

**COURSE STRUCTURE & SYLLABUS
FOR
MCA (2 YEARS)
(W.E.F. 2020-2021)**



महात्मा ज्योतिबा फुले
रुहेलखण्ड विश्वविद्यालय, बरेली

**DEPARTMENT OF CSIT
MJP ROHILKHAND UNIVERSITY
BAREILLY (UP)**

Department of Computer Science & Information Technology

About The Department

The Department of Computer Science and Information Technology was established in 1995. It is an integral constituent of the Faculty of Engineering & Technology, MJP Rohilkhand University, Bareilly. The Department offers regular B.Tech., M.C.A. and Ph.D. programmes.

The B.Tech. and MCA programs are duly approved by the AICTE, New Delhi. Whereas, the commencement of the Integrated M.Tech.-Ph.D. program is under process to start from session 2022-23. The well-equipped laboratories, furnished classrooms, and ICT enabled seminar halls, conference room, individual faculty chambers, the separate building of department with surrounding greenery gives an excellent academic atmosphere among the students.

M.C.A. is a two year professional post graduate program for students who aimed to enter the field of Computer and IT. The MCA Course structure is comprehensive of class room learning and practical learning including subjects such as Programming in C ,DBMS, Data Structure , Cyber Security , Cloud computing and much more .

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Department of Computer Science and Information Technology

MCA Course Structure

M.C.A. First Year (1st Semester)

Sr. No.	Subject Code	Subject Name	L	T	P	Internal Assessment			End Semester Exam	Subject Total	Credits
						CT	TA	Total			
1.	MCA-101	Programming in C	3	1	0	30	20	50	50	100	4
2.	MCA-103	Database Management System	3	1	0	30	20	50	50	100	4
3.	MCA-105	Computer Organization	3	1	0	30	20	50	50	100	4
4.	MCA-107	Data Structures and Algorithms	3	1	0	30	20	50	50	100	4
5.	MCA-109	Principles of Management	3	1	0	30	20	50	50	100	4
6.	MCA-111	Programming in C Lab (Based on MCA-101 & MCA-107)	0	0	3	30	20	50	50	100	3
7.	MCA-113	DBMS Lab	0	0	3	30	20	50	50	100	3
Total										700	26

M.C.A. First Year (2nd Semester)

Sr. No.	Subject Code	Subject Name	L	T	P	Internal Assessment			End Semester Exam	Subject Total	Credits
						CT	TA	Total			
1.	MCA-102	Object Oriented Programming Using JAVA	3	1	0	30	20	50	50	100	4
2.	MCA-104	Cyber Security	3	1	0	30	20	50	50	100	4
3.	MCA-106	Computer Network	3	1	0	30	20	50	50	100	4
4.	MCA-108	Web Technology	3	1	0	30	20	50	50	100	4
5.	MCA-110	Software Engineering	3	1	0	30	20	50	50	100	4
6.	MCA-112	Java Programming Lab (Based on MCA-102)	0	0	3	30	20	50	50	100	3
7.	MCA-114	Operating System Lab using Linux	0	0	3	30	20	50	50	100	3
Total										700	26

Department of Computer Science and Information Technology

MCA Course Structure

M.C.A. Second Year (3rd Semester)

Sr. No.	Subject Code	Subject Name	L	T	P	Internal Assessment			End Semester Exam	Subject Total	Credits
						CT	TA	Total			
1.	MCA-201	Computer Graphics and Animation	3	1	0	30	20	50	50	100	4
2.	MCA-203	Operating System	3	1	0	30	20	50	50	100	4
3.	MCA-205	Dot Net Frame work with C#	3	1	0	30	20	50	50	100	4
4.	MCA-207	Cloud Computing	3	1	0	30	20	50	50	100	4
5.	MCA-***	Elective-I	3	1	0	30	20	50	50	100	4
6.	MCA-209	Dot Net Lab	0	0	3	30	20	50	50	100	3
7.	MCA-211	Industrial Training								100	3
Total										700	26

M.C.A. Second Year (4th Semester)

Sr. No.	Subject Code	Subject Name	L	T	P	Internal Assessment			End Semester Exam	Subject Total	Credits
						CT	TA	Total			
1.	MCA-202	Artificial Intelligence and Machine Learning	3	1	0	30	20	50	50	100	4
2.	MCA-***	Elective-II	3	1	0	30	20	50	50	100	4
3.	MCA-***	Elective-III	3	1	0	30	20	50	50	100	4
4.	MCA-204	Seminar	2	0	0				100	100	2
5.	MCA-206	Advanced Programming Lab	0	0	3	30	20	50	50	100	3
6.	MCA-208	Major Project	0	0	6		50		50	100	9
Total										600	26

Department of Computer Science and Information Technology

MCA Course Structure

List of Electives

Sr. No.	Subject Code	Subject Name	L	T	P	Credit
1.	MCA-351	Theory of Computation	3	1	0	4
2.	MCA-352	Advanced Computer Networks	3	1	0	4
3.	MCA-353	Natural Language Processing	2	1	0	4
4.	MCA-354	Distributed Systems	3	1	0	4
5.	MCA-355	Wireless Network & Mobile Computing	3	1	0	4
6.	MCA-356	Object Oriented Analysis and Design	3	1	0	4
7.	MCA-357	Soft Computing	3	1	0	4
8.	MCA-358	Programming in Python	3	1	0	4
9.	MCA-359	Big Data Analysis	3	1	0	4
10.	MCA-360	Network Security & Cryptography	3	1	0	4
11.	MCA-361	Information Retrieval System	3	1	0	4
12.	MCA-362	GIS and Image Processing	3	1	0	4
13.	MCA-363	Data Analytics using R	3	1	0	4

Note:

1. The industrial training of 6 to 8 weeks has to be done in summer vacation after completion of MCA second semester examination. Students have to submit training completion certificate along with training report in form of a project. Evaluation of industrial training shall be done in MCA third semester based on their report, presentation and viva-voice.
2. The list of ELECTIVES may be changed according to the availability of faculty members.



Detailed Syllabus

M.C.A. First Year

UNIT I

Basics of programming: Approaches to problem solving, Use of high level programming language for systematic development of programs, Concept of algorithm and flowchart, Concept and role of structured programming.

Basics of C: History of C, Salient features of C, Structure of C Program, Compiling C Program, Link and Run C Program, Character set, Tokens, Keywords, Identifiers, Constants, Variables, Instructions, Data types, Standard Input/Output, Operators and expressions.

UNIT II

Conditional Program Execution: if, if-else, and nested if-else statements, Switch statements, Restrictions on switch values, Use of break and default with switch, Comparison of switch and if-else.

Loops and Iteration: for, while and do-while loops, Multiple loop variables, Nested loops, Assignment operators, break and continue statement.

Functions: Introduction, Types, Declaration of a Function, Function calls, Defining functions, Function Prototypes, Passing arguments to a function Return values and their types, Writing multifunction program, Calling function by value, Recursive functions.

UNIT III

Arrays: Array notation and representation, Declaring one-dimensional array, Initializing arrays, Accessing array elements, Manipulating array elements, Arrays of unknown or varying size, Two-dimensional arrays, Multidimensional arrays.

Pointers: Introduction, Characteristics, * and & operators, Pointer type declaration and assignment, Pointer arithmetic, Call by reference, Passing pointers to functions, array of pointers, Pointers to functions, Pointer to pointer, Array of pointers.

Strings: Introduction, Initializing strings, Accessing string elements, Array of strings, Passing strings to functions, String functions.

UNIT IV

Structure: Introduction, Initializing, defining and declaring structure, Accessing members, Operations on individual members, Operations on structures, Structure within structure, Array of structure, Pointers to structure.

Union: Introduction, Declaring union, Usage of unions, Operations on union. Enumerated data types

Storage classes: Introduction, Types- automatic, register, static and external.

UNIT V

Dynamic Memory Allocation: Introduction, Library functions – malloc, calloc, realloc and free.

File Handling: Basics, File types, File operations, File pointer, File opening modes, File handling functions, File handling through command line argument, Record I/O in files.

Graphics: Introduction, Constant, Data types and global variables used in graphics, Library functions used in drawing, Drawing and filling images, GUI interaction within the program.

Books & References:

1. Kanetkar Y., "Let Us C", BPB Publications.
2. Hanly J. R. and Koffman E. B., "Problem Solving and Program Design in C", Pearson Education.
3. Schildt H., "C- The Complete Reference", McGraw-Hill.
4. Goyal K. K. and Pandey H.M., "Trouble Free C", University Science Press
5. Gottfried B., "Schaum's Outlines- Programming in C", McGraw-Hill Publications.

DATABASE MANAGEMENT SYSTEMS

MCA-103

Credits: 4 (3-1-0)

MCA First Year, Semester-I

UNIT- I

Introduction: An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.

UNIT- II

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, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree

UNIT- III

Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus, **Introduction to SQL:** Characteristics of SQL. Advantage of SQL. SQL data types and literals. 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, Unions, Intersection, Minus, Cursors in SQL. induction over

UNIT- IV

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

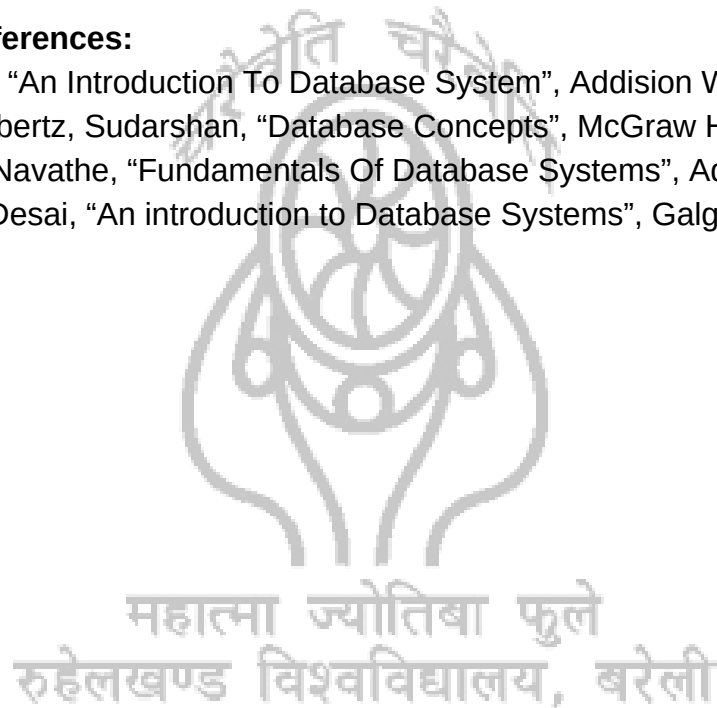
UNIT- V

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

Concurrency Control Techniques: Concurrency control, locking techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction.

Books & References:

- Date C J, "An Introduction To Database System", Addison Wesley.
- Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill.
- Elmasri, Navathe, "Fundamentals Of Database Systems", Addison Wesley.
- Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication.



UNIT I

Introduction and Arithmetic for Computer: - Review of digital logic gates, Design of adder and subtractor using gates & K-MAP. Introduction to number system, negative numbers, Arithmetic Algorithms (Addition, Subtraction, Booth Multiplication), Floating Point Arithmetic Concepts: Mantissa Alignment, Normalization, Biased Exponent Concepts, IEEE standard for Floating point numbers

UNIT II

Processor Design: - Von-Neumann Structure, Processor Organization: General register organization, Types of Registers, Stack Organization, Addressing modes, Instruction types, Program Control, Reduced Instruction Set Computer, Complex Instruction Set Computer

UNIT III

Control Design: - Control memory Structure, Micro Instruction Interpretation, CPU control unit, Hardwired & Micro Programmed Control Unit, basic concepts of micro programmed control, Mapping Scheme, Micro Instruction Format, Micro Program Sequencer for a control memory

UNIT IV

Memory Organization:- Memory Hierarchy, Locality of Reference Concept, RAM and ROM Chips, addressing scheme, CPU Interconnection with RAM & ROM Chips, Virtual Memory Concepts, TLB, characteristics of cache memory (Working Principle, Hit Ratio), Cache memory organization, Page Replacement Policies (FIFO, LRU and Optimal schemes)

UNIT V

System Organization: - Bus arbitration (Serial and Parallel Procedure), Synchronous & Asynchronous Communication, Modes of Transfer, Programmed I/O (IO Addressing, IO Instruction), Direct Memory Access (DMA) (Cycle Stealing Concept, DMA Controller and DMA Transfer), Interrupts (procedure, interrupt selection, vectored interrupts) & Interrupt Handling

Books & References:

1. Computer Architecture and Organization, John P. Hayes, TMH.
2. Computer organization and design, by John L. Hennessy & David A. Petterson, Morgan Kaufman.
3. Computer System Architecture, M. Morris Mano, PHI
4. Computer Organization, William Stallings (PHI)
5. Structured Computer Organization, Tannenbaum (PHI)

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UNIT-I

Introduction to Data Structure: Introduction, Arrays, Stacks, Operations on Arrays and Stack, Queue: Types and operations, Applications of:- Arrays, Stack and queue ,Tower of Hanoi.

Unit II

Linked List, Tree, Graph, Searching and File Structures : Linked List: Types, Application, Garbage Collection and Compaction. Tree: Types, Representation and Terminology, Application, Sequential search, binary search, comparison and analysis, Graph: Types, Representation and Terminology. File Structure: Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Techniques and their Comparisons.

Unit III

Introduction to Algorithms: Analysis, Design and Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences and their solution methods. Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort, Medians and order statistics.

Unit IV

Advanced Design and Analysis Techniques: Dynamic programming, Greedy Algorithm, Backtracking, Branch-and-Bound, Graph Algorithms: Elementary Graph Algorithms, Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal's Algorithms, Prim's Algorithms, Single Source Shortest Path, All pair Shortest Path.

DATA STRUCTURES AND ALGORITHMS

MCA-107

Credits: 4 (3-1-0)

MCA First Year, Semester-I

Unit-V

Randomized Algorithms, String Matching, NP-Hard and NP-Completeness, Approximation Algorithms, Sorting Network, Matrix Operations, Polynomials and FFT, Number Theoretic Algorithms.

Books & References:

1. Y. Langsam, M. Augenstein and A. Tannenbaum, Data Structures using C and C++, Pearson Education Asia,
2. Ellis Horowitz, S. Sahni, D. Mehta Fundamentals of Data Structures in C++, Galgotia Book Source, New Delhi.
3. S. Lipschutz, Data Structures Mc-Graw Hill International Editions
4. Thomas H Cormen Leiserson "Introduction to Algorithms", PHI Learning Private Limited, Delhi India.
5. Aho, "Design and Analysis of Computer Algorithms", Pearson Education. 6. Horowitz and Sahani, "Fundamentals of Computer Algorithms", Galgotia Publications Pvt Ltd Delhi India.
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UNIT I

Management as a discipline: Definition , nature , scope , functions , managerial skills. Management. Thought-Historical Prospective , Social Responsibility of Business.

UNIT II

Planning: Concept and Purpose, Planning process, Management by Objectives (MBO), Decision making.

UNIT III

Organization: Concept and Purpose of organization, types of organization, bases of Departmentation, concept of Authority and Responsibility, Span of Management, Line and Staff Authority, Functional Authority, Delegation of Authority, centralization And Decentralization of Authority, Coordination Staffing.

UNIT IV

Directing: Leadership Concept, Ingredients, Traits, Styles, Roles Communication Concept, Types, Process Barriers, Making Communication effective, importance.

UNIT V

Controlling: Concept, Provides, Requirements for Adequate Control, controlling And earning, Budgeting control Importance, Management Audit, management in future.

Books & References:

1. Drucker, P.F. : Managements, Tasks, Responsibilities, Practices
2. Asha Kaul: Effective Business Communication (PHI)
3. RonLudlow, Fergus Panton: The Essence of Effective Communication(PHI)
4. Efrain, jae, david, H. Micheal: Electronic Commerce : A Managerial Perspective (Pearson Education)
5. Stoner, Freeman, Gilbert Jr.: Management (Pearson education)
6. Kootz, O'Donnell, Weighrich: Essentials of Management.

OBJECT ORIENTED PROGRAMMING USING JAVA

MCA-102

Credits: 4 (3-1-0)

MCA First Year, Semester-II

UNIT I

Introduction: Introduction – what is java, importance of java, java implementation application of java, sample program & compilation, using block of code. **Data type, operators, control structures:** variables, constants, declaration, literals, scope of variable, type casting, arithmetic operators, relational operators, logical operators, assignment operators, increment –decrement operators, conditional operators, bit wise operators, interface of operators, dot operators, if-else, statement, loops (while, do-while, for break, goto, continue return) switch statement, operator, array –declaration, creation, initialization, length, two-dimensional arrays, string-string arrays, string methods, stringbuffer class.

UNIT II

Introduction of classes, objects and methods: What is class, object & method, defining class, adding variables, adding methods, creating objects, constructors THIS key word, garbage collection, finalize() method, accessing class members, vectors and wrapper classes, inheritance, final variables and methods, final classes, finalizer methods, abstract methods and classes, visibility control – public access, friendly access, protected access, private protected access, String class, Command-Line arguments.

UNIT III

Inheritance: Inheritance, Member access, super class, creating multilevel Hierarchy, Method over loading & overriding, Abstract class, method, Using final to prevent overriding & overloading , the object class, packages and interfaces.

UNIT IV

Multithreaded programming: creating threads, run()method, new thread, thread class, stopping & blocking threads, life cycle of threadnewborn, runnable, running, blocked, dead, waiting sleeping, suspended, blocked, using thread methods, thread priority, synchronization, implementing the Runnable interface. **Exception handling:** exception types, uncaught exceptions, multiple catch clauses, nested try statements, throw, throws, finally.

UNIT V

I/O files in java: Concept of streams, difference between character streams and byte streams.

Applet: what is an applet, applet lifecycle, applet class, use of java .awt graphics class and its various methods in an applet, Event Handling, Graphical user interface.

Books & References:

1. Programming with Java A Primer, E. Balaguruswamy Tata McGraw Hill Companies.
2. Java Programming John P. Flynt Thomson 2nd.
3. Java Programming Language Ken Arnold Pearson.
4. The complete reference JAVA2, Hervert schildt. TMH.
5. Big Java, Cay Horstmann 2nd edition, Wiley India Edition.
6. Core Java, Dietel and Dietel.
7. Java – Balaguruswamy.



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UNIT I

Introduction to Information System, Type of information system, Development of information system, CIA model of Information Characteristics, Introduction to Information Security, Need of Information Security, Cyber Security, Business need, Ethical and Professional issues of security.

UNIT II

Information Security Model, Component of an Information security, Aspect of information security, Security attacks (Active and Passive Attacks), Security mechanism and Security Services (X.800).

UNIT III

Information Security Techniques, Introduction to Cryptography: Terminology, cryptanalysis, Security of algorithms, Substitution Cipher and Transposition Cipher, Single XOR, One-way Pad, Cryptographic Protocols: Arbitrated and Adjudicated Protocol, One-Way Hash function, Public key cryptography, Digital Signature, Digital Watermarking Technique: Characteristics and Types.

UNIT IV

Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies- Sample Security Policies.

UNIT V

Information Security Standards-ISO, IT Act 2000 Provisions: Introduction to digital law(cyber law, Intellectual Property, Copyright Law, Patent Law, Software License).

Books & References:

1. Applied Cryptography by Bruce Schneier, John Wiley & Sons
2. Hand book of information security management by Micki Krause, Harold F tipton, CRC Press

Unit 1:

Introduction: Data communication (Problem definition, types of signals, Modulation, Networks Topologies, Categories of Network (LAN, MAN & WAN), Transmission Media (design factors, classes and characteristics of different transmission medias), Switching techniques, Protocols and layering for Internet, Reference models (OSI and TCP/IP), Network devices (NIC, switch, hubs, Repeater, Bridge, Gateway, Router, Access point)

Unit 2:

Data Link Layer: Problem definition, Functions of data link layer, Framing and Data Link Control, Error detection schemes (VRC, LRC, CRC and checksum), Error correction schemes (Hamming), Flow control and sliding window protocols (Simplest, Stop & Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ), Multiple Access protocols (ALOHA family, CSMA family, Contention-free access, polling and token passing method for MAC protocol, Channelization, Ethernet evaluation through generations (Standard, fast, Gigabit), SDLC, HDLC, SLIP and PPP protocols, IEEE standard (802.3, 802.4, 802.5, 802.6, 802.11).

Unit 3:

Network Layer and Internetworking: Problem definition, Datagram and virtual circuit models (IP, MPLS), IP addressing (class-full, Classless, subnetting and super-netting) and forwarding (prefixes, longest matching prefix), IP helpers: ARP, DHCP, Internetworking (fragmentation, path MTU discovery, ICMP), IPv4 datagram, IPv6 header and transition from IPV4 to IPv6, Network Address Translation (NAT), VPN concepts.

Unit 4:

Routing: Problem definition, Routing concepts: Chars, Types, Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Connectionless Service and Connection-Oriented Service, Design elements of routing strategies. Shortest cost routing model, Dijkstra's algorithm, Distance Vector and Link-state routing, Hierarchical routing, Flooding, Broadcast routing, Multicast routing, Routing for Mobile Host.

Unit 5: Transport Layer, and Application layer: Problem definition, Sockets, ports and service, Reliable and unreliable delivery (TCP, UDP), Connection establishment and teardown, General Principles of Congestion Control, Congestion Prevention Policies, Congestion control in datagram subnet, TCP congestion control (slow start, fast retransmission and recovery), Techniques for achieving good Quality of Service: Buffering, Traffic shaping, The leaky bucket algorithm, The Token bucket algorithm; **Application Layer Protocols:** Naming (DNS), Telnet, Electronic Mail, SMTP, ftp, mime, pop3, imap4.

TEXT BOOKS :

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson, Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan. Third, Edition TMH.

REFERENCES :

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson
3. Data Networks, D. Bertsekas and R Gallager, PHI.
4. W. Stallings, Data and Computer Communication, Pearson education.

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UNIT I

Introduction to WWW : Protocols and programs, secure connections, application and development tools, the web browser, Web Design: Web site design principles, planning the site and navigation.

UNIT II

Introduction to HTML : The development process, Htmltags and simple HTML forms, web site structure .Introduction to XHTML : XML, Move to XHTML, Meta tags, Character entities, frames and frame sets, inside browser.

UNIT III

Style sheets : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS.

UNIT IV

Javascript : Client side scripting, What is Javascript, How to develop Javascript, simple Javascript, variables, functions, conditions, loops and repetition , **Advance Javascript** :Javascript and objects, Javascript own objects, the DOM and web browser environments, forms and validations

UNIT V

DHTML : Combining HTML, CSS and Javascript, events and buttons, controlling your browser, Ajax: Introduction, advantages & disadvantages ,Purpose of it ,ajax based web application, alternatives of ajax . **XML** : Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT

Books & References:

1. Steven Holzner,"HTML Black Book", Dremtech press.
2. Web Technologies, Black Book, Dreamtech Press
3. Web Applications : Concepts and Real World Design, Knuckles, Wiley-India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson

UNIT- I

Evolution and impact of Software engineering, software life cycle models: Waterfall, prototyping, Evolutionary and Spiral models. Feasibility study, Functional and Non-functional requirements, Requirements gathering, Requirements analysis and specification.

UNIT- II

Basic issues in software design, modularity, cohesion, coupling and layering, function-oriented software design: DFD and Structure chart, object modeling using UML, Object-oriented software development, user interface design. Coding standards and Code review techniques

UNIT- III

Fundamentals of testing, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, White box and black box testing, Alpha and Beta Testing of Products, Test coverage analysis and test case design techniques, mutation testing, Static and dynamic analysis, Software reliability metrics.

UNIT- IV

Software Maintenance and Software Project Management, Software as an evolutionary entity, need for maintenance, categories of maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance.

UNIT- V

Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Books & References:

- 1.R. S. Pressman, "Software Engineering - A practitioner's approach", III Edition, McGraw Hill International editions, 1992.
- 2.IAN Sommerville, "Software Engineering", Pearson Education Asia, VI Edition, 2000.
- 3.Pankaj Jalote, "An Integrated Approach to software Engineering", Springer Verlag, 1997.



Detailed Syllabus

M.C.A. Second Year

COMPUTER GRAPHICS AND ANIMATION

MCA-201

Credits: 4 (3-1-0)

MCA Second Year, Semester-III

UNIT I

Introduction: Origin of Computer Graphics, Types and applications of Computer Graphics, Working of Interactive Graphics Display. **Display Techniques and Devices:** Point plotting techniques, coordinate systems and incremental methods, line-drawing algorithms, circle generators, Display devices, CRT, inherited memory devices, the storage tube display, refresh line-drawing display, Raster and random display process system.

UNIT II

Two Dimensional Transformation: Transformation Principles, concatenation and matrix representation, Types of 2D transformation, Windowing and Clipping concepts, Window to viewport transformation, Line clipping algorithm, midpoint division, clipping polygon clipping and other graphic entities.

UNIT III

Graphic Packages And Display Files: Graphics Rules for Graphics software design, segments, Graphic Primitives, Window and Miscellaneous functions, Functions for segmenting the display files, Posting and Unposting a segment, Segment naming schemes, Default error conditions and append to segment, Refresh concurrent with reconstruction and free storage allocation, Display file structure, geometric, models, Symbol and Instances.

UNIT IV

Input Devices: Pointing and positioning devices, Three dimensional input devices. Graphical input techniques: Positioning and Pointing. Introduction to Event Handling, Polling, Interrupts, Eventqueue, Functions for handling events, polling task design, On-line character recognition.

UNIT V

3-D Graphics: Techniques for achieving realism, Parallel and Perspective Projection, 3D Transformation, Curves & surfaces, Hidden line and surface elimination, Transparencysolids and shading. Introduction to Virtual Reality.

Animation: Fundamentals of computer animation, Animation Techniques. Animation and Flash Overview, Using Layer and Creating Animation

Books & References:

1. Principles of interactive computer graphics by W. M. Newman & R. F. Sproull, McGraw Hill.
2. Computer Graphics by Roy A. Plastick & Gordon Kalley, Schaum's Out-line Series
3. Computer Graphics by Donald Hearn & Baker, PHI.
4. Computer graphics, Multimedia and Animation by Malay. K. Pakhira, PH

UNIT-I

Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System Services.

UNIT-II

Process Concept, Principle of Concurrency, Mutual Exclusion, Critical Section Problem, Semaphores, Classical Problems in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes.

Unit-III

Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Scheduling Algorithms, Multiprocessor Scheduling. Deadlock System model, Deadlock characterization, Prevention, Avoidance and Detection, Recovery from deadlock.

Unit-IV

Memory, Address Binding, Physical & Logical Address Space, Dynamic Loading, Swapping, Memory Allocation, Fragmentation, Memory Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit-V

I/O devices, and I/O subsystems, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

Books & References:

1. Silberschatz, Galvin and Gagne, —Operating Systems ConceptsII, Wiley
2. Sibsankar Halder and Alex A Aravind, —Operating SystemsII, Pearson Education
3. Harvey M Dietel, — An Introduction to Operating SystemII, Pearson Education
4. D M Dhamdhere, —Operating Systems : A Concept based ApproachII, 2nd Edition, TMH
5. William Stallings, —Operating Systems: Internals and Design Principles II, 6th Edition, Pearson Education

DOT NET FRAME WORK WITH C#

MCA-205

Credits: 4 (3-1-0)

MCA Second Year, Semester-III

UNIT I

Introducing C#, Overview of C#, Literals, Variables & Constant, Data Types, Operators, Expressions, Branching, Looping, Methods, C# statements Arrays, Strings, Structures, Enumerations.

UNIT II

Introduction, Common Language Runtime, Common Type System, Common Language Specification, The base class library, The .Net Class Library Intermediate Language, Just In Time Compiler, Garbage Collection, Assemblies

UNIT III

Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, System Collections, Delegates, Events, Errors and Exceptions.

UNIT IV

Namespace System, Window Forms, C# in Web Application, Programming Web Applications with Web Form, Programming Web Services, Validation and Rich Controls, Master Pages and Themes, Building Windows Applications, Accessing Data with ADO.NET.

UNIT V

ADO.NET Fundamentals, Reflection, State Management, Website Navigation, Forms Connectivity with Database, Versioning, Attributes, Viewing Metadata, Type Discovery, Reflecting on a Type, Marshaling, Remoting, Understanding Server Object Types, Specifying a Server with an Interface, Building a Server, Building the Client, Using Single Call, Threads.

Books & References:

- 1).E.Balagurusamy,—Programming in C#, Tata McGraw-Hill, 2004.
1. 'Beginning ASP.NET 2.0 in C# 2005' by Apress
2. 'C# with .NET Framework' by Shibi Pannikar & Kumar Sanjeev
3. J.Liberty,—Programming C#, 2nd ed., O'Reilly, 2002.

UNIT I

Introduction

Cloud-definition, benefits, usage scenarios, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing- issues in Clouds - Eucalyptus - Nimbus - Open Nebula, Cloud Sim.

UNIT II

Cloud Services

Types of Cloud services: Software as a Service-Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services.Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.

UNIT III

Collaborating Using Cloud Services

Email Communication over the Cloud - CRM Management - Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.

UNIT IV

Virtualization For Cloud

Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.

UNIT V

Security, Standards And Applications

Security in Clouds: Cloud security challenges – Software as a Service Security,Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

Books & References:

1. John Rittinghouse & James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.
2. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Que Publishing, August 2008.
3. James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.
4. David E.Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.
5. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
6. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing : A Practical Approach, Tata McGraw-Hill

Unit I

Introduction to Artificial Intelligence: Foundations and History of Artificial Intelligence, can machine think?, AI techniques, components of AI, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Processing

Unit II

Searching: Searching for solutions, Uniformed search strategies(BFS,DFS), Informed search strategies(hill climbing search,best-first search,A* search,IDA*,AO*), Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning. **Knowledge Representation & Reasoning:** Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit III

Machine Learning - Introduction , Model of Learning , Types of Learning , Types of problem : Regression and Classification, Supervised and Unsupervised learning, Reinforcement Learning . **Linear Regression** : Model representation for single variable, Single variable Cost Function, Gradient Decent for Linear Regression, Multivariable model representation . **Logistic Regression** : Classification, Hypothesis Representation, Decision Boundary, Cost function, Advanced Optimization, Multi-classification (One vs All), Problem of Overfitting, Regularization, Bias and Variance,

Unit IV

Data Prepossessing : Label Encoder, Standard Scalar . **Supervised Machine Learning** : k-Nearest Neighbors, Support Vector Machine, Decision Tree, Random Forest, Hyper Parameter Tuning, Over Fitting and Under-fitting . **Unsupervised Learning**-K-MEAN Clustering , Random Initialization, Choosing number of clusters.

Unit V Python Library for Machine Learning - Numpy : Basic & Advanced Array Operations, Slicing, Indexing. **Pandas** : Creating a DataFrame, Dealing with Rows and Columns, Indexing and Selecting Data, Working with Missing Data. **Seaborn**: Stripplot, Swarmplot , KDE Plot, Box plot, Pair plot, Count Plot, Joint Plot . **ScikitLearn**: Data Split, Model Training, Confusion Matrix, Performance Metrics .**Tensor Flow** : Tensor, Graph, Session, Placeholder . **Keras** : metrics , optimizers , activations function , Building an ANN, Evaluating, Improving and Tuning the ANN, Building CNN, Evaluating, Improving, Tuning the CNN.

Books & References:

- Stuart Russell, Peter Norvig, —Artificial Intelligence – A Modern Approachll, Pearson Education
- Elaine Rich and Kevin Knight, —Artificial Intelligencell, McGraw-Hill
- E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2006
- T. M. Mitchell, Machine Learning, McGraw-Hill, 1997.
- C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
- R. O. Duda, P. E. Hart, and D.G. Stork, Pattern Classification, John Wiley and Sons, 2001.

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UNIT I

Introduction: A general introduction to Strings, languages, graphs, trees and relations, Models of Computation: RAM and RASP Models of Computation, Finite State Machines, Regular expressions; Deterministic- Finite systems, Non deterministic Automata with and without e-moves, equivalence of DFA and NFA without e-moves, Construction of DFA from NFA with e-moves, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT II

Properties of regular sets: Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleene's Theorem, Construction of Regular expression from FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages.

UNIT III

Context Free Grammars (CFG): Chomsky Hierarchy of Grammars: Type 0, 1, 2 and 3 Grammars. Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammar, Ambiguous to Unambiguous CFG, Simplification of CFGs, Normal forms for CFGs: CNF (Chomsky normal form) and GNF (Greibach normal form), Conversion of a given grammar into Chomsky normal form, Greibach normal form (examples only). Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT IV

Push Down Automata: Definition of instantaneous descriptions, definition of Deterministic PDA, Construction of PDA for a given language, Two Stack PDA and its construction, construction of CFL's given the transition function of PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

UNIT V

Turing machine (TM): Definition, Types of TM, Different representations of TM, Construction of Turing machines for simple languages, Definition of Computable languages and functions, Definition of total recursive, partial recursive functions, Church Thesis, Post correspondence Problem, Halting problem.

Books & References:

- KamalaKrithivasan,RamaR,—IntroductiontoFormalLanguages,AutomataTheory and ComputationII, Pearson Education.
- MartinJ.C.,—IntroductiontoLanguagesandTheoryofComputationsII,TMH.
- Papadimitrou , C.and Lewis, C.L., —Elements of the Theory of Computation ,PHI.
- K.L.P.MishraandN.Chandrasekaran,—TheoryofComputerScience:Automata, Languages and ComputationII, PHI
- Cohen D.I.A.,—Introduction to Computer theory, John Wiley & Sons.

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UNIT I

Introduction : TCP/IP Internet, User Datagram Protocol (UDP): Format of UDP message, UDP Pseudo Header, UDP Encapsulation, UDP Port Numbers, Transmission Control protocol (TCP): Need for Stream Delivery, properties of Reliable delivery Services, Idea behind Sliding window, TCP port connection and endpoints, passive and active open, Segments, Streams and Sequence Numbers, TCP Segment Format, TCP options, Limitations of TCP, Internet Protocol (IP): Purpose of IP, IPv4 Datagram, Datagram format, encapsulation, datagram size, network MTU and fragmentation, Reassembly of fragments, TTL, Datagram options. Classfull and Classless Addressing.

UNIT II

Routing architecture and IP switching: Cores, peers and algorithms, Routing Architecture, Routing between peers (BGP), Routing with an autonomous system: RIP and OSPF, IP switching and MPLS, Switching technology, using switching with IP, MPLS encapsulation, MPLS and fragmentation.

UNIT III

Mobile IP: Introduction, Mobile IP characteristics, Mobile IP operations, Foreign agent Discovery, Agent registration, Message Format, Communication with home network, VPN addressing and routing, Interaction between NAT and ICMP, Voice and Video over IP (RTP, RSVP and QoS) IPv6: why IPv6, Header Format IPv6, fragmentation and reassembly, hexadecimal notation, Address types, unspecified and loopback addresses, IPv4 Vs IPV6, Mobile TCP.

UNIT IV

Emerging Wireless Technologies: WLAN: Advantage and disadvantage, WLAN architecture, WLAN applications, HiperLAN technology, WPAN technology, WMAN Technology, Wi-Max, Wi-Max and 3Gpp, Wi-Fi, Bluetooth, Security in Wireless Networks (WLAN, WPAN and WMAN), interoperability of Wireless Networks.

UNIT V

Adhoc Networks: Infrastructure based and infrastructure less Networks, Types of Adhoc protocols, Applications of adhoc networks, Limitations of Adhoc networks, Routing in Wireless Adhoc Networks, types, case study: Dynamic Source routing protocol, Cluster based Routing protocol, Routing in vehicular Adhoc networks, Wireless Adhoc (MANET) Vs vehicular Adhoc Networks (VANETs), Introduction to Sensor and mesh networks.

Books & References:

1. Murthy and Manoj, Ad Hoc Wireless Networks, Pearson Education Publication.
2. Jochen Schiller,—Mobile Communications II, Addison-Wesley.

Unit I

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

Unit II

Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Unit III

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

Unit IV

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

Unit V

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

Books & References:

- 1.1) NLP: A Paninian Perspective by Akshar Bharti, Vineet Chaitanya and Rajeev Sangal Prentice Hall, New Delhi
- 2.2) Natural Language Understanding by James Allen, Pearson Education
- 3.3) Speech and Language Processing by D. Jurafsky, J.H. Martin, Pearson Education
- 4.4) Language as a Cognitive Process by T. Winograd, Wesley

UNIT I

Introduction to distributed system :What is distributed system, Advantages of distributed systems over centralized systems and PCs, Disadvantages of distributed system. Hardware concepts: Bus based multiprocessors, switched Multiprocessors, Bus based multi computer, Switched multi computers. Software Concepts: Network OS, true distributed systems, Multiprocessor time sharing system.

UNIT II

Architecture of Distributed System: Motivation of distributed operating system, System Architecture types, Various issues in distributed operating system: Global Knowledge, Naming, Scalability, Compatibility, Process Synchronization, Resource Management, Security, Client-Server computing model. Communication Network (WAN and LAN), Communication Primitives, The Message Passing Model, Remote procedural calls.

UNIT III

Theoretical Foundations of Distributed Operating system: Inherent limitation of distributed system, absence of global clock, Absence of shared memory, Lamport's Logical clock, Global State Chandy-Lamport's global state recording algorithm, termination detection.

UNIT IV

Distributed deadlock, Distributed Mutual Exclusion and Agreement Protocol
Mutual Exclusion: Centralized Algorithm, Distributed algorithm, Token ring algorithm. Deadlock in distributed system. Distributed deadlock detection, Distributed deadlock prevention. Introduction to Agreement protocols, System models: Asynchronous Vs Synchronous Computation, Model of processor failure, Authenticated Vs Non-Authenticated Messages, Performance Aspects.

UNIT V

Distributed data storage and distributed Query Processing :

Data Replication, Data Fragmentation (horizontal, vertical and mixed), Data replication and fragmentation, Query Transformation, Simple join Processing. Semijoin strategy. Join strategy that exploits parallelism, Distributed transaction model. Commit protocols- two phase commit and three phase commit, Concurrency control- locking protocol and time stamping, Deadlock handling - centralized and distributed approaches.

Books &References:

1. Advanced Concepts in operating system by MukeshSinghal and Niranjana G. Shivaratri.
2. Distributed operating system by Andrew S. Tanenbaum.

WIRELESS NETWORK AND MOBILE COMPUTING

MCA-355

Credits: 4 (3-1-0)

Detailed Syllabus of Electives

UNIT I

Overview of wireless communication: History, Different Generations, General characteristics of mobile devices, Electromagnetic spectrum, Radio propagation mechanisms, characteristics of wireless medium, wireless topology, cellular system (cell concepts, cell hierarchy, cell fundamentals) Issues in mobile computing: Introduction, functions, 3-Tier architecture, applications and services. GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling Handover, Security.

UNIT II

WLAN: Technical issue (uses, design goal, types, components and services offered by a typical IEEE 802.11 network), IEEE 802.11 standard (physical layer, MAC layer mechanism & functionalities, CSMA/CA mechanism). HIPERLAN: HIPERLAN standard, HyperLAN/1 (physical layer, DLC & RLC layer, MAC sub-layer), HyperLAN/2 (Physical layer, MAC sub-layer, power conservation issues) BLUETOOTH: Specifications, transport protocol group, middleware protocol group, profile.

UNIT III

Medium access control (wireless): Motivation for a specialized MAC (hidden and exposed terminals, near and far terminals), SDMA, FDMA, TDMA and CDMA.

UNIT IV

Mobile Network layer: Mobile IP: Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations, and dynamic host configuration protocols (DHCP). Mobile Transport layer: Traditional TCP, Indirect TCP, Snooping TCP,, Mobile TCP, Fast retransmission/ fast recovery, transmission/time-out freezing, selective retransmission, transaction oriented TCP. Wireless Application Protocol WAP: Introduction, protocol architecture and treatment of protocols of all layers.

WIRELESS NETWORK AND MOBILE COMPUTING

MCA-355

Credits: 4 (3-1-0)

Detailed Syllabus of Electives

UNIT V

Introduction & issues in Ad Hoc wireless networks: introduction (cellular vs ad hoc wireless networks and applications), Medium Access Scheme, Routing, Multicasting, transport layer protocols, Pricing Scheme, QoS provisioning, Self organization, security, addressing and service discovery, energy management, Scalability, deployment considerations, Issues in designing a routing protocol for ad hoc wireless Networks (Mobility, Bandwidth constraint, Error prone shared broadcast radio channel, Hidden & exposed Terminal Problems, Resource Constraints, characteristics of idle routing protocol), Classification of routing protocols: Table-driven routing protocols (DSDV, WRP), On-demand routing protocols (DSR, AODV, LAR).

Books & References:

- Murthy and Manoj, Ad Hoc Wireless Networks, Pearson Education publication.
- Jochen Schiller, —Mobile Communications II, Addison-Wesley.
- Stojmenovic and Cacute, —Handbook of Wireless Networks and Mobile Computing II, Wiley, 2002

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OBJECT ORIENTED ANALYSIS AND DESIGN

MCA-356

Credits: 4 (3-1-0)

Detailed Syllabus of Electives

UNIT I

Introduction to OOAD What is OOAD? What is UML? What are the Unified process(UP) phases Case study the NextGen POS system, Inception Use case Modeling Relating Use cases include, extend and generalization.

UNIT II

Elaboration Domain Models Finding conceptual classes and description classes Associations Attributes Domain model refinement Finding conceptual class hierarchies Aggregation and Composition UML activity diagrams and modeling

UNIT III

System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram Logical architecture refinement UML class diagrams - UML interaction diagrams

UNIT IV

GRASP: Designing objects with responsibilities Creator – Information expert Low Coupling Controller High Cohesion Designing for visibility Applying GoF design patterns – adapter, singleton, factory and observer patterns.

UNIT-V

UML state diagrams and modeling Operation contracts Mapping design to code UML deployment and component diagrams.

Books & References:

1. Applying UML and Patterns: An Introduction to object oriented Analysis and Design and iterative development by Craig Larman, Pearson Education
1. Object-Oriented Analysis & Design: Understanding System Development with UML2.0 by Mike O'Docherty,

UNIT I

FUZZY SET THEORY

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning– Fuzzy Inference Systems.

UNIT II

ARTIFICIAL NEURAL NETWORK : Neural Network : Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebb's learning rule/Delta rule, ADALINE, MADALINE, Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA.

UNIT III

GENETIC ALGORITHM : Genetic algorithm : Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional method.

UNIT IV

Integration of neural networks, fuzzy logic and genetic algorithms, applications of computational intelligence: Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction Soft Computing for Color Recipe Prediction.

UNIT V

Universe of discourse, Mapping inside fuzzy domain, Fuzzy membership mapping methods, Application to real world problems.

Books & References:

1. Timothy J. Ross, —Fuzzy Logic with Engineering Applications, McGraw-Hill, 1997.
2. Davis E. Goldberg, —Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G. A. V. Pai, —Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI, 2003.
4. R. Eberhart, P. Simpson and R. Dobbins, —Computational Intelligence PC Tools, AP Professional, Boston.

UNIT I

Introduction to Python- Writing and Executing First Python Program Literal, Constants, Numbers, Strings, Variables, and Identifiers, Data Types, Input/Output Operation, Comments, Reserved Words Indentation , Operators and Expressions, Arithmetic Operators, Comparison Operators, Shortcut Operators, Unary Operators, Bitwise Operators, Shift Operators, Logical Operators, Membership Operators, Identity Operators, Operators Precedence and Associativity, Expressions in Python, Operations on Strings, Concatenation, Multiplication (or String Repetition), Slice a String, Type Conversion. **Decision Control Statements:** if statement, if-else Statement, Nested if statements, if-elif-else statement, Basic Loop Structures: while loop, for Loop, Nested Loops, The break Statement, The continue Statement, The pass Statement.

UNIT II

Building Blocks in Python - Functions : Definition ,Calling ,Parameters ,Variable Scope and Lifetime ,Local and Global Variables , return statement ,Required Arguments , Keyword Arguments ,Default Arguments ,Variable-length Arguments , Lambda Functions , Documentation Strings , Recursive Functions. **Modules :**The from...import statement ,Name of Module ,Making your own Modules .

UNIT III

Python Strings :Concatenating, Appending, and Multiplying Strings ,String Formatting Operator , Built-in String Methods ,Slice Operation , in and not in operators ,Comparing Strings ,Iterating String ,The String Module .Regular Expressions : match() , search() , sub() , findall() , finditer(). **File Handling :**File Path ,Types of Files ,ASCII Text Files ,Binary Files ,Opening and Closing Files ,Reading and Writing Files ,Renaming and Deleting Files . **Data Structures :**Lists ,Tuple ,Sets ,Dictionaries ,List vs Tuple vs Dictionary vs Set .

Unit IV

Classes and Objects : Introduction ,Classes and Objects, Defining Classes ,Creating Objects, Data Abstraction and Hiding through Classes ,Class Method and self Argument ,The __init__() Method , The __del__() Method ,Public and Private Data Members, Private Methods , Calling a Class Method from Another Class Method , Built-in Functions to Check, Get, Set, and Delete Class Attributes, Built-in Class Attributes .

Unit V

Inheritance Introduction , Inheriting Classes in Python , Polymorphism and Method Overriding , Types of Inheritance , Composition or Containership or Complex Objects , Abstract Classes and Interfaces , Metaclass ; **Error and Exception Handling** : Introduction to Errors and Exceptions , Syntax Errors, Logic Error , Exceptions , Handling Exceptions , Multiple Except Blocks , Multiple Exceptions in a Single Block , Except Block Without Exception , The else Clause , Raising Exceptions , Instantiating Exceptions , Handling Exceptions in Invoked Functions , Built-in and User-defined Exceptions , The finally Block , Pre-defined Clean-up Action Re-raising Exception , Assertions in Python.

Books & References:

1. Python Programming: Using Problem Solving Approach : Reema Thareja
2. Core Python Programming by R. Nageswara Rao

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UNIT I

INTRODUCTION TO BIG DATA AND HADOOP : Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

UNIT II

HDFS (Hadoop Distributed File System): The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT III

Map Reduce: Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

UNIT IV

Hadoop Eco System

Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.

Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.

Big SQL : Introduction

UNIT V : Data Analytics

Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Books & References:

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reilly Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
3. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
4. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
5. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.

NETWORK SECURITY AND CRYPTOGRAPHY

MCA-360

Credits: 4 (3-1-0)

Detailed Syllabus of Electives

UNIT I

Introduction: Terminology, Substitution ciphers and Transposition ciphers, Simple XOR, One-Time Pads, Computer Algorithms. Cryptographic Protocols

UNIT II

Protocol Building Blocks: Introduction, Communication using Symmetric Cryptography, One-Way Hash Functions, One-Way Hash Functions, Communication using Public-Key Cryptography, Digital Signatures, Digital Signatures with Encryption.

UNIT III

Protocols: Authentication and Key exchange, Key Exchange, Authentication, Multiplekey public key cryptography, Secret splitting, Secret Sharing, Cryptographic protection. Zero- Knowledge Proofs, Zero-Knowledge Proofs of Identity, Blind Signatures, Oblivious Transfer, oblivious signature, Simultaneous contract signing Cryptographic Techniques

UNIT IV

Key Management : Generating Keys, Nonlinear Keyspaces, Transferring Keys, Verifying Keys, Using Keys.

UNIT V

Using Algorithms: Choosing an Algorithm, Public-Key cryptography versus Symmetric cryptography, Encrypting Communication Channels, Encrypting data for Storage.
Cryptographic Algorithms: RSA, DES.

Books & References:

1. Applied Cryptography, Bruce Schneier, John Wiley & Sons
2. Network Security and Cryptography Willam Stallings
3. Concept of Network Security and Cryptography Frozen

UNIT I

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and DataWarehouses.

Information Retrieval System Capabilities: Search, Browse, Miscellaneous Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction.

UNIT II

Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext datastructure.

UNIT III

Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

UNIT IV

User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, Weighted searches of Boolean systems, Searching the Internet and hypertext. Information Visualization: Introduction, Cognition and perception, Information visualization technologies.

UNIT V

Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems. **Information System Evaluation:** Introduction, Measures used in system evaluation, Measurement example TREC results.

Books & References:

1. Modern Information Retrieval, by Yates, Pearson Education.
2. Information Storage & Retrieval by Robert Korfage, John Wiley & Sons.

UNIT I

GEOGRAPHIC INFORMATION SYSTEM: Geographic Information System: Introduction, GIS categories, Components of GIS, Fundamental operations of GIS, A theoretical framework for GIS. Types of data representation- Data collection data input and output. Manual Digitizing and Scanning. GIS Data File Management; Layer based GIS, Feature based GIS mapping. Data storage – Raster, Vector and Attribute data storage, Overview of the Data Manipulation and Analysis. Integrated Analysis of the Spatial and Attribute Data. Integration of RS, GIS & GPS.

UNIT II

Introduction to Digital Image Processing: Applications of digital image processing, Steps in digital image processing, Components of an Image Processing system, Image sampling and Quantization, Relationships between pixels. **Image Enhancement:** Intensity transformations and spatial filtering, Point and Mask based techniques, Histogram processing, Fundamentals of spatial filtering, Smoothing and sharpening spatial filters.

UNIT III

Filtering in frequency domain: Fourier series and Transform, Discrete Fourier Transform, Frequency Domain Filtering Fundamentals, Homomorphic Filtering. Color Image Processing: Color Fundamentals, Color characteristics, Color models, RGB, CYK, CMYK, HIS, YIQ models, Pseudo color image processing, full color image processing, color transformations, Smoothing and sharpening of images.

UNIT IV

Image Restoration: Model of Image Degradation/Restoration process, Noise models, Linear, Inverse filtering, Mean Square Error Restoration, Least Square Restoration. Image Compression Fundamentals: Lossless and Lossy Compression, **Basic Compression Methods:** Huffman Coding, Run-Length Coding, LZW Coding, Arithmetic Coding, Bit-Plane Coding, Predictive Coding, Transform Coding, Wavelet Coding, Compression standards.

UNIT V

Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region- Based Segmentation. **Image Representation:** Boundary Representation, Chain Codes, Polygonal Approximations, Signatures, Boundary Descriptors, Simple Descriptors, Shape Numbers, Regional Descriptors, Topological Descriptors, Texture.

Books & References:

- Gonzalez R.C., Woods R.E., "Digital Image Processing", Pearson Education.
- Gonzalez R.C., "Digital Image Processing with MATLAB", Tata McGraw Hill.
- Sonka Milan, "Image Processing Analysis and Machine vision", Cengage Learning.
- William K. Pratt, "Digital Image Processing", Wiley India Pvt. Ltd.
- Chanda B., Majumder D. Dutta, "Digital Image Processing and Analysis", PHI Learning.
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- Jayaraman S., Esakkirajan S., Veerakumar T., "Digital Image Processing", Tata McGraw Hill.
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महात्मा ज्योतिबा फुले
रुहेलखण्ड विश्वविद्यालय, बरेली

Unit I

Introduction: Basic fundamentals; installation and use of software; RStudio, R for mathematics: Arithmetic, Logarithms and Exponentials, E-Notation; Assigning Objects, Vectors: Creating a Vector, Sequences, Repetition, Sorting, and Lengths, Matrix Operations and Algebra, Multidimensional Array, Non-numeric values, String and its operations, Factors, List and Data Frames, special values, reading/writing data, Reading files: R-Ready Data Sets and Reading in External Data Files, import/export data, correlation and aggregation.

Unit II

Control structures, Loops, and Function: If Statements, else Statements, if-else statement, Nesting and Stacking Statements, The switch statement, Loops: For and while, Functions: Function creation and return statements, recursive functions, scoping rules.

Unit III

Data Analysis: Data: Numeric, Categorical, univariate and multivariate, Analysis of Data: Centrality: Mean, Median, Mode, Counts, Percentages, and Proportions Quantiles, Percentiles, Spread: Variance, Standard Deviation, and the Interquartile Range. Covariance and Correlation Outliers.

Unit IV

Machine Learning: Regression in R: simple, multi-linear, and stepwise, Decision Tree in R, R Random Forest, Kmeans clustering, examples

Unit V

Data Visualization: Using plot with Coordinate Vectors, Graphical Parameters: Automatic Plot Types, Title and Axis Labels, Color, The ggplot2 Package, Bar plots and Pie Charts, Histograms, Box plot, Scatter plot.

Books & References:

1. Beginning R: The Statistical Programming Language by Mark Gardener, Wiley, 2013.
2. The R Software-Fundamentals of Programming and Statistical Analysis by Pierre Lafaye de Micheaux, Rémy Drouilhet, Benoit Lique, Springer 2013.
3. A Beginner's Guide to R (Use R) by Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009.
4. Data Analysis and Graphics Using R. by John Maindonald and John Braun Cambridge University Press, Cambridge, 2nd edition, 2007. ISBN 978-0-521-86116-8.
5. The R book by Crawley, Michael J John Wiley & Sons, 2012.
6. The book of R: a first course in programming and statistics by Davies, Tilman M., No Starch Press, 2016.