Course Curriculum

3-Year M.C.A Degree Programme

(Batch- 2019-22)

Credit Structure

Distribution of Total Credits & Contact Hours in all Semesters

S. No.	Semester Number	Credits/Semester	Contact hours/week
1	I	30	40
2	II	28	36
3	III	28	36
4	IV	28	36
5	V	28	36
6	VI	18	36
	Total	160	220

Course Structure: M.C.A. 2019-22
Semester - I

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	MCA-T101	Fundamentals of Computers and PC Packages	3	1	0	4
2	MCA-T102	Computer Organization	3	1	0	4
3	MCA-T103	Fundamentals of Programming Languages	3	1	0	4
4	MCA-T104	Discrete Mathematics	3	1	0	4
5	MCA-T105	Principles of Management	3	1	0	4
6	MCA-P101	PC Packages and Programming Lab	0	0	8	4
7	MCA-P102	Microprocessor Lab	0	0	8	4
8	MCA-S101	Skill Course	0	0	4	2
					Total Credits	30
					Total Contact hours/week	40

Semester - II

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	MCA-T201	Object Oriented Programming	3	1	0	4
2	MCA-T202	Data Structure	3	1	0	4
3	MCA-T203	Computer Networks	3	1	0	4
4	MCA-T204	Operating System	3	1	0	4
5	MCA-T205	MIS and E-Commerce	3	1	0	4
6	MCA-P201	Data Structure Lab	0	0	8	4
7	MCA-P202	Object Oriented Programming Lab	0	0	8	4
					Total Credits	28
					Total Contact hours /week	36

Semester – III

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	MCA-T301	Computer Architecture	3	1	0	4
2	MCA-T302	Design & Analysis of Algorithms	3	1	0	4
3	MCA-T303	Database Management System	3	1	0	4
4	MCA-T304	Numerical Methods & Computation	3	1	0	4
5	MCA-T305	Python Programming	3	1	0	4
6	MCA-P301	DBMS Lab	0	0	8	4
7	MCA-P302	Python Programming Lab	0	0	8	4
					Total Credits	28
					Total Contact hours /week	36

Semester – IV

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	MCA-T401	Compiler Design	3	1	0	4
2	MCA-T402	Web and Mobile Technologies	3	1	0	4
3	MCA-T403	Software Engineering	3	1	0	4
4	MCA-E404	Departmental Elective – I	3	1	0	4
5	MCA-E405	Departmental Elective – II	3	1	0	4
6	MCA-P401	Minor Project Lab	0	0	8	4
7	MCA-P402	Web and Mobile Technologies Lab	0	0	8	4
					Total Credits	28
					Total Contact hours/week	36

Semester – V

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	MCA-T501	Artificial Intelligence & Machine Learning	3	1	0	4
2	MCA-T502	Advanced Java Programming	3	1	0	4
3	MCA-E503	Departmental Elective – III	3	1	0	4
4	MCA-E504	Departmental Elective – IV	3	1	0	4
5	CA-OE505	Open Elective	3	1	0	4
6	MCA-P501	Advanced Java Lab	0	0	8	4
7	MCA-P502	Lab based on Elective – III(MCA-E503)	0	0	8	4
					Total Credits	28
					Total Contact hours/week	36

Semester - VI

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	MCA-T601	Project Work	0	0	36	18
					Total Credits	18

List of Departmental Elective(s) – I

S. No.	Course Code	Course Title	L	T	P	Credit
1	MCA-E404-1	Software Testing	3	1	0	4
2	MCA-E404-2	Real Time Systems	3	1	0	4
3	MCA-E404-3	Cryptography & Network Security	3	1	0	4
4	MCA-E404-4	Computer Graphics	3	1	0	4
5	MCA-E404-5	Graph Theory	3	1	0	4

List of Departmental Elective(s) – II

S. No.	Course Code	Course Title	L	T	P	Credit
1	MCA-E405-1	Mobile Computing	3	1	0	4
2	MCA-E405-2	Cloud Computing	3	1	0	4
3	MCA-E405-3	Image Processing	3	1	0	4
4	MCA-E405-4	Agile Methodologies	3	1	0	4
5	MCA-E405-5	Parallel Computing	3	1	0	4
6	MCA-E405-6	Information Systems & Cyber Security	3	1	0	4
7	MCA-E405-7	Robotics	3	1	0	4

List of Departmental Elective(s) - III

S. No.	Course Code	Course Title	L	T	P	Credit
1	MCA-E503-1	Open Source Operating Systems and Shell Programming	3	1	0	4
2	MCA-E503-2	Embedded Systems	3	1	0	4
3	MCA-E503-3	Ethical Hacking and Digital Forensics	3	1	0	4
4	MCA-E503-4	Mobile Application Development	3	1	0	4
5	MCA-E503-5	Data Mining and Data warehousing	3	1	0	4

List of Departmental Elective(s) - IV

S. No.	Course Code	Course Title	L	T	P	Credit
1	MCA-E504-1	Bio-Informatics	3	1	0	4
2	MCA-E504-2	Internet of Things	3	1	0	4
3	MCA-E504-3	Soft Computing	3	1	0	4
4	MCA-E504-4	Ad Hoc Networks	3	1	0	4
5	MCA-E504-5	Distributed Databases	3	1	0	4
6	MCA-E504-6	Natural Language Processing	3	1	0	4

List of Open Elective(s)

S. No.	Course Code	Course Title	L	T	P	Credit
1	MCA-OE505-1	Communication Through Drama	3	1	0	4
2	MCA-OE505-2	Professional Ethics & Morals	3	1	0	4
3	MCA-OE505-3	Intellectual Property Rights & Patents	3	1	0	4
4	MCA-OE505-4	Entrepreneurship	3	1	0	4
5	MCA-OE505-5	Operations Research	3	1	0	4
6	MCA-OE505-6	Research Methodologies	3	1	0	4
7	MCA- OE505-7	Number Theory	3	1	0	4
8	MCA- OE505-8	Modern Algebra	3	1	0	4
9	MCA- OE505-9	Digital Marketing	3	1	0	4

M.C.A. SEMESTER – I

MCA-T101   **Fundamentals of Computers and PC Packages**

UNIT I

Information Concepts and Processing: Basic components of a computer system, Control Unit, ALU, Input/output functions and characteristics, memory, RAM, ROM, and other types of memory.
Number systems: Binary numbers, octal numbers, hexadecimal numbers, Radix- decimal, octal, hexadecimal, conversion from one form to another-Examples, Representation of decimal, octal, hexadecimal numbers: fractional numbers and signed numbers, 1's and 2's complement forms, Binary arithmetic-addition, subtraction, multiplication and division-Examples. Codes-Various types-ASCII and 8 bit EBCDIC.

UNIT II

Computer Software's, Need, Types of Software's, System software, Application software. System Software, Operating System, Utility Programme, Programming languages, Assemblers, Compilers and Interpreter. Operating Systems, Functions, Types, Batch, Single, Multi-programming, Multiprocessing. Programming languages, Machine, Assembly, High Level, 4 GL, their merits and demerits (Theory).
Application Software, Word-processing, Spreadsheet, Presentation Graphics, Data Base Management Software

UNIT III

Data Communication and Networks Analog and Digital Signals Modulations, Amplitude Modular (AM), Frequency Modulation (FM), Phase Modulation (PM). Communication Process Direction of Transmissions Flow, Simplex, Half Duplex, Full Duplex. Communication Software Communication Protocols, Communication Channels–Twisted, Coaxial, Fiber Optic, Serial and Parallel Communication. Modem, Working and Characteristics Types of Connections, Dialup, Leased Lines, ISDN Types of Network, AN, WAN, MAN, etc. Topologies of LAN - Ring, Bus, Star, Mesh and Tree topologies, Use of Communication in daily life.

UNIT IV

Word Processing: features, Creating and Formatting Documents: Paragraph formats, Aligning Text and Paragraph, Borders and Shading, Headers and Footers, Multiple Columns, AutoSummarize, Mail merge, mailing labels, Wizards and Templates, Handling Graphics
Worksheet: creating sheets, Graphs and charts, using wizards, various charts type, formatting grid lines & legends, previewing & printing charts. Macros.

UNIT V

Presentation Graphics: Creating presentation using Slide master and template in various color scheme, Working with different views and menus of power point Working with slides, Editing and formatting text:, find and replace text. Bullets, footer, paragraph formatting, spell checking. Printing presentation, Print slides, notes, handouts and outlines. Inserting Objects, Drawing and inserting objects using Clip Art's pictures and charts. Slide sorter, slide transition effects and other animation effects. Presenting the show, making stand alone presentation, Pack and go wizards
Database management software: Introduction to database, defining and designing database, creating tables, insert/update/delete records, creating forms, working with data basic queries, generating reports.

Recommended Books
1. Fundamentals of Computers, P .K. Sinha, BPB Publications
2. Fundamental of Computers, R. Thareja, Oxford University Press.
3. Introduction to Information Technology-ITL Education solutions limited, PEARSON.

MCA-T102   Computer Organization

UNIT I

Introduction: Structured Computer Organization: languages, levels and virtual machines, contemporary multilevel machines, evolution of multilevel machines. Milestones in Computer Architecture: various generations. The computer Zoo: technological and economic forces, the computer spectrum. Example-computer families.

UNIT II

Computer System Organization: Computer Systems Organization: Processors: CPU organization, instruction execution, RISC versus CISC, design principles for modern computers, instruction-level parallelism, processor-level parallelism. Primary Memory: Bits, memory addresses, byte ordering, error-correcting codes, cache memory, memory packaging and types. Secondary Memory: Memory hierarchies, magnetic disks, floppy disks, IDE disks, SCSI disks, RAID, CD-ROMs, CD-Recordable, DVD. INPUT/OUTPUT: Buses, terminals, mice, printers, modems, character codes.

UNIT III

Digital Logic Level: The Digital Logic Level: Gates and Boolean algebra: Gates, Boolean algebra, implementation of Boolean functions, circuit equivalence. Basic Digital Logic Circuits: Integrated circuits, combinational circuits, arithmetic circuits, clocks. Memory: Latches, flip-flops, registers, memory organization, memory chips, RAMs and ROMs. CPU Chips and Buses: CPU chips, computer buses, bus width, bus clocking, bus arbitration, bus operations. Example CPU chips and buses. Interfacing: I/O chips, address decoding.

UNIT IV

The Micro-Architecture Level: The Micro-architecture Level: An example micro-architecture: The data path, micro- instructions, micro-instruction control the MIC-1. An example ISA: IJVM: Stacks, the IJVM memory model, the IJVM instruction set, compiling Java to IJVM. An example implementation: micro-instruction and notation, implementation of IJVM using Mic-1. Design of the micro-architecture level: Speed versus cost, reducing the execution path length, a design with pre-fetching the Mic-2, a pipelined design the Mic-3, a seven-stage pipeline the Mic-4. Improving performance: Cache memory, branch prediction, out-of-order execution and register renaming, speculative execution. Examples of the micro-architecture level.

UNIT V

Microprocessors: Microprocessors: Architecture of 8085 microprocessor; instructions of 8085, addressing modes, introduction to assembly language programming.
Recent Developments in Computer Hardware (CPU, Chipsets, memories, disks & interfaces used in desktops)

Recommended Books
1. Computer system architecture Morrris mano
2. Structured Computer Organization, A.S.Tannenbaum, Pearson.
3. Computer architecture and organization nicholous o cartter
4. Introduction to microprocessors, Ramesh Gaonkar, Prentice Hall.
5. Digital Computer Fundamentals, Thomas C. Bartee, Tata McGraw-Hill Publishing.
6. Microprocessors and Interfacing: programming and Hardware, Duglus V. Hall, Glencoe.

MCA-T103 Fundamentals of Programming Languages

UNIT I

Algorithm development: problem identification, algorithms, flow charts, testing and debugging, algorithms for searching (linear and binary), sorting (selection, bubble & insertion), merging of ordered list, analysis of algorithm.

An Introduction to Programming Languages and Evolution of Major Programming Languages Categories of programming languages: Procedural, Object Oriented, Prototype, Scripting, Programming, syntax and semantics, binding and scoping rules

UNIT II5

Programming in C: history, structure of C programs, compilation and execution of C programs, debugging techniques, character set, keywords, data type and variables, expressions, operators, operator precedence and their order of evaluation.

Control statements - if-else, switch, break, continue, coma operator, goto statement. Loops - for, while, do-while.

UNIT III

Functions: built-in and user-defined functions function declaration, parameter passing- call by value & call by reference, recursive functions. storage classes - auto, extern, global and static.

Array: one dimensional and multi-dimensional array, array handling, passing arrays to functions, arrays and strings, string-handling functions, Structures and Union, array of structure

UNIT IV

Pointers: pointer variable and its importance, pointer arithmetic, array of pointers, function of pointers, structure of pointers, dynamic memory allocation functions, pointer to pointer, pointer to structure, pointer to function, self-referential structure, enumeration, macro.

Static and stack based storage management, Fixed and variable Size heap storage management, Garbage collection.

UNIT V

File handling: opening and closing data file, creating a data file, read and write functions, formatted and unformatted data files, command line arguments. Introduction to Object oriented Concepts

Recommended Books
1. C in depth : Deepali Shrivastava and S.K. Shrivastav
2. Complete reference Herbert Schildt
3. Programming in C: Balagurusamy
4. Let us C and Solution by Yashwant Kanetkar
5. Programming in C : Amit Ashok and Kamthane Pearson
6. Fundamentasl of programming languages Elis howoritz
7. Programming Language Pragmatics, Scott, Elsevier.
8. Concept of programming language, Sebasta, Addison Wesley.

MCA-T104   Discrete Mathematics

UNIT I

Set Theory: Introduction, sets and elements, universal set and empty set, subsets, Venn diagram, set operations, algebra of sets and duality, finite sets, counting principle, classes of sets, power sets, partitions, mathematical induction.

Relations: Introduction, product set, relations, pictorial representation of relations,composition of relations, types of relations, closure properties, equivalence relations, partial ordering relations, n-ary relations.

UNIT II

Functions: One-to-one onto and invertible functions, mathematical functions, exponential and logarithmic functions, sequences, indexed classes of sets, recursively defined functions, cardinality.

Logic and Propositional calculus: Propositions and compound propositions, basic logical operations, propositions and truth tables, tautologies and contradictions, logical equivalence, algebra of proposition, conditional and bi-conditional statements, arguments, logical implication, propositional functions, quantifiers, negation of quantified statements.

UNIT III

Matrices: Matrix addition and scalar multiplication, matrix multiplication, transpose, square matrices, invertible matrices, inverse, determinants, elementary row operations, Gaussian elimination, Boolean matrices.

UNIT IV

Counting: Basic counting principles, factorial notation, binomial coefficient, permutations, combinations, the pigeon-hole principle, the inclusion-exclusion principle, ordered and unordered partition.

Probability Theory: Introduction, Sample space and events, finite probability space, conditional probability, independent events, independent repeated trials, binomial distribution, random variables.

UNIT V

Property of Integers: Order and inequalities, absolute value, mathematical induction, division algorithm, divisibility, primes, greatest common divisor, Euclidean algorithm, fundamental theorem of arithmetic, congruence relation, congruence equations.

Recommended Books
1. Discrete Mathematics, Lipschutz S., Lipson M.
2. Discrete Mathematical Structures, Kolman B.,Robert C.B., Sharon R.
3. Discrete Mathematical Structures with Applications to Computer Science, Trembley J.P. and Manohar R.P.
4. Discrete Mathematical Structures for Compute Science, Kolman B., Busby R, PHI.
5. Introduction to Discrete Mathematics, Liu, McGraw-Hill

MCA-T105   Principles of Management

UNIT I

Business and Management: Business Meaning and Contents, Business as a system, Business Environment.

Management Concept and Nature, Management Process, Basic function of Management, Management Level, Role of Manager, Management Principles (Henry fayol's principle of management, Taylor's Scientific Management) .

UNIT II

Organizational Behavior: Need of Understanding human behaviour in organization, Challenges and Opportunities for OB.

Management by Objective (MBO), Decision making process and models, Conflict Management, Strategies & Policies.

UNIT III

Managing Personnel: HRM- Meaning and Functions, Man Power Planning, Job Analysis and Design, Training, Career Planning & Development.

Motivation Theories & Practices, Leadership Concept theories & Style, Compensation Management.

UNIT IV

Marketing Management and Finance: Basic Concepts of Marketing, Nature & Scope of Marketing, Sales Promotion, Product Life Cycle, Marketing Information System (MIS) and Marketing Research.

Main Sources of Finance, Concept of Fixed & Working Capital, Introduction of Tax, Income Tax, Service Tax & VAT, Basic Concept of Invoice & Quotations.

UNIT V

Case Study: IT & BPO Industry, HR & Finance, Case Study of Local Industry with around Hundred Employees, Industry Visit, Project.

Recommended Books
1. Business Organization and Management Functions, B.P.Singh & T.N. Chabbra, Dhanpat Rai & Co.
2. Principles of Management, P.C Tripathi & P. N. Reddy, Tata McGraw Hill Publishing
3. Principles and Practices of Management, L.M. Prasad & Stephen P. Robbins
4. Organizational Behavior, Prentice Hall of India.
5. Human Resource Management, K. Aswathappa, Tata McGraw Hill
6. Marketing Management, Philip Kotler, Prentice Hall of India.
7. Marketing Management: Planning, Control, Ramaswamy. V.S. and Namakumari.S. MacMillan.
8. Financial Management,Principles and Practices, Dr. S.N. Maheshwari), S. Chand &Sons.

MCA-P101   PC Packages and Programming Lab
Lab based on paper MCA-T101

MCA-P102   Microprocessor Lab
Lab based on paper MCA-T102

MCA-S101   Skill Course

M.C.A. SEMESTER II

MCA-T201   Object Oriented Programming

UNIT I

Different paradigms for problem solving, need for OOP, differences between OOP and procedure oriented programming, abstraction, overview of OOP principles- encapsulation, inheritance and data binding polymorphism.

OOPS basics: Data types, variables, expressions, operators, type conversions, pointers and arrays, strings, structures, references, flow control statement, functions-scope of variables, parameter passing, recursive functions, default arguments, inline functions, dynamic memory allocation and deallocation operators.

UNIT II

Classes and data abstraction: class definition, class structure, class objects, class scope, this pointer, static class members, constant member functions, constructors and destructors, dynamic creation and destruction of objects, friend function and class, static class member.
Overloading: function overloading, operator overloading, unary, binary operators.

UNIT III

Inheritance, Packages and Interfaces, Access Control, Method Overriding, Garbage Collection, Abstract Classes
Templates - function templates and class templates, overloading of function template, static class member in class template, Exceptions Handling, throwing an exception, try block, catching an exception, Types of Exceptions, Multithreading, Synchronization

File handling: stream classes hierarchy, stream I/O, file streams, opening and closing data file, creating a data file, read and write functions, error handling during file operations, formatted I/O, sequential and random file processing.
The Applet Class, An Applet Skeleton, adding images & sound, Passing parameters to an applet.

UNIT IV

Standard template library (STL): component of STL, containers, iterations, algorithms, application of container classes.
AWT and Swings: Building User Interface with AWT, Handling Events, Event Delegation Model (Events, Listeners, interfaces, Anonymous Classes). Layouts and Layout Manager, Introduction to Swing Components

UNIT V

Database Connectivity JDBC Overview, JDBC implementation, Connection class, Statements, Types of statement objects (Statement, Prepared Statement and Callable Statement), Types of resultset, ResultSetMetadata, Catching Database Results, Handling database Queries, JDBC and AWT.

Recommended books
1. Object Oriented Programming with C++, E. Balagurusamy, Mcgraw Hill Education
2. C++ Programming, Robert Lafore
3. Object Oriented with C++, Ashok N. Kamthane, Pearson Education
4. Java2: The Complete Reference, Herbert Schildt, Tata Mcgraw Hill.
5. The JAVA programming language, K. Arnold and J. Gosling, Pearson Education.
6. Programming with JAVA, E. Balagurusamy, Tata McGraw Hill.
7. Java2 Black Book, Steven Holzner, Dreamtech Press.
8. Database Programming with JDBC and Java, George Reese, O'Reilly.

MCA-T202   Data Structure

UNIT I

Data Type - Data Object - Data Structure: Data abstraction and abstract data type; Notion of an algorithm - Complexity measures: Rate of growth, basic time analysis of an algorithm; ordering notion- detailed timing analysis - space complexity.

Arrays: Arrays and their representation-Single and multidimensional arrays-row major and column major ordering-address calculation.

Linked lists: Pointers and their uses- Continuous vs. linked storage. Singly and doubly linked lists-Operations on lists-representation of sparse matrices and polynomials using lists- Circular lists-generalized lists

UNIT II

Storage Management: Dynamic storage management-Reclamation and compaction-Boundary Tag method.

Stacks and Queues: Stacks and Queues-representation and Manipulation-Uses of stacks and Queues-Recursion, polish expressions

UNIT III

Trees: Trees-Binary and N-ary trees-Representation of trees-Tree traversal algorithms- Threaded trees and advantages-Conversion of general trees to Binary trees-B trees- Applications: Decision trees, Game trees and expression parsing.

UNIT IV

Graphs: Graphs and their representations: Matrix representation-List structure-Graph traversal algorithm, Application of graphs.

Strings and their features: Strings-Representation and Manipulation using Arrays and lists- String matching algorithms. Brute force, Knuth-Morris-Pratt and Boyer-Moore strategies.

UNIT V

Sorting and Searching: Searching and sorting-Sequential, Binary and hashed Searching- Bubble sort, Insertion sort, shell sort, Merge sort and Quick sort-Comparison.

Tables: Decision tables-Symbol tables-Hash Tables-Examples of representation and implementation-Applications.

Recommended Books
1. Data Structure & Algorithms, Aho A.V. & Ullman J.E.
2. Data Structures using C, Aron M. Tannenbaum.
3. Data Management & File Structures, Mary E.S. Loomis.
4. Introduction to Data Structures, Bhagat Singh & Thomas Naps.
5. An Introduction to Data Structures with Applications, Trembley & Sorenson.

MCA-T202   Computer Networks

UNIT I

Protocol Architecture: Overview: Communication model, Communication Tasks, Data Communication Networking: WAN, LAN, Wireless Networks. Basics of Network Software: Protocol and protocol architecture, Protocol functions, Design Issues for the layers, interfaces &Services, Connection oriented and connectionless services, service primitives, relationship of services to protocols, ISO REF Models, TCP/IP Model.

Data Communications: Data Transmission: Concepts of Frequency, Spectrum, bandwidth, Electromagnetic spectrum and frequencies for data communication, Fourier analysis, Data and signal, Transmission impairments, channel capacity, Nyquist bandwidth, Shannon capacity formula, decibels and signal strength, Transmission media: Coaxial, twisted pair, Comparative study of Categories of cables, Coaxial, Optical Fibers, Wireless transmission: Terrestrial Microwave, satellite, Broadcast Radio, Infrared.

UNIT II

Data Encoding: BCA (NRZ, Bipolar AMI, B8ZS, HDB3, ASK, FSK,PSK,PCM,AM,FM,PM), Spread Spectrum. Asynchronous and Synchronous transmission, Full and Half duplex, Interfacing, Functional and Procedural aspects of V.24,
Data Link Control: Flow control: Stop and Wait, Sliding window, Error detection: Parity Check, CRC. Error control: Stop and Wait ARQ, Go back-N ARQ, Selective-Reject ARQ, Brief idea of HDLC and other Data Link control protocols

UNIT III

Circuit Switching: Simple switching Network, Circuit Switching Networks, Circuit Switching Concepts: Space Division switching, Time Division Multiplexing,

Routing in circuit switching Networks, Control Signaling, Inchannel & common channel signaling, Brief idea of SS7. Packet Switching: Packet switching principles, Routing, X.20

UNIT IV

LAN Technology: LAN architecture, IEEE 802 standards, Ethernet (CSMA/CD): Medium Access Control, Ethernet, Fast Ethernet, Brief survey of other LAN systems (Token ring, FDDI, ATM, Fiber channel). Wireless LANS, Bridges, Latest trends in LAN technologies LAN Devices: Study of specifications of L2 and L3 switches, Structured cabling, Passive Components.

UNIT V

Principles of Internetworking, connection less Internetworking, IPv4, IPv6, IP multicasting. Routing protocols, TCP, UDP, SNMP, SMTP and MIME, HTTP.

Recommended Books
1. Data & Communications, William Stallings, Prentice Hall,
2. Data Communications and Networking, Behrouz A. Forouzan, Tata McGraw-Hill Education,
3. Computer Networks, A. S. Tanenbaum, Prentice-Hall,
4. Computer networks and internets, Douglas Comer, Prentice Hall

MCA-T204   Operating System

UNIT I

Introduction to Operating Systems: Mainframe systems, desktop systems, multiprocessor systems, distributed systems, clustered systems, real-time systems, handheld systems. Feature migration and computing Environments.

Computer System Structures: Computer system operation, I/O structure, storage structure, storage hierarchy, hardware protection, network structure.
Operating System Structures: System components, operating system services. System calls, system programs, system structure, virtual machines.

UNIT II

Processes: Process concept, process scheduling, operations on processes, cooperating processes, inter-process communication, communication in client-server systems.
Threads: Overview, multithreading models, threading issues.

UNIT III

CPU Scheduling: Basic Concepts, scheduling criteria, scheduling algorithms, multiple- processor scheduling, real-time scheduling, algorithm evaluation.
Process Synchronization: The critical section problem, synchronization hardware, semaphores, classical problems of synchronization, monitors.
Deadlocks: System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

UNIT IV

Storage and Memory Management: Swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.
Virtual Memory: Demand paging, process creation, page replacement, allocation of frames, thrashing.
File System Interface: File concept, access methods, directory structure, file system mounting, file sharing, protection.
File-System Implementation: File system structure, file-system implementation, directory implementation, allocation methods, free space management, efficiency and performance.

UNIT V

Protection: Goals of protection, domain of protection, access matrix, implementation of access matrix, revocation of access rights.
Security: The security problem, user authentication, program threats, system threats, security systems and facilities, intrusion detection, cryptography.

Recommended Books
1. Operating System Concepts, Silberschatz G.G., John Wiley & SonsInc.
2. Modern Operating Systems, Andrew S. Tanenbaum,Pearson Prentice Hall,
3. Advanced Concepts in Operating Systems Distributed, Database, and Multiprocessor Operating Systems, Mukesh Singhal and Niranjan G. Shivaratri, Tata McGraw-Hill
4. Operating Systems: A Concept-based Approach, Dhananjay M. Dhamdhere, Tata McGraw-Hill Education.
5. Distributed Systems: Concepts and Design, Coulouris et al, Addison Wesley.
6. Tanenbaum and Steen: Distributed Systems: Principles and Paradigms, Pearson Education

MCA-T205   MIS and E-Commerce

UNIT I

Management Information Systems - Need, Purpose and Objectives- Contemporary Approaches to MIS – Business processes and Information Systems –Information systems function in Business-Use of Information Systems for competitive advantage - MIS as an instrument for the organizational change: Management issues – Types of Business Information Systems.

UNIT II

Enhancing Decision Making: Information, Management and Decision Making - Models of Decision Making - Classical, Administrative and Herbert Simon's Models - Attributes of information and its relevance to Decision Making - Types of information, Decision Support Systems - Group Decision Support Systems –- Executive Support Systems

UNIT III

E-commerce: Introduction, Definition of e-commerce, emergence of Internet, commercial use of Internet, history of e-commerce, advantages and disadvantages of e-commerce

Business models for e-commerce: B2C, B2B, C2C, C2B, brokerage model, aggregator model, infomediaries, communities, value-chain model, manufacturer model, advertising model, subscription and affiliate model

UNIT IV

Enabling technologies: Internet Client server applications, networks, Uniform Resource Locator (URL), search engines, software agents, Internet Service Providers(ISP), broadband technologies, Electronic Data Interchange(EDI).

E-payment systems: token-based system, card-based system, e-cash. E-cheque, e-banking, risks, data protection

UNIT V

E-marketing: characteristics, methods, e-marketing value-chain, site adhesion, browsing behavior model, e-advertising, e-branding, e-marketing strategies

E-security: Security risks, risk management issues, legal and ethical issues, security mechanisms, encryption, digital signature, digital certificates,

Recommended Books
1. Management Information Systems, Laudon and Laudon, 7th Edition, Pearson Education Asia
2. P.T. Joseph, S.J. E-commerce: An Indian Perspective, Prentice Hall India, Second Edition, 2007

MCA-P201   Data Structure Lab
Lab based on MCA-T202

MCA-P202   Object Oriented Programming Lab
Lab based on MCA-T201

M.C.A. SEMESTER   I I I

MCA-T301   Computer Architecture

UNIT I

Processor Basics

Processor Basics: CPU Organization: Fundamentals, additional features. Data representation: Basic formats, fixed point numbers, floating-point numbers. Instruction sets: Instruction formats, instruction types, programming considerations.

UNIT II

Data path Design

Data path Design: Fixed point arithmetic- Addition and subtraction, multiplication, division. Arithmetic Logic Unit: Combinational ALUs, sequential ALUs. Advanced topics: Floating-point arithmetic, pipeline processing.

UNIT III

Control Design

Control Design: Basic concepts: Introduction, hardwired control, design examples. Micro-programmed control: Basic concepts, multiplier control unit, CPU control unit. Pipeline control: Instruction pipelines, pipeline performance, super-scalar processing.

UNIT IV

Memory Organization

Memory Organization: Memory technology: Memory device characteristics, random-access memories, serial-access memories. Memory systems: Multilevel memories, address translation, memory allocation. Caches: Main features, address mapping, structure versus performance.

UNIT V

System Organization

System Organization: IO and System Control: Programmed IO, DMA and interrupts, IO processors. Parallel processing: Processor-level parallelism, multiprocessors.

Recommended Books
1. Computer Architecture and Organization, J.P. Hayes: McGraw-Hill International
2. Computer Architecture: A Quantitative Approach, J. L. Hennessy, David A. Patterson Morgan Kaufmann
3. Computer Organization and Architecture, William Stallings, Pearson.
4. Advanced Computer Architecture, Kai Hwang, McGraw-Hill
5. Computer Organization and Architecture: Designing for Performance, William Stallings, Pearson Education Limited

MCA-T302   Design & Analysis of Algorithms

UNIT-I

Algorithms Analysis: Algorithms and structured programming. Analyzing algorithms, Asymptotic behavior of an algorithm, Order notations, time and space complexities (polynomial, logarithmic and exponential), average and worst case analysis, lower and upper bounds.

UNIT-II

Algorithm design strategies: Divide and conquer (Merge sort, Quick sort, matrix multiplication).
Greedy method (knapsack problem, minimum spanning trees). Basic search & Traversal Techniques (Breadth first and Depth first traversals of Graphs).

UNIT-III

Dynamic programming: 0/1 knapsack, Travelling salesman problem
Backtracking: 8-queen problem, sum of subsets, Graph coloring, 0/1 Knapsack
Branch & Bound: 0/1 knapsack, Travelling salesman.

UNIT-IV

Matrix algorithms: Basics, Strassen's matrix-multiplication algorithm
Data structures for set manipulation problems: Fundamental operation on sets, a simple disjoint-set union algorithm, tree structures for UNION-FIND problem, applications and extensions of the UNION-FIND algorithm.

UNIT-V

Finite automata and regular expression, recognition of regular expression, patterns, recognition of substrings, Conversion from NFA to DFA

Complexity Theory: Overview, Turing machine, polynomial and non-polynomial problems, deterministic and non-deterministic algorithms, P class, NP class & NP complete problems- vertex cover and 3-SAT and NP–hard problem, Hamiltonian cycle.

Recommended Books
1. Fundamentals of Computer Algorithms, E. Horowitz, S. Sahni, Galgotia Publications.
2. Introduction to Algorithms, Charles Leiserson, Ronald Rivest, & Thomas H. Cormen, MIT Press
3. Design & Analysis of Computer Algorithms, Av. Aho, J.E. Hopcroft, & J.D. Ullman, Addition Wesley.
4. Design and Analysis of algorithms, S.K. Basu, PHI Publications

MCA-T303   Database Management System
UNIT I

Introduction: Database system applications, database systems versus file systems, views of data, data models, database languages, database users and administrators, transaction management, database system structure, application architecture.

Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, unique key, generalization, aggregation, reduction of an ER diagram to tables.

UNIT II

Relational model: Structure of relational databases, relational algebra, tuple relational calculus, domain relational calculus.

SQL: Characteristics of SQL, advantages of SQL, types of SQL commands, SQL operators and their procedure, tables, views and indexes, queries and sub-queries, aggregate functions, insert, update and delete operations, joins, union, intersection, minus, cursors in SQL. Domain constraints, referential integrity, assertions, triggers, authorization and authentication.

Relational database design & normalization: Functional dependencies, normal forms- First, second, third, BCNF, fourth and fifth normal forms, decomposition.

UNIT III

Indexing and Hashing: Basic concepts, ordered indices, B-tree, B+ tree, static hashing, dynamic hashing, comparison of ordered indexing and hashing, index definition in SQL, multiple-key access.

Query Processing & Optimization: Measure of query cost, selection operation, sorting, join operation, other operations,

UNIT IV

Transactions: Transaction concept, atomicity and durability, concurrent execution, serializability, conflict and view, testing of serializability.

Concurrency Control: Concurrency Control, Locking Techniques for Concurrency control, Time stamping protocols for concurrency control, validation-based protocols,

Recovery System: Failure classification, storage structure (RAID), recovery and atomicity, log based recovery, shadow paging,

UNIT   V

Object Oriented Database Concept: Data types and Object, Evolution of Object-Oriented Concepts, Characteristics of Object-Oriented Data Model. Object Hierarchies, Generalization, Specialization, Aggregation. Object Schema. Inter-object Relationships, Similarities and difference between Object Oriented Database model and Other Data models.

Object Oriented DBMS Architecture, Application Selection for Object Oriented DBMS, Database Design for an Object Relational DBMS. Data Access API (ODBC, DAO, ADO, JDBC, OLEDB)

Recommended Books
1. Database Systems Concepts, Korth
2. Fundamental of database system - Elmasiri and Navathe
3. Database Systems, Date C.J., AddisionWesley
4. DBM and Design, Hansen and Hansen, PHI
5. Distributed Databases, Ceri S, Pelagatti G, Principles and Systems,McGraw Hill.

MCA-T304   Numerical Methods and Computation

UNIT 1

Floating point Arithmetic: Basic Concepts of floating point number systems, implications of finite precision, Illustration of errors due to round off. Solution of non-linear Equations: Bisection, Fixed point iteration, Newton's method, rates of Convergence.

UNIT II

Direct Methods for Linear Systems of Equations: Gaussian elimination, Operational counts, Implementation including pivoting and scaling. Iterative methods: Jacobi's method, Gauss Seidal method, Acceleration of iterative methods, Relaxation method.

UNIT III

Computation of Eigen values and Eigen vectors: Basic theorems, Eigen values and Eigen vectors, Error estimates, the power method, Jacobi's method, Matrices, determinants, LU decomposition.

UNIT IV

Interpolation and approximation: Finite Differences, Difference tables, Polynomial Interpolation: Newton's forward and backward formula, Central Difference Formulae: Gauss forward and backward formula.

UNIT V

Numerical Differentiation and Integration:
Numerical Differentiation, Taylor series method, Euler's methods, Runge-Kutta Methods, Predictor-Corrector methods
Numerical Integration: Trapezoidal rule, Simpson's rules.

Recommended Books
1. Numerical Methods for Scientists and Engineers, K. Sankara Rao
2. Computer Oriented Numerical Methods, V. Rajaraman

MCA-T305   Python Programming

UNIT I

INTRODUCTION TO PYTHON

Function Declaration, Import, Objects, Indenting as Requirement, Exceptions, Unbound Variables, Case Sensitive, Scripts, Native Data Types, Booleans, Numbers, Lists, Tuples, Sets, Dictionaries, Comprehensions, List Comprehensions, Dictionary Comprehensions, Set Comprehensions

UNIT II

STRINGS

Strings, Unicode, Formatting, String Methods, Bytes, Encoding, Regular Expressions, Verbose, Case Studies

UNIT III

CLASSES

Closures, List of Functions, List of Patterns, File of Patterns, Generators, Defining Classes, Instantiating Classes, Instance Variables, Iterators, Assert, Generator Expressions

UNIT IV

TESTING AND FILES

Test Case, Testing Invalid Inputs, Refactoring, Handling Changing Requirements, Reading and Writing Text Files, Binary Files, Stream Objects, Standard Input, Output and Error.

UNIT V

XML, Serialization and Web Services

XML, Atom Feed, Parsing HTML, Searching for Nodes, html, Generation, Serializing Objects, Pickle Files, Versions, Debugging, Serializing to JSON, HTTP Web Services, Features, httplib2

Recommended Books

1. Dive into Python,Mark Pilgrim, Apress,
2. How to Think Like a Computer Scientist Learning with Python Allen Downey, Jeffrey Elkner, Chris Meyers, Green Tea Press,
3. Introduction to Computation and Programming using Python, John V. Guttag, Prentice Hall of India.
4. Learning Python: Powerful Object-Oriented Programming, Mark Lutz, O'Reilly, Shroff Publishers and Distributors.

MCA-P301   DBMS System Lab

Lab based on MCA-T303

MCA-P302   Python Programming Lab

Lab based on MCA-T305

M.C.A. SEMESTER – IV

MCA-T401   Compiler Design

UNIT I

Introduction to translators, compilers, interpreters, compilation process. Programming language grammars, derivations, reductions, regular expression, context free language and grammar.
Lexical analyzer, input buffering, specification and recognition of tokens, introduction to finite automata, regular expressions to NFA, minimization of DFA, keywords and reserve word policies, LEX, the lexical analyzer generator.

UNIT II

Syntax analyzer, context free grammars, top down parsing, brute force parser, recursive descent parser, LL(1) parser, Bottom up parsing, operator precedence parsing, simple precedence parsing, LR parser, LALR parser, YACC, the parser generator.

UNIT III

Syntax directed translation schemes, implementation of syntax directed translators, synthesized attributes, inherited attributes, dependency graph, evaluation order, construction of syntax trees, directed acyclic graph of expression, bottom up evaluation of S- attributed definitions, L attributed definitions, top down translation of L - attributed definitions.

UNIT IV

Errors, lexical phase errors, syntactic phase errors. Intermediate languages, postfix notation, syntax trees, parse trees, three address code, triples and indirect triples. Translation of assignment statements, Symbol tables, operation on symbol tables, and symbol table organization for non-block structured languages, symbol table organization for block, structured languages.

UNIT V

Run time storage management, storage allocation and referencing data in block structured language, storage allocation. Code optimization, sources of optimization, loop optimization, DAG and optimization of basic blocks. Code generation, a machine model, next use information register allocation and assignment, a simple code generator, code generation from DAG's, Peephole optimization.

Recommended Books
1. Compilers, Principles, techniques and tools, Aho, Ullman and Sethi, Pearson Education.
2. The Theory and Practice of Compiler Writing, Tremblay, Sorenson, BSP.
3. Compiler Design in C, Holub, PHI.

MCA-T402   Web and Mobile Technologies

UNIT I

Introduction of HTML: introduction, markup language, editing HTML: common tags, headers, text styles, linking, images, formatting text, horizontal rules and more line breaks, unordered lists, nested and ordered lists, basic HTML tables: intermediate HTML tables and formatting: basic HTML forms, more complex HTML forms, HTML5: Input Types & Attributes, internal linking, creating and using image maps

UNIT II

Java script Introduction to scripting: introduction- memory concepts- arithmetic- decision making. Java script control structures, Java script functions: introduction, program modules in java script - function definitions, duration of identifiers, scope rules, recursion, java script global functions. Java script arrays: introduction, array-declaring and allocating arrays, references and reference parameters, passing arrays to functions, multiple subscripted arrays. Java script objects: introduction, math, string, date, Boolean and number objects. Dynamic HTML

UNIT III

CSS: introduction, inline styles, creating style sheets with the style element, conflicting styles, linking external style sheets, positioning elements, backgrounds, element dimensions, text flow and the CSS box model, user style sheets, Filter and Transitions, HTML DOM, Browser

HTML form using GET, POST, REQUEST, SESSION, COOKIE variables, Sending E-mail, Database Operations with PHP, Connecting to My-SQL (or any other database), Selecting a db,

UNIT IV

Introduction to PHP & web server Architecture Model Overview of PHP Capabilities, PHP HTML embedding tags & syntax, Simple script examples, PHP & HTTP Environment variables. PHP Language Core-Variables, constants, data types, PHP: operators, flow control & loops, Arrays, string, functions Include & require statements, Simple File & Directory access operations, Error handling, Processing

UNIT V

Introduction to Android, Architecture, Versions, Application Components, Resources, Services, User Interface, UI Layouts, UI Controls, Publishing Android Applications.
Introduction to iOS, Architecture, Application Components, Resources, Services, current trends and latest developments.

Recommended Books
1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI/Pearson Education.
2. Internet and World Wide Web, H.M. Deitel, P.J. Deitel, A.B. Goldberg Pearson Education
3. Web Technologies Black Book Dreamtech Press (2018)

MCA-T403   Software Engineering

UNIT I

Software Engineering Fundamentals: Definition of Software, Software characteristics, Software Applications.

Software Process: Software Process Models - Waterfall model, prototyping model, spiral model, incremental model, concurrent development model.

Project management Concepts: The Management Spectrum - The People, The Product, The Process, The Project.

UNIT II

Software Process and Project Metrics: Measures, Metrics and Indicators, Software measurement: Size - Oriented Metrics, Function - Oriented Metrics, Extended Function point metrics

Software Project Planning: Project Planning Objectives, Software Project Estimation, Decomposition Techniques - Problem Based Estimation, Process Based Estimation, Empirical Estimation Models- The COCOMO Model

Risk Analysis and Management: Software risks, Risk identification, Risk Projection, Risk Refinement, Risk Mitigation, Monitoring and Management.

UNIT III

Software Quality Assurance: Basic concepts- Quality, Quality Control, Quality Assurance, Cost of Quality, Software Quality Assurance (SQA), Formal Technical Review

Software Configuration Management: Baselines, Software Configuration Items, The SCM Process, Version Control, Change Control, Configuration Audit, Status Reporting.

Analysis Concepts and Principles: Requirements Elicitation for Software, Analysis Principles -The Information Domain, Modeling, Partitioning, Essential and Implementation Views, Specification: Specification Principles, Representation, The Software Requirement Specification (SRS)

UNIT IV

Design Concepts and Principles: Design Principles, Design Concepts, Abstraction, Refinement, Modularity, Software Architecture, Control Hierarchy, Structural Partitioning, Data Structure, Software Procedure, Information Hiding, Effective Modular Design- Cohesion, Coupling

Software Testing: Testing Objectives & principles, Unit Testing, Integration Testing (Top Down Integration, Bottom Up Integration, Regression Testing, Smoke Testing), Validation Testing (Alpha and Beta Testing), System Testing (Recovery Testing, Security Testing, Stress Testing, Performance Testing).

UNIT V

Reengineering: Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering

CASE Tools: What is CASE, Building Blocks of CASE, A Taxonomy of CASE Tools, Integrated CASE Environments, The Integration Architecture, The CASE Repository.

Recommended Books
1. Software Engineering, R. Pressman, McGraw-Hill.
2. Software Engineering, K.K. Agrawal and Y. Sing, New Age International.
3. Software Project Management in Practice, P. Jalote, Pearson.

MCA-E404   **Departmental Elective I**

MCA-E404-1   **Software Testing**

UNIT I

Testing Fundamentals and its types
Software Testing: Introduction, Importance, Fundamental Principles of Testing SDLC Vs STLC, Manual Testing, Automation Testing, Automated Testing Vs. Manual Testing, Unit Testing, Integration Testing, System Testing, Smoke and Sanity Testing, Regression Testing, Non-Functional Testing

UNIT II

Test Case and testing Techniques
Introduction to Test Formality, Test Scenario, Test Case Specifications, Test Basis, Traceability Matrix, Software Testing Techniques, Equivalence Partitioning & Boundary Value Analysis, Decision Table Testing, State Transition Diagram, Use Case Testing, Test Management & Control Estimation, Test Plan

UNIT III

Defects and Testing Tools
Defects, Defect Life Cycle, Testing Tools, Agile, Agile Testing Methodology, Scrum Testing, Automation Testing for Agile Methodology, Scaled Agile Framework(SAFe), Waterfall Vs. Agile, Agile Vs Scrum, Scrum Vs. Kanban,

UNIT IV

Business Intelligence Testing:

WhiteBox Testing: Loop Testing,   Path Testing,   Condition testing,   Memory Testing
Blackbox Testing: Functional Testing, Integration Testing, System Testing, Acceptance Testing, Smoke Testing, Exploratory Testing, Ad hoc Testing.

UNIT V

Performance Testing
Performance Testing, Load Testing, Stress Testing, Volume Testing, Scalability Testing, Soak Testing, Stability Testing, Spike Testing, Performance Testing vs. Load Testing vs. Stress Testing, Globalization Testing, Compatibility Testing, Static Testing, Cyclomatic Complexity, Testing as a Service (TaaS), Test Maturity Model (TMM)

Recommended Books
1. The Art of Software Testing, Glenford Myers , Wiley
2. Agile Testing: A Practical Guide for Testers and Agile Teams, Lisa Crispin, Pearson Education
3. Software Testing: Principles and Practice, Gopalaswamy Ramesh and Srinivasan Desikan, Pearson Education
4. Software Testing: A Craftsman's Approach, Paul Jorgensen, CRC Press.

MCA-E404-2   Real Time Systems

UNIT I

Introduction to Real-time systems, Issues in Real-time Systems, Real-time System Components, Classification of Real-time systems and Real-time tasks, Misconceptions about Real-time computing. Real-time System requirements: Speed, Predictability, reliability, adaptability, Specification of timing constraints.

UNIT II

Real-time scheduling: Requirements and Issues, Terminology, modeling, Introduction to static and dynamic scheduling schemes, cyclic scheduling, Schedulability tests.

UNIT III

Priority driven scheduling of periodic tasks, Scheduling aperiodic tasks, mixed task scheduling, aperiodic task scheduling: fixed priority server/non-server based scheduling algorithms.

UNIT IV

Task Synchronization: Need and priority inversion problem, Priority Inheritance protocol, priority ceiling protocol and stack-based priority ceiling protocol for fixed priority preemptive system.

UNIT V

Introduction to multiprocessor real-time systems, problems and issues. Fault tolerant real time system design: types of faults, causes, detection techniques, mitigation techniques, reliability evaluation, Examples of a real-time operating system

Recommended Books
1. Real-Time Systems, J.W.S.Liu, Pearson Education Asia
2. Real-time system Design, S.T.Lavi, A.K.Agrawala: McGraw Hill
3. Real-time Systems Design and Analysis, P.A.Laplante, An Engineer's Handbook, IEEE Press
4. Real-time Microcomputer System Design An Introduction, P.D.Laurence, K.Mauch, McGraw Hill

MCA-E404-3   **Cryptography & Network Security**

UNIT   I

Security and Cryptographic algorithm
Need for security, principle of security, types of attacks.
Cryptographic techniques: cryptography terminology, substitution techniques, transposition techniques, Symmetric and asymmetric key algorithm, possible types of attack, key range, steganography. Symmetric vs. asymmetric, algorithm types and modes,
Encryption methods: DES, double and triple DES, AES, Comparison of various cryptographic algorithms and requirement of good cryptographic algorithm.

UNIT   II

Asymmetric cryptographic algorithm and Message Authentication
Public key cryptography principles and algorithms, RSA algorithm, Diffie-Hellman key exchange. One-way hash functions, message digest, MD5, SHA1, message authentication code, Digital envelope and Digital signatures.

UNIT   III

Network Management: Management Standards and Models, configuration management, configuration database and reports, fault management, identification and isolation, protecting sensitive information, host and user authentication, structure of management information, Standard management information base, SNPv1 protocol, accounting management, performance management, network usage, matrices and quotas.
Virtual Private Networks: Visual and private network topology, tunneling, IPSEC

UNIT   IV

Networks Security: Security in OSI model, IPV4, IP, TCP, UDP, ICMP, ARP, RARP and DNS: ping, traceroute, Threats in networks. PKI, SSH, SSL, IPSec, Content Integrity, Access Controls, Wireless Security, Honeypots, Traffic Flow Security, Firewalls, Intrusion Detection Systems component of an IDS, placement of IDS components, types of IDS: network-based IDS, file integrity checkers, host based IDS, IDS evaluation parameters,

Network attacks: Buffer overflow, IP scheduling, TCP session hijacking, sequence guessing. Network scanning: ICMP, TCP sweeps, basic port scans. Denial of service attacks: SYN flood, teardrop attacks, land, smurf attacks.

UNIT   V

Web Security and Application Security: Web servers and browsers: security features, server privileges, active pages, scripting, security configuration setting for browsers, security of active content: JAVA, JAVA script, Active x, plug-ins, cookies. SSL & SET,
Firewalls: Firewall characteristics & design principles, types of firewalls, packet filtering router, application level gateway or proxy, content filters, bastion host. Firewall architectures: dual homed host, screening router, screened host, screened suvnet. Firewall logs. Security mail: PEM and PGP.

Recommended Books
1. Network Security, Private Communication in a public world, Kaufman, C., Perlman, R., and Speciner, M., Prentice Hall.
2. Cryptography and Network Security: Principles and Practice, Stallings, W. Prentice Hall PTR.
3. Fundamentals of Computer Security, Pieprzyk Josef, Springer-Verlag,

MCA-E404-4   Computer Graphics

UNIT I

Geometry and Line generation: Lines, Line segments and perpendicular lines, distance between a point and a line, vectors, pixels, frame buffers, vector generation, Bresenham's algorithm, anti-aliasing of line, thick line segments, character generation, display the frame buffer.

Graphics Primitives: Display devices, primitive operations, Display file interpreter, Normalized device co-ordinates, Display file structure and display file algorithms, Display control, text, Linesstyle primitives.

UNIT II

Polygons: Polygon representation, Entering polygons, Polygon interfacing algorithms, filling polygons, filling with a pattern, Initialization, Antialiasing.

Segments: Creation of segment, Closing, deletion and renaming segments, visibility, image transformations, saving and showing segments.

UNIT III

2D and 3D Transformations: Matrices, Scaling transformations, Rotation, Homogeneous co-ordinates and Translations, Co-ordinate transformations, Rotation about an arbitrary point, Inverse transformations, Transformation routines, Transformation and patterns, Initialization, Display procedures. 3D geometry, 3D primitives and transformations.

UNIT IV

Windowing and Clipping: The viewing transformation and its implementation, Clipping, Cohen Sutherland Outcode algorithm, Clipping of polygons, generalized clipping, Multiple windowing, Parallel projection, Viewing projections and special projections, Conversion to view plane co-ordinates, Clipping in three dimensions, Clipping planes.

UNIT V

Hidden surfaces and Lines: Back-face algorithm, Z-buffers, Scan line algorithm, Franklin algorithm, Illumination, Transparency, Reflection, Shadows, Ray tracing, halftones, Color Models

Recommended Books:
1. Computer Graphics, Hearn and Baker, PHI
2. Computer Graphics: A programming Approach, Steven Harrington
3. Computer Graphics, principles and practice, Foley, VanDam, Feiner, Hughes, Addison Wesley.
4. Mathematical Elements for Computer Graphics, David F. Rogers, Adams, McGraw Hill.
5. Procedural Elements for Computer Graphics, David F. Rogers, McGraw Hill.

MCA-E404-5   Graph Theory

UNIT I

Introduction

Graphs, Introduction, Isomorphism, Sub Graphs, Walks, Paths, Circuits , Connectedness– Components, Euler Graphs, Hamiltonian paths and circuits, Trees, Properties of Trees– Distance and Centers in Tree, Rooted and Binary Trees.

UNIT II

Trees, Connectivity & Planarity

Spanning Trees, Fundamental Circuits, Spanning Trees in a Weighted Graph, Cut Sets, Properties of Cut Set, All Cut Sets, Fundamental Circuits and Cut Sets, Connectivity and Separability, Network Flows, 1-Isomorphism, 2-Isomorphism, Combinational and Geometric Graphs, Planer Graphs, Different Representation of a Planer Graph.

UNIT III

Matrices, Colouring and Directed Graph

Chromatic Number, Chromatic Partitioning, Chromatic Polynomial, Matching, Covering, Four Color Problem, Directed Graphs, Types of Directed Graphs, Digraphs and Binary Relations, Directed Paths and Connectedness, Euler Graphs.

UNIT IV

Permutations & Combinations

Fundamental Principles of Counting - Permutations and Combinations - Binomial Theorem - Combinations with Repetition - Combinatorial Numbers - Principle of Inclusion and Exclusion - Derangements - Arrangements with Forbidden Positions.

UNIT V

Generating Functions

Generating Functions - Partitions Of Integers - Exponential Generating Function - Summation Operator - Recurrence Relations - First Order and Second Order , Non- Homogeneous
Recurrence Relations - Method of Generating Functions.

Recommended Books
1. Computer Graphics with OpenGL, Donald D. Hearn, M. Pauline Baker and Warren Carithers, , Pearson / Prentice Hall.
2. Computer Graphics Using OpenGL, Francis S Hill, Jr. and Stephen M Kelley, Prentice Hall,
3. Fundamentals of Computer Graphics‖, Peter Shirley, A K Peters.
4. Principles of Computer Graphics Theory and Practice Using OpenGL and Maya‖ Shalini Govil Pai, Springer (India).

| MCA-E405 | Departmental Elective II |
| MCA-E405-1 | Mobile Computing |

UNIT I

Basic of mobile technology & smart client Mobile Devices -Definition, m-commerce, m-business, component of wireless environment, wireless communication, mobile device classification, Wireless Network -WPANS, WLAN, WWANS (1 G, 2G, 2.5G, 3G) Introduction to Mobile Communications and Computing, Mobile Computing, novel applications, limitations and architecture Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, security in MANETs.

UNIT II

Cellular concept and its initial implementations The cellular concept, Multiple access technologies for cellular systems, Cellular system operation and planning (General principles, System Architecture, Location updating and call setup), Handoff and power control Initial implementations of the cellular concept: The AMPS system, TACS system, NMT system, NTT system, Concluding remarks.

UNIT III

Digital cellular mobile systems Introduction, GSM: The European TDMA digital cellular standard, GSM standardization and service aspects GSM reference architecture and function partitioning, GSM radio aspects, Security aspects, GSM protocol model, Typical call flow sequences in GSM, Evolutionary directions for GSM IS-136: The North American TDMA digital cellular standard(D-AMPS), Background on North American digital cellular, Service aspects of D-AMPS(IS-136), Network reference, Radio aspects, Security aspects, Protocol model and typical flow sequences, Evolutionary directions

UNIT IV

Mobile data communications Introduction, Specialized packet and mobile radio networks, Circuit switched data services on cellular networks, circuit switched data on analog cellular networks, Circuit switched data on digital cellular networks, high speed Circuit switched data in GSM, Packet switched data services on cellular networks, Packet data in analog cellular networks, CDPD(cellular digital packet data), Packet data in digital cellular, Evolution of cellular mobile data capabilities: The EDGE concept, Data over lower power wireless or cordless telecommunication networks, Data services over DECT(Digital enhanced cordless telecommunications),Data services in PACS(Personal Access communications System), Data services in PHS(Personal Handy phone system), Data services in CT2(Cordless Telephony 2)

UNIT V

Android Basic & Its components Introduction to Android -History of android, The Open Handset Alliance, Android SDK installation, Android SDK & their codenames, Advantages of android, The Android O/S Architecture, Over view of IDE for Android application, AVD, launching and starting AVD (android virtual device) Managing Application Resources -What are resources, resource value types, storing different resource values types (string, string arrays, Boolean, colors, integer, animation, & menus) Android Application Components- Activities & its life cycle, Services & its life cycle, Broadcast receiver, Content provider, Intents, shutting down component, Android Manifest File in detail, Use of Intent Filter

Recommended Books
1. Mobile and personal communication systems and Services, By Raj Pandya
2. Mobile communications, By Jochen Schiller Addison-Wesley.
3. Mobile Computing, By Talukder Yavagal
4. Handbook of Wireless Networks and Mobile Computing, Stojmenovic and Cacute,Wiley.
5. Android Application Development by Rick rogers, John Lombardo,O'Reilly Professional
6. Android 2 application development by Reto Meier –Wrox

MCA-E405-2   Cloud Computing

UNIT I

Introduction Cloud Computing: Definition, Types of Clouds, Layer and Services models, deployment models, Cloud Computing Architecture and infrastructure: Cloud Reference Model, Virtualization: Definition, Types of virtualizations (Compute, Network, Storage), Types of Hypervisors

UNIT II

Cloud Platforms in Industry: Major vendors and their offerings, Introduction to Microsoft Azure, Amazon web services (EC2, S3, Etc.), Google AppEngine, Aneka: Cloud Application Platform - Integration of Private and Public Clouds
Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM and ERP, Social networking. Cloud Application- Scientific Application, Business Application.

UNIT III

Advance Topic in Cloud Computing: Cloud Security, Risks and Approaches of Migration into Cloud. Federated Cloud/ Intercloud, Third Party Cloud Services, Business Continuity and Disaster Recovery, Service Level Agreement (SLA), Dynamic resource provisioning and management, Server consolidation and placement policies, Energy efficiency in data centers, Elastic Load Balancing and Auto Scaling.

UNIT IV

Storage Network Design: Architecture of storage, analysis and planning. Storage network design considerations; NAS and FC SANs, hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, host system design considerations.
Techniques for Big data processing (Google GFS, BigTable, and Map-Reduce Hadoop Distributed File System (HDFS), HIVE).

UNIT V

Consensus in Cloud Computing: Issues in consensus, Consensus in synchronous and asynchronous system, Byzantine Agreement: Agreement, Faults, Tolerance, Measuring Reliability and Performance, SLIs, SLOs, SLAs, TLAs, Byzantine failure, Byzantine Generals Problem, Failures & Recovery Approaches in Distributed Systems, Checkpointing.

Recommended Books
1. Distributed and Cloud Computing, Kai Hawang, Geofrey C.Fox, Jack J. Dongarra Elservier
2. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
3. Cloud Computing, Kumar Saurabh, Wiley Pub
4. Cloud Security, Krutz, Vines, Wiley Pub
5. Cloud Computing- A Practical Approach, Velte, TMH

MCA-E405-3   Image Processing

UNIT I

Image presentation and transform: Elements of visual perception, color representation, Image capture, representation and storage. gray level transformation, histogram equalization, multi-image operations.
Image transform: Discrete Fourier transforms (DFT), Discrete cosine transform (DCT), Walsh-Hadamard transform, Haar transform, Karhunen-Loeve transform, singular value decomposition.

UNIT II

Image enhancement: Contrast Intensification, linear stretching, Non-linear stretching, histogram specification, modifying gray level co-occurrence matrix, smoothing, image averaging, mean filter,

order statistic filter, edge preserving smoothing, low pass filtering, Image sharpening, high pass filtering, homomorphic filtering.

UNIT III

Image restoration: Mean square error restoration, least-square error restoration, restoration by singular value decomposition, restoration by maximum a posterior estimation, restoration by homomorphic filtering, distortion model and range of parameter, filtering procedure and related problems.

UNIT IV

Image compression: Fidelity criteria, run length coding, Huffman coding, LZW, arithmetic coding, JPEG encoder and decoder, vector quantization compression.

UNIT V

Image segmentation: Region extraction, pixel based approach, multilevel thresholding, local thresholding, region based approach, growing, splitting, merging, split and merge techniques.

Recommended books
1. Digital Image processing and analysis, B. Chandra and D. Majumder
2. Fundamental of digital image processing, Anil K. Jain

MCA-E405-4   Agile Methodologies

UNIT I

Agile Methodology

Theories for Agile Management , Agile Software Development , Traditional Model vs. Agile Model - Classification of Agile Methods , Agile Manifesto and Principles, Agile Project Management, Agile Team Interactions, Ethics in Agile Teams - Agility in Design, Testing, Agile Documentations, Agile Drivers, Capabilities and Values

UNIT II

Agile Processes

Lean Production- SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview, Lifecycle, Work Products, Roles and Practices.

UNIT III

Agility and Knowledge Management

Agile Information Systems, Agile Decision Making - Earl̲S Schools of KM, Institutional Knowledge Evolution Cycle, Development, Acquisition, Refinement, Distribution, Deployment , Leveraging, KM in Software Engineering, Managing Software Knowledge, Challenges of Migrating to Agile Methodologies, Agile Knowledge Sharing, Role of Story- Cards, Story-Card Maturity Model (SMM).

UNIT IV

Agility and Requirements Engineering

Impact of Agile Processes in RE–Current Agile Practices, Variance, Overview of RE Using Agile, Managing Unstable Requirements, Requirements Elicitation, Agile Requirements Abstraction Model, Requirements Management in Agile Environment, Agile Requirements Prioritization, Agile Requirements Modeling and Generation, Concurrency in Agile Requirements Generation.

UNIT V

Agility and Quality Assurance

Agile Product Development, Agile Metrics, Feature Driven Development (FDD), Financial and Production Metrics in FDD, Agile Approach to Quality Assurance - Test Driven Development,

Agile Approach in Global Software Development.

Recommended Books
1. Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, David J. Anderson and Eli Schragenheim, Prentice Hall.
2. Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Hazza and Dubinsky, Springer.
3. Agile and Iterative Development: A managers Guide‖, Craig Larman, Addison-Wesley.
4. Agile information systems: conceptualization, construction, and management, Kevin C. Desouza, Butterworth-Heinemann.

MCA-E405-5   Parallel Computing

UNIT I

Fundamentals of Parallel Computing
Need for Parallel Computing, Parallel Computer Models, ILP, TLP and Data Parallelism, Parallel Programming Overview, Processes, Tasks and Threads, Parallel Programming Models, Shared Memory Programming, Message Passing Paradigm, Interaction and Communication, Interconnection Networks.

UNIT II

Challenges of Parallel Programming
Identifying Potential Parallelism, Techniques for Parallelizing Programs, Issues, Cache Coherence issues, Memory Consistency Models, Maintaining Memory Consistency, Synchronization Issues, Performance Considerations.

UNIT III

Shared Memory Models and Openmp Programming
OpenMP Execution Model, Memory Model and Consistency, Open MP Directives, Run Time Library Routines, Handling Data and Functional Parallelism, Performance Considerations.

UNIT IV

MPI Programming
The MPI Programming Model, MPI Basics, Circuit Satisfiability, Global Operations, Asynchronous Communication, Collective Communication, Other MPI Features, Performance Issues, Combining OpenMP and MPI.

UNIT V

Programming Heterogeneous Processors
PU Architecture, Basics of CUDA, CUDA Threads, CUDA Memories , Synchronization Handling, Performance Issues, Application Development. Introduction to OpenCL.

Recommended Books
1. An Introduction to Parallel Programming, Peter S. Pacheco, Morgan Kaufmann.
2. Parallel programming in C with MPI and OpenMP, Michael J Quinn, Tata McGraw Hill.
3. Programming Massively Parallel Processors, David B. Kirk and Wen-mei W. Hwu, Morgan Kaufmann.
4. Concurrent Programming: Principles and Practice, Greg Andrews, Addison Wesley.
5. Principles of Concurrent Programming, M. Ben-Ari, Prentice Hall.
6. Introduction to Parallel Computing by Ananth Grama, Anshul Gupta, Geroge Karypis, Vipin Kumar, Pearson

MCA-E405-6   Information Systems & Cyber Security

UNIT I

Security Essentials

Introduction, Elements of Information security, Security Policy, Techniques, steps, Categories, Operational Model of Network Security, Basic Terminologies in Network Security.

UNIT II

Cyber Crime

Concept of Cyber Crimes, Categories of cyber crime, Types of Cyber crimes, Viruses, worms, software piracy, Web jacking, Web Defacement, Cyber Stalking, Cyber Pornography, Hacking, Phishing, e-fraud, threatening email, Cyber Terrorism.

UNIT III

Cyber Laws and Security

Introduction to Cyber Law, Definition, Objectives of Cyber Law, Need, Scope, Copyright issues in Cyberspace, Data encryption, Cryptography, Digital Signatures, Password, Encrypted smart card, Bio-metric, firewall. Information Security Management System and other Security Compliances, Security Assurance, Security Laws, International Standards, Security Audit, SSE-CMM / COBIT etc

UNIT IV

Information Technology Act

Background of Information Technology Act 2000, Preliminary, Definitions, amendments, Authentication of electronic records, Legal recognition of electronic records, Legal recognition of digital signatures, Attribution, Regulation of Certifying Authorities, Acknowledgment and Dispatch of electronic records, Secure records and secure digital signatures, Functions of controller, Duties of Subscribers, Penalties and Offences.

UNIT V

Intellectual Property Rights

Introduction, objectives of copyright, Requirement and meaning of copyright, copyright as a bundle of rights, Framing, Linking and Infringement, Information Technology act related to copyright, Linking and Infringement, information Technology act related to Copyright

Recommended Books

1. Cyber Laws, Dr Gupta & Agrawal, Premier publishing Company
2. Cyber Law simplified, Vivek Sood, Tata MaGraw-Hill
3. Nature of Cyber Laws, S.R. Sharma, Anmol Publications
4. Dimensions of Cyber Crime, S.R. Sharma, Anmol Publications
5. Computer Forensics & Cyber Crimes , Marjie Britz , Pearson.
6. e-Commerce - Concepts, Models, Strategies, C S V Murthy, Himalaya Publishing House
7. Electronic Commerce, Elias M Awad, Pearson Education

MCA-E405-7   Robotics

UNIT I

Introduction

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems Hydraulic, Pneumatic and Electric system.

UNIT II

End Effectors and Robot Controls

Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver, LVDT-Motion Interpolations-Adaptive control.

UNIT III

Robot Transformations and Sensors

Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation- Homogeneous coordinates, multiple transformation-Simple problems. Sensors in robot, Touch sensors-Tactile sensor, Proximity and range sensors, Robotic vision sensor-Force sensor-Light sensors, Pressure sensors.

UNIT IV

Robot Cell Design and Applications

Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using MATLAB, NXT Software Introductions-Robot applications Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting and undersea robot.

UNIT V

Micro/Nano Robotics System

Micro/Nanorobotics system overview-Scaling effect-Top down and bottom up approach- Actuators of Micro/Nano robotics system-Nanorobot communication techniques-Fabrication of micro/nano grippers-Wall climbing micro robot working principles-Biomimetic robot-Swarm robot-Nanorobot in targeted drug delivery system.

Recommended Books
1. Robotics Technology and flexible automation, S.R. Deb, Tata McGraw-Hill Education.
2. Industrial Robotics, Technology programming and Applications, . Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, McGraw Hill.
3. Robotics Engineering an Integrated Approach, Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Phi Learning.
4. Engineering foundation of Robotics, Francis N. Nagy, Andras Siegler, Prentice Hall Inc.
5. Robotics and Image Processing an Introduction, P.A. Janaki Raman, Tata McGraw Hill Publishing company Ltd.

MCA-P401   Minor Project Lab

Students can get acquainted with the concept of web technology and its role in industry. They also learn new web language and framework based on which Minor project is to be developed.

MCA-P402   Web Technologies Lab

The faculty offering the course can adopt variations in tune with DBMS subject.
Lab is expected to cover Conceptual designs using ER diagrams; Design and implementation of small DBMS; SQL queries.

M.C.A. SEMESTER - V

MCA-T501   Artificial Intelligence and Machine Learning

UNIT I

Overview of AI, Problems, Problem space and searching techniques, Definition- production system, Control strategies- forward and backward chaining, Heuristic search techniques-Hill Climbing, Breadth first Search, A* algorithm, AND/OR Graphs, Knowledge representation-First Order predicate logic, Resolution Principles and unification, Horn clause

UNIT II

Neural Architecture: Neuron model, transfer function, hamming and Hopfield network, perceptron: Linear Separability, learning rule. Back propagation: generalized delta rule, limitations, Neural network applications: Pattern classification, function approximation

Expert System: Introduction, Component, development process. Learning, Planning and Explanation in Expert Systems, Study of existing expert systems: MYCIN & AM.

UNIT III

Machine Learning: Learning, Types of Machine Learning, Learning: Supervised, associative, competitive, unsupervised learning. Unsupervised learning: Self-organizing maps, Adaptive Resonance Theory
Linear Models
Multi-layer Perceptron, Going Forwards, Going Backwards: Back Propagation Error, Multilayer Perceptron in Practice, Examples of using the MLP, Overview, Deriving Backpropagation, Radial Basis Functions and Splines, Concepts, RBF Network, Curse of Dimensionality, Interpolations and Basis Functions, Support Vector Machines.

UNIT IV

Tree and Probabilistic Models
Learning with Trees, Decision Trees, Constructing Decision Trees, Classification and Regression Trees, Ensemble Learning, Boosting, Bagging, Different ways to Combine Classifiers, Probability and Learning, Data into Probabilities, Basic Statistics, Gaussian Mixture Models, Nearest Neighbor Methods, Unsupervised Learning, K means Algorithms, Vector Quantization.

UNIT V

Dimensionality Reduction and Evolutionary Models
Dimensionality Reduction, Linear Discriminant Analysis, Principal Component Analysis, Factor Analysis, Independent Component Analysis, Locally Linear Embedding, Isomap, Least Squares Optimization, Genetic Algorithms, Reinforcement Learning, Markov Decision Process
GRAPHICAL MODELS: Markov Chain Monte Carlo Methods, Sampling, Proposal Distribution, Markov Chain Monte Carlo, Graphical Models, Bayesian Networks, Markov Random Fields, Hidden Markov Models, Tracking Methods

Recommended Books
1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
2. Artificial Intelligence: A Modern Approach. Stuart Russell and Peter Norvig. Prentice Hall,
3. Introduction to AI & Expert System: Dan W. Patterson, PHI.
4. Building Expert Systems, Jackson, John Wiley
5. Machine Learning, C. Bishop T. M. Mitchell,   McGraw-Hill
6. Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.

MCA-T502   Advanced Java Programming

UNIT-I
J2EE Platform: Enterprise architecture style(2 tier, 3 tier, N tier), J2EE run time, J2EE APIs, J2EE technology, web components, EJB, Developing J2EE applications.

Database Programming with JDBC: Database drivers, java.sql package, javax.sql package, Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data, The Statement Interface, PreparedStatement, CallableStatement The ResultSet Interface, Updatable Result Sets, connection pooling, distributed transactions, RowSet operations.

UNIT-II
Servlets: Servlet API, Overview of Servlet, Servlet Life Cycle, HTTP Methods Structure and Deployment descriptor ServletContext and ServletConfig interface, Attributes in Servelt, Request Dispacher interface

Filter API: Filter, FilterChain, Filter Config Cookies and Session Management: Understanding state and session, Understanding Session Timeout and Session Tracking, URL Rewriting

UNIT-III
Java Server Pages: JSP Overview, Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, JSP Directives, JSP Action, JSP Implicit Objects JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking JSP Database Access, JSP Standard Tag Libraries, JSP Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing.

UNIT-IV
Java Server Faces: Introduction to JSF, JSF request processing Life cycle, JSF Expression Language, JSF Standard Component, JSF Facelets Tag, JSF Convertor Tag, JSF Validation Tag, JSF Event Handling and Database Access, JSF Libraries

Hibernate: Overview of Hibernate, Hibernate Architecture, Hibernate Mapping Types, Hibernate O/R Mapping, Hibernate Annotation, Hibernate Query Language 7

UNIT-V
Java Web Frameworks: Spring MVC, Overview of Spring, Spring Architecture, bean life cycle, XML Configuration on Spring, Managing Database, Managing Transaction

EJB Architecture and Design: What are EJBs, EJB Components, Session beans, Entity beans, Message Driven beans, Life Cycle of Beans, EJB container and its services, working with EJB, design of the EJB tier

Recommended Books
1. Professional Java Server Programming by Subrahmanyam Allamaraju, Cedric Buest Wiley Publication
2. Spring in Action 3rd edition , Craig walls, Manning Publication
3. Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication
4. Java Server Faces in Action, Kito D. Mann, Manning Publication
5. JDBC™ API Tutorial and Reference, Third Edition, Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley
6. Beginning JSP, JSF and Tomcat, Giulio Zambon, Apress
7. Complete Reference J2EE by James Keogh McGraw publication

MCA-E503   **Departmental Elective III**

MCA-E503-1   **Open Source Operating Systems and Shell Programming**
UNIT I
History and Overview of GNU/Linux and FOSS

Definition of FOSS & GNU, History of GNU/Linux and the Free Software Movement, advantages of Free Software and GNU/Linux, FOSS Usage, Basic Commands, PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip,file permissions, networking commands, text processing utilities

UNIT II
Introduction to Shells:

Overview of Different Shells: Common features, Differing features, Standard Streams,Redirection, Filters and Pipes, Command Execution, Variables, Predefined Variables, Options, Shell/Environment Customization, Grep, sed, awk.

Shell Programming

Basic Script concepts, Expressions, Decisions:Making Selections, Repetition, special Parameters &Variables, changing Positional Parameters, Argument Validation, Debugging Scripts & Examples.

UNIT III
Process Management:

Process Creation, parent and child processes, background and foreground process, priority commands, nice, kill.

File Management:

File Structures, System Calls for File Management, create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API, opendir, readdir, closedir, mkdir, rmdir, umask.

UNIT IV
System Administration

GNU/Linux OS Installation--Detect Hardware, Configure Disk Partitions & File Systems And Install A GNU/Linux Distribution; Common System Configuration Files & Log Files ; Configuring Networking, Basics of TCP/IP Networking And Routing, Connecting to the Internet (Through Dialup, DSL, Ethernet, Leased Line)

Configuring Additional Hardware - Sound Cards, Displays & Display Cards, Network Cards, Modems, USB Drives, CD Writers; Accessing the Internet, Playing Music, Editing Documents and Spreadsheets, Sending and Receiving Email, Copy Files from Disks and Over the Network, Playing Games, Writing Cds ; X Window System Configuration and Utilities--Configure X Windows, Detect Display Devices; Installing Software From Source Code as well as Using Binary Packages.

UNIT V
Server Setup and Configuration

Setting up Email Servers--Using Postfix(SMTP Services),Courier(IMAP &POP3 Services),Squirrel Mail (Web Mail Services) ; Setting up Web Servers --Using Apache (HTTP Services), Php (Server-Side Scripting), Perl (CGI Support) ; Setting up File Services --Using Samba (File and Authentication Services for Windows Networks), Using NFS (File Services For Gnu/Linux / Unix Networks).

Setting up Proxy Services --Using Squid (Http / Ftp / Https Proxy Services) ; Setting up Printer Services -Using CUPS (Print Spooler), Foomatic (Printer Database) ; Setting up a Firewall -Using netfilter and iptables

Recommended Books

1. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg. Thomson
2. Your the ultimate guide, Sumitabha Das, TMH. 2nd Edition.
3. Unix for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson Education.
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. The Complete Reference Unix, Rosen, Host, Klee, Farber, Rosinski, Second Edition, TMH.
6. Introduction to Linux: Installation and Programming, N. B. Venkateshwarlu, B S Publishers.
7. Running Linux, Matt Welsh, Matthias Kalle Dalheimer, Terry Dawson, and Lar Kaufman, O'Reilly Publishers.

MCA-E503-2   Embedded Systems

UNIT I

Overview and General Purpose Processor

Overview: Overview of embedded systems, Design challenges, common design metrics, processor technologies: general purpose processors, single-purpose processors, application specific instruction set processors, IC technologies- full custom/VLSI, semicustom ASIC, PLD, Design Technologies- compilation/ synthesis, libraries/ IP, test/ verification.

General-Purpose Processors: Basic architecture, datapath, control unit, memory, operation, instruction execution, pipelining, superscalar and VLIW architectures, programmers view, instruction set, program and memory data space, registers, I/O, interrupts, development environment, design flow and tools, debugging and testing, selecting a microprocessor.

UNIT II

Custom Processors

Custom-Single purpose processors: Custom single purpose processor design, optimizing custom single processors.

Standard single-purpose processors: peripherals Timers, counters, watchdog timers, UART, Pulse width modulator, LCD controller, Keypad controller, ADC, Real time clocks.

UNIT III

Application Specific Instruction Set Processors

Application Specific Instruction Set Processor (ASIP) Design: ASIP Design methodologies, steps involved in ASIP design: application analysis, design space exploration, generation of software tools like compiler, debugger, instruction set simulator etc., synthesizing processor. Simulation based and scheduler based design space exploration techniques and their comparison.

UNIT IV

Memory and Interfacing

Memory: Memory write ability and storage performance, Common memory types, composing memories, memory hierarchy and cache, advanced RAM: DRAM, FPM DRAM, EDO DRAM, SDRAM, RDRAM, Memory management Unit.

Interfacing: Arbitration, Muti-level bus architectures, Serial protocols: I2C bus, CAN bus, Fire Wire bus, USAB, Parallel protocols: PCI and ARM bus, Wireless Protocols: IrdA, Bluetooth, IEEE802.11.

UNIT V

Case Study

Case study of embedded system (Digital Camera): Introduction to a simple digital camera- user's perspective and designer's perspective, requirements specification- non functional requirements, informal functional specification, refined functional specification. Design alternatives- microcontroller alone, microcontroller and CCDPP, microcontroller and CCDPP/ Fixed-Point DCT, microcontroller and CCDPP/DCT.

Recommended Books

1. Frank Vahid & Tony Givargi s: Embedded system design: A unified hardware/software Introduction, John Wiley & Sons Inc. 2002.
2. Denial D. Gajski, Frank Vahid: Specification and design of embedded systems, PH
3. Jonathan W. Valvano: Embedded Microcomputer Systems, Thomson Learning
4. Myke Predko: Programming and Customizing the 8051 Micro Controller, TMH
5. Ayala: 8051 Micro controllers, Penram Press

MCA-E503-3   Ethical Hacking and Digital Forensics

UNIT I

Computer network and defense fundamentals, Network security threats, vulnerabilities, attacks. Overview of the Top 20 OWASP Security vulnerabilities. CVSS Scoring system including VAPT techniques.

UNIT II

Network security controls, protocols, and devices, Network security policy design and implementation, Physical security, Host security, Secure firewall configuration and management, Secure IDS configuration and management, Secure VPN configuration and management

Wireless network defense, Network traffic monitoring and analysis, Network risk and vulnerability management, Data backup and recovery, Network incident response and management,

UNIT III

Ethical hacking, Foot printing and reconnaissance, Scanning networks, Enumeration, Sniffing, System hacking, Malware threats, Social engineering, Denial of service, Session hijacking, Hacking web applications, SQL injection, Hacking wireless networks, Hacking web servers, Hacking mobile platforms, Evading IDS, Firewalls, and Honeypot.

UNIT IV

Computer forensics in today's world
Computer forensics investigation process,   Data Acquisition and Duplication, Understanding hard disks and file systems, Defeating anti-forensics techniques, Operating system forensics, Network forensics, Investigating web attacks, Database forensics, Cloud forensics, Malware forensics, Investigating email crimes, Mobile forensics process,

UNIT V

Mobile OS architecture, boot process, and file systems, Mobile threats and security, Forensics report writing and presentation,   encryption and stenography analysis. Investigation process: legal process of investigation, jurisdiction and agencies, internet investigation, IP address and domain names, investigation method, evidence collection .
Legal Issues: Constitutional law, search and seizure guidelines, ECPA, challenges in process, international computer crime law.

Recommended Books
1. Hacking for Dummies, Kevin Beaver,Wiley
2. Computer Forensics: Incident Response Essentials, Jay G. Heiser and Warren G. Kruse,Pearson
3. Ethical Hacking and Penetration Testing Guide,**Rafay Baloch,CRC Press**
4. Handbook of Digital Forensics and Investigation, Eoghan Casey,Elsevier.

MCA-E503-4   **Mobile Application Development**

UNIT I
Introduction
Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Mobile User, More on UIs, VUIs and Mobile Apps, Multichannel and Multimodal UIs.

UNIT II
Overview   of Android, Architecture, Application Components, Resources, Services, Broadcast Receivers, Content Providers, Fragments, Intents/Filters, User Interface, UI Layouts, UI Controls: TextView, EditText, buttons, toggle buttons, time picker, Date picker, Creating the Layout and Activity, Event Handling, Drag and Drop, Notifications, Publishing Android Applications.

UNIT III
Storing the Data Persistently:
Persistent data storage using queries (CRUD), Internal Storage, external Storage, Using the SQLite Database, Networking in Android, Accessing Web Services Using HTTP: POST, GET Method, JSON Services

UNIT IV
Intents and Services, Location Based Services: Google Maps
Working with Graphics and Animation: Using Drawing the Drawable Object,Referencing an Image File,Defining Drawable in XML,Using the Shape Drawable Object,Working with the Nine Patch Drawable Graphics,Understanding the Concept of Hardware Acceleration

UNIT V
Introduction to iOS, Architecture, Application Components, Resources, Services, current trends and latest developments.

Recommended Books
1. Android Application Development Black Book, Pradeep Kothari, Wiley
2. Head First Android Development: A Brain-Friendly Guide, David Griffiths and Dawn Griffiths,O'reilly
3. Professional Android 4 Application Development, Reto Meier,Wiley
4. iOS Programming: The Big Nerd Ranch Guide,
5. Learning iOS UI Development Paperback , Yari D'areglia, PACKT Publishing
6. Mastering iOS 10 Programming, Donny Wals, PACKT Publishing

MCA-E503-5   Data Mining and Data Warehousing

UNIT I

Database Introduction Database Introduction: Database Management System Concepts and Architecture, Normalization, RDBMS, Concurrency control. Introduction to Data Warehouses, Differences between Operational Database Systems and Data Warehouses, a multidimensional Data Model, Data Warehouse Architecture, Three-tier Data Warehouse Architecture, Steps for the design and construction of Data Warehouses,

UNIT II

Conceptual Data Architecture, Logical Architectures-star schema, snowflake, constellation, facttable and dimensions tables, Design Techniques. Data Warehouse Implementation Data Warehouse and OLAP Technology for Data Mining, Data Warehouse and OLAP Technology for Data Mining:, Data Marts, Metadata, OLAP, Categorization of OLAP Tools.

UNIT III

Data Preprocessing(ETL Process): Data Cleaning, Data Integration and Transformation, Data Reduction, Data Mining Primitives, Concept Description, Mining Association Rules and Algorithms.

UNIT IV

Data Mining Methods Data Mining Methods –Correlation Analysis, Classification and Prediction - Basic Concepts, Statistical based classification, Decision Tree Induction, K Nearest Neighbors, Rule Based Classification, Classification by Backpropagation, Support Vector Machines

UNIT V

Clustering and Introduction to Fuzzy Logic Clustering and Introduction to Fuzzy Logic: Cluster Analysis, Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Outlier Analysis, Data Mining Applications. Crisp set and Fuzzy set, Basic concepts of fuzzy sets, membership functions. Basic operations on fuzzy sets, Properties of fuzzy sets, Fuzzy relations. Propositional logic and Predicate logic

Recommended Books

1. Fundamentals of Database Systems, Elmasri, Navathe: Addison Wesley, Pearson Education.
2. Data Warehousing, Data Mining & OLAP, Alex Berson and Stephen J. Smith, Tata McGraw,Hill
3. Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber, Elsevier.
4. Introduction To Data Mining, Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Person Education.
5. Insight into Data mining Theory and Practice, K.P. Soman, Shyam Diwakar and V. Ajay, Prentice Hall of India.
6. Introduction to Data Mining with Case Studies,G. K. Gupta,Prentice Hall of India.

MCA-E504   **Departmental Elective IV**

MCA-E504-1   **Bio-Informatics**
UNIT I
Introduction
Need for Bioinformatics technologies, Overview of Bioinformatics technologies Structural bioinformatics, Data format and processing, Secondary resources and applications, Role of Structural bioinformatics - Biological Data Integration System.

UNIT II
Datawarehousing and Datamining In Bioinformatics

Bioinformatics data,Data warehousing architecture, data quality, Biomedical data analysis, DNA data analysis,Protein data analysis,Machine learning,Neural network architecture and applications in bioinformatics

UNIT III
Modeling for Bioinformatics
Hidden markov modeling for biological data analysis, Sequence identification –Sequence classification,multiple alignment generation,Comparative modeling –Protein modeling,genomic modeling,Probabilistic modeling,Bayesian networks,Boolean networks - Molecular modeling,Computer programs for molecular modeling.

UNIT IV
Pattern Matching and Visualization
Gene regulation,motif recognition,motif detection,strategies for motif detection,Visualization,Fractal analysis,DNA walk models,one dimension,two dimension,higher dimension,Game representation of Biological sequences,DNA, Protein, Amino acid sequences.

UNIT V
Microarray Analysis
Microarray technology for genome expression study,image analysis for data extraction, preprocessing, segmentation, gridding, spot extraction, normalization, filtering, cluster analysis, gene network analysis, Compared Evaluation of Scientific Data Management Systems, Cost Matrix, Evaluation model - Benchmark - Tradeoffs

Recommended Books
1. BioInformatics Technologies, Yi-Ping Phoebe Chen (Ed), Springer Verlag.
2. BioInformatics, Managing Scientific data, Zoe lacroix and Terence Critchlow, Elsevier.
3. Bio Informatics Computing, Bryan Bergeron,Pearson Education.
4. Introduction to Bioinformatics, Arthur M Lesk, Oxford University Press.

MCA-E504-2   Internet of Things

UNIT I

Introduction to IoT: Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology

UNIT II

IoT Architecture M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

UNIT III

IoT Protocols

Protocol Standardization for IoT,Efforts,M2M and WSN Protocols, SCADA and RFID Protocols, Unified Data Standards, Protocols, IEEE 802.15.4,BACNet Protocol, Modbus– Zigbee Architecture, Network layer,6LowPAN - CoAP - Security

UNIT IV

Building IoT With Raspberry Pi & Arduino

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python,IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT V

Case Studies and Real-World Applications

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT, Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

Recommended Books
1. Internet of Things, A hands-on approach Arshdeep Bahga, Vijay Madisetti, Universities Press,
2. Architecting the Internet of Things Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), Springer.
3. The Internet of Things in the Cloud: A Middleware Perspective Honbo Zhou, CRC Press.
4. The Internet of Things, Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley.

MCA-E504-3   Soft Computing

UNIT I

Introduction: Soft Computing, Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

UNIT II

Neural Networks

Neural Network, Applications of ANN, Learning rules and various activation functions, Single layer Perceptron's, Back Propagation networks, Architecture of Back propagation (BP) Networks, Backpropagation Learning, Variation of Standard

UNIT III

Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

UNIT IV

Fuzzy Systems

Introduction to Fuzzy logic, Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification, Fuzzy membership functions, Operations on Fuzzy sets. Fuzzy relations, Fuzzy proposition, Fuzzy implications, Fuzzy inferences Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method.

UNIT V

Genetic Algorithm: History of Genetic Algorithms (GA), Working Principle, Various Operators-Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Solving optimization problems, Multi-level Optimization.

Recommended Books

1. Genetic Algorithm in Search Optimization and Machine Learning, David E. Goldberg, Pearson Education India.
2. Neural Networks Comprehensive Foundation, Simon Haykin, Pearson Education.
3. Genetic Algorithms: Search and Optimization, E. Goldberg Addision-Wesley
4. Neuro-Fuzzy and Soft Computing, J.S.R.Jang, C.T. Sun and E.Mizutani, PHI /Pearson Education
5. Principles of Soft Computing, S.N.Sivanandam and S.N.Deepa, Wiley India Pvt Ltd.
6. Fuzzy Set Theory: Foundations and Applications, George J. Klir, Ute St. Clair, Bo Yuan, Prentice Hall.
7. Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications S.Rajasekaran and G.A.Vijayalakshmi Pai, Prentice-Hall of India Pvt. Ltd.
8. Neural Networks Algorithms, Applications, and Programming Techniques, James A. Freeman, David M. Skapura, Pearson Education India.

MCA-E504-4   Ad Hoc Networks

UNIT I

Introduction

Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum –Radio propagation Mechanisms, Characteristics of the Wireless Channel -mobile ad hocnetworks (MANETs) and wireless sensor networks (WSNs): concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT II

Mac Protocols for Ad Hoc Wireless Networks

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention Based Protocols -Reservation and Scheduling Mechanisms - Other Protocols. Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms –Multi channel MAC-IEEE 802.11

UNIT III

Routing Protocols and Transport Layer in Ad Hoc Wireless Networks

Design Issues and Classifications of unicast and multicast Routing Protocols - proactive routing, reactive routing (on-demand), hybrid routing protocols, Energy Efficient and QoS guaranteed multicast protocols.

UNIT IV

Routing Protocol: Global State Routing (GSR), Dynamic State Routing (DSR), Fisheye State Routing (FSR), Ad hoc On-Demand Distance Vector (AODV), Destination Sequenced Distance, Vector outing (DSDV).   Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT V

Wireless Sensor Networks (WSNS) and Mac Protocols

Single node architecture: hardware and software components of a sensor node, WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

Recommended Books

1. Ad Hoc Wireless Networks, C. Siva Ram Murthy and B.S. Manoj
2. Ad Hoc Mobile Wireless Networks: Protocols and Systems, C.K. Toh, Prentice Hall PTR,
3. Ad Hoc Networking, Charles E. Perkins, Addison Wesley,
4. Wireless Communications: Principles and Practice, T.Rappaport, Prentice Hall,
5. Principles of Wireless Networks, K. Pahlavan & P. Krishnamurthy, Prentice Hall

MCA-E504-5   Distributed Databases

UNIT I

Overview of Distributed Database System

Distributed Database System (DDBS), Features of DDBS, promises of DDBS, Design issue in DDBS, Distributed DBMS architecture: - components of DDBMS Client/server System, Peer-to-Peer, Multi-Database system.

Distributed Database Design: Distributed database design concept, objective of Data Distribution, top-down, bottom-up patterns, technical design (fragmentation, allocation and replication of fragments, optimality, heuristics)

UNIT II

Distributed Transaction and Concurrency Control

Introduction to Distributed Transaction management, definition and examples, properties, classification, processing issues, execution, Model for Transaction management.

Distributed Concurrency control:-Objective, concurrency control anomalies, Distributed Serializability, locking based algorithm, Timestamp based algorithm. deadlock management

Distributed Deadlock and Recovery

Introduction to Deadlock, Distributed Deadlock prevention, avoidance, detection and recovery, Two-Phase and Three-Phase Commit Protocol.

UNIT III

Distributed Query Processing and Optimization

Overview of distributed query processing, Query optimization, Global query optimization, Query decomposition and data localization: normalization, analysis, elimination of redundancy, rewriting, reduction for HF, reduction for VF, ordering of joins and semi joins, query optimization algorithms, INGRES, System R

UNIT IV

Reliability: definitions, basic concepts, local recovery management, distributed reliability protocols 2Phase Commit protocol

Heterogeneous Database

Architecture of Heterogeneous Database, Database Integration**: -** Schema Translation and schema Integration, Query processing issues in Heterogeneous database.

UNIT V

XML

XML for data integration, structure of XML, XML document schema, Querying and Transformation, storage of XML data, XML application, Brief introduction of distributed database

Recommended Books

1. Principles of Distributed Database Systems, M.T. Ozsu and P. Valduriez, Prentice-Hall.
2. Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley.

MCA-E504-6   Natural Language Processing

UNIT I

Overview and Language Modeling

Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages - NLP Applications-Information Retrieval. Language Modeling: Various Grammar- based Language Models-Statistical Language Model.

UNIT II

Word Level and Syntactic Analysis

Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.

UNIT III

Semantic Analysis and Discourse Processing

Semantic   Analysis: Meaning Representation Lexical Semantics Ambiguity, Word Sense Disambiguation. Discourse Processing: cohesion-Reference, Resolution, Discourse Coherence and Structure.

UNIT IV

Natural Language Generation and Machine Translation

Natural Language Generation: Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation-Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.

UNIT V

Information Retrieval and Lexical Resources

Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval, valuation Lexical Resources: World Net-Frame Net- Stemmers-POS Tagger- Research Corpora.

Recommended Books

1. Natural Language Processing and Information Retrieval, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press.
2. Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, Daniel Jurafsky and James H Martin, Prentice Hall.
3. Natural Language Understanding, James Allen, Benjamin /Cummings publishing company,

MCA-OE505	Open Elective
MCA-OE505-1	**Communication Through Drama**
MCA-OE505-2	**Professional Ethics & Morals**
MCA-OE505-3	**Intellectual property Rights & Patents**
MCA-OE505-4	**Entrepreneurship**
MCA-OE505-5	**Operations Research**
MCA-OE505-6	**Research Methodologies**
MCA- OE505-7	**Number Theory**
MCA- OE505-8	**Modern Algebra**
MCA- OE505-9	**Digital Marketing**

M.C.A. SEMESTER - VI

MCA-T601   **Project Work**

Only the projects submitted by the candidates as per following guidelines will be evaluated.

1. Project to be selected by the student at the **end** of **fifth Semester**
2. The project must be of approximately **480** man hours and so **certified** by the **supervisor** of the project
3. The project must be submitted in the form in consonance with the format enclosed
4. **Monthly progress report** must be **submitted** through supervisor in the enclosed format.
5. Project must be submitted before the prescribed last date .
6. Candidates are required to make a **presentation** of their project work during their project examination
7. Students whose Projects graded as **unsatisfactory** will **given one more chance** to undertake **another project** under another supervisor /organization.
8. The project work of the candidates whose monthly progress report is not submitted will be considered as incomplete and may be **terminated** within **two weeks** from the prescribed due date.
9. Students will be allowed to undertake project works only at the bonafide organizations / research project under the supervision of departmental faculty.
10. Students are required to **give two seminars** during the project work, one at the **end of 2nd month** and another at the **end of 4th month**. However, candidates working for their project in organizations **outside the state** need **to give only one seminar** during the entire project period.
11. Examination of the project work will be conducted by a committee consisting of at least **two internal examiners and one external examiner.**

Guidelines for Project in partial fulfillment of the requirement of MCA course

(a) The project will consist of two parts:
    1. Documentation   2. Viva-voce
(b) The **source-code** and the **executable** code have to be submitted on CD/DVD and student must **demonstrate** working of the software.
(c) Project shall be original and **not copied** from the existing material from any source and a certificate, as per format given will be provided with the Project, duly countersigned by the supervisor.
(d) Project will be submitted only when the candidate completes all papers though he or she may start the projects earlier.
(e) Presentation of the Project will be in the accepted norms; as laid down in various text- books; IEEE standard/ ISO standards etc., are some models to follow.
(f) As far as possible, the Project should be of **Real life problem / Social Impact / Commercially viable solution.**
(g) Though the Project is given 480 hours, the student is expected to use his/her discretion to ensure that it is large enough to be of **practical value.**
(h) The number of hours will **not include** the hours for writing and documentation of the Project.
(i) During the presentation of the Project at via-voce the candidate is advised to have a computer based or an overhead project presentation material handy.

PERFORMA FOR CERTIFICATE

This   is   to   certify   that   this   is   a   bonafied   record   of   the   Project   entitled

_____

was done satisfactory at _____ by Mr./Ms.

_____ in partial fulfillment of MCA course. He/ She has successfully completed all

the subjects.

This report had not been submitted for any other examination and does not form part of any other course undergone by the candidate.

PLACE:

DATE: SIGNATURE

                                                                         NAME:

                                                                         DESIGNATION:

                                                                         (Name & Seal of Supervisor)

PROFORMA FOR THE PROJECT REPORT

1. Title of the Project

2. Objectives

3. Input to the Project

4. Output generated

5. Details of Hardware Platform used

6. Details of Software Tools used

7. Implementation Issues (Clearly defining the area of Application).

8. Miscellaneous

9. Signature of the Candidature.

GUIDELINES FOR THE CHAPTERS AND SECTIONS

1. Microscopic Summary
2. Details of candidate and Supervisor along with certificates of:

   - Original Work;

   - Assistance if any;

   - Credits.

3. Aims and Objectives

4. Approach to Project and Time Frame

5. Project Design Description with Appendices to cover:

   - Flow Charts/Data Flow Diagram-Macro/Micro level

   - Source Code

   - Hardware Platform

   - Software Tools

   - Security measures

   - Quality Assurance

   - Auditability

6. Test Data and Result.