Programming: Concept of Port and Sockets. Client Server Application Development using TCP & UDP Sockets, Network Byte Ordering, Basic Server Architectures. Introduction to Information Security, Principles of Security. Network Security: Firewalls & their Components, Encryption Techniques & examples of Encryption Standard (DES, AES & RSA).

REFERENCES:

1. Andrew Tanenbaum, “Computer Networks”,
2. Douglas Comer, “Internetworking With TCP/IP”, Pearson
3. W. Richard Stevens, “Unix Network Programming”, PHI
4. Maufer, “IP Fundamentals”, Pearson
5. Douglas Comer, “Client-Server Programming with TCP/IP” Vol. 1-3, PHI

Course No: MCA-3T4-C
Course Title: Software Engineering

UNIT I

Software Engineering: Definition & Evolution, its Role & Impact in Computer Science. Software Process, Characteristics of a SW Process, CMMI, TSP & PSP, Software Product, Characteristics of a Good Software Product, Software Process Models, Comparative Study & Applications. Basic concepts of Agile Process.**Software Requirements Analysis (SRA):** Requirements - Types, Steps Involved in SRA. SW Requirements Specification (SRS): Need & Characteristics for an SRS, Components of an SRS, Prototype for a Good SRS. Structured Analysis: DFD'S, Control Flow Diagrams, Data Dictionary, State Transition Diagrams, and Entity - Relationship Diagrams. Case Study: Developing a Complete SRS.

UNIT II

Software Design: Concepts & Principles, Design Considerations & Good Design. Characterization of Effective Modular Design (Functional Independence, Cohesion, Coupling). Design: Architectural Design, Procedural Design, Interface Design, & Data Design. SW Architecture Styles: (Dataflow, Call & Return Architectures, Independent Process Architectures, Virtual Machine Architectures). Concept of Verification & Validation. Goals of SW Testing, Testing Principles.

UNIT III

Approaches to the Design of Test Cases: Black Box & White Box Testing, Techniques used by these Approaches: Basis Path & Loop Testing, Graph Based Testing, Equivalence Partitioning, Cyclomatic Complexity, Documentation of Test Cases, Phases in Testing Activity : Unit, Integration, Validation & System Tests. **Software Project Management**, Phases of Management, Project Planning & Control, Scheduling, Organization & Team Structures, Project Estimation Techniques – KLOC, FP & COCOMO, Risk Analysis & Management, Software Quality Assurance, Software Configuration Management.

UNIT IV

Technical Metrics for Software. Object Oriented Software Engineering: Object Oriented Paradigm, Concepts - Classes & Objects, Inheritance, Abstraction, Polymorphism, etc. OOA & OOD. Design Methodology – Dynamic Modeling, Functional Modeling. Advanced Concepts: Software Reuse, Reengineering, Reverse Engineering, Restructuring, Client/Server Software Engineering, Computer Aided Software Engineering, Advances & Future Scope in Software Engineering.

REFERENCES:

1. Pressman, Roger, "Software Engineering- A Practitioners Approach", McGraw Hill
2. Gheezi, Jazayeri Et Al, "Fundamentals Of Software Engineering", PHI
3. Ian Sommerville, "Software Engineering", Pearson Education
4. PankajJalote, "An Integrated Approach To Software Engineering",Narosa
5. Peters and Pedrycz, "Software Engineering an Engineering Approach", Wiley

Course No: MCA-3E1-DCE

Course Title: Open Source Technologies

UNIT I

Overview of Open Source Software. Need of Open Sources –Advantages of Open sources – Applications- Licensing, Certification , Comparison with close source / Proprietary software , Free Software . Open source vs source available, Widely used open source software licenses : Apache License, BSD license, GNU General Public License, GNU Lesser General Public License, MIT License, Eclipse Public License.

UNIT II

Open Source OS : Installation of Linux (Redhat-CentOS): Theory about MultibootEnviroment, Command Line: Basic File System Management Task, Understanding FHS of Linux. Overview of other OS : Ubuntu and Ubuntu Server. Mobile OS : Android , overview and architecture.

Open Source Languages and Web Servers : Overview of PHP, Basic syntax and usage. Python programming language basics, JQuery.

Open Source Web servers: Installation, configuration and administration of Apache, Nginx.

UNIT III

Open Source Tools , IDE, RDBMS:

Eclipse IDE ,OpenStack cloud technology, Version Control Systems , GIT , CVS.

Open Source Repositories :GitHub, SourceForge, Google Code.

Open Source RDBMS: MySQL basics, installation and usage.

PostgreSQL,NoSQL, MongoDB, Hadoop.

REFERENCES:

1. Understanding Open Source and Free Software Licensing - By Andrew M. St. Laurent, Oreily Media.
2. Apache HTTP Server Documentation Version 2.2 by byApache Software Foundation
3. MySQL 5.5 Reference Manual (Chapter 2 and 3 of manual) (e-Resource)
4. The Complete Guide to Linux System Administration by Nicholas Wells, Cengage Learning.

Course No: MCA-3E2-DCE
Course Title: Green Technologies

UNIT I

Wind: basic concepts, sources and uses of wind, scientific principles of wind, Energy concept: kinetic energy, electromagnetism, wind turbine technology, Electricity concept: production, transmission, storage and uses of wind electricity, Hydroelectric and fuel cells: sources and uses, production, transmission ,storage and uses of hydroelectric and fuel cell electricity, small hydropower systems

UNIT II

Solar energy:basic concepts, sources and uses, energy concept: reflection, absorption and concentration of solar energy, introduction to photovoltaics, types of photovoltaic systems, solar cells and solar modules. Green management, nuclear energy

UNIT III

Biomass: concepts, sources and uses, biofuel, heat energy, production and transmission of biomass electricity, Energy conversion, basics of ecology and environment, natural resources, global environment issues and environment risk management, recycling. Concept of ecological footprint.

REFERNCES:

1. Foundation of Green IT: Marty Poniatowski
2. Powering the dream: the history and promise of green technology: Alexix Madrigal
3. Understanding photovoltaics: jay warmke
4. Green technology-Earth friendly innovations:Geetha Sobha

Course No: MCA-3E3-DCE
Course Title: Advanced Operating Systems

UNIT I

Overview of an Operating system, Process Management Concepts, Inter-process Communication, Process Scheduling, Synchronization, Deadlocks. Case Studies: LINUX/Windows OS/Android OS

UNIT II

Memory Management: Linking, Loading, Memory Allocation, Design Issues & Problems, Fragmentation, Virtual Memory: Design Technique, Demand Paging, Page Replacement Algorithms, Allocation Algorithms, Thrashing Case Studies: LINUX/Windows OS/Android OS

UNIT III

File Management: File Structure, File Protection, File System Implementation, Directory Structure, Free Space Management, Allocation Methods, Efficiency and Protection. Case Studies:

UNIX/LINUX/Windows NT OS /Android OS Disk Management: Disk Structure, Disk Scheduling Algorithm, Disk Management, Swap Space concept and Management, RAID Structure, Disk Performance issues. Case Studies: LINUX/Windows OS/Android OS

REFERNCES:

1. Dietel H.M. "An Introduction To Operating System", Addison Wesley
2. Peterson, J.L. Abraham, Silberschatz, "Operating System Concepts", Addison Wesley
3. Tanenbaum, A.S., "Modern Operating System", PHI
4. Karnetkar, "UNIX Shell Programming", BPB
5. W.Stallings, "Operating systems"
6. Dhamdhere, "An Operating System –Design and principles"
7. Madnick E, Donovan J, "Operating Systems", TMH
8. Marko Gergent, "Learning Android", O'rielly

Course No: MCA-3E4-DCE
Course Title: Microprocessor and Assembly Language Programming

UNIT I

Software Model of 8088 / 8086 Microprocessor , Memory Add. Space and Data Organization, Data Types, Segment Registers, Memory Segmentation Dedicated, reserved and General use of Memory, generating an Memory Address, Pin-out diagram of 8086 Microprocessor.

UNIT II

The Microcomputer Organization, Assembly Language Programming Development on PC, Instruction Set, Addressing Modes, 8086 Instruction set, Integer Instructions and Computations, Data Transfer, Arithmetic, Logic Shift, Rotate Instruction, Flag Control, Compare, Control Flow & Jump, Subroutine & Subroutine Handling Instructions, Loop & Loop Handling, String & String Handling Instructions. Statement Syntax for a source Program, Assembler Directives, Assembling, Linking, Loading & executing a run Module.

UNIT III

Isolated I / O, Memory Mapped I/O, DMA Controller, Programming Communication Interfaces Controller. Interfacing I/O devices to microprocessor, programmable peripheral interface. Interrupt, Mechanism, Types & Priority, Interrupt Vector table, Real Mode.

8086 / 8088 Microprocessors, 8086 / 8088 Microprocessor's Minimum Mode, Maximum Mode

Systems, Bus Cycle & Unit States, Memory Control Signals, Read & Write Bus Cycles, Memory Interface Circuits.

REFERENCES:

1. DOUGLAS HALL "Microprocessors and Interfacing" Tata McGrawHill.
2. LIU, GIBSON et al "Microcomputer system The 8086/8088 Family" PHI.
3. PAL CHAUDHURI "Computer Organization and Designing" PHI.
4. MORRIS MANO "Computer System Architecture" Pearson Education.
5. GILMORE "Microprocessors" Wiley/ Tata McGraw Hill.