Department of Computer Science & Informatics

UNIVERSITY OF KOTA, KOTA

Scheme of Course, Based on CBCS

Master of Computer Application (MCA)

MCA –I Semester

S. No.	Subject Code	Name of Paper	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
				L*	T*	P*			
1.	MCA 101	Computer organization & Architecture	4	4	0	0	30	70	100
2.	MCA 102	Programming in C	4	4	0	0	30	70	100
3.	MCA 103	Discrete Mathematics	4	4	0	0	30	70	100
4.	MCA 104	Data Base Management System	4	4	0	0	30	70	100
5.	MCA 105	Lab on C & DBMS	9	0	0	12	00	100 (50+50)	100
		Total Credit	25	Total Marks					500

L* = Lecture T* = Tutorial P* = Practical

MCA - II Semester

S. No.	Subject Code	Name of Paper	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
				L*	T*	P*			
1.	MCA 201	Data Structures	4	4	0	0	30	70	100
2.	MCA 202	Computer Oriented Numerical Methods	4	4	0	0	30	70	100
3.	MCA 203	Data Communication & Networking	4	4	0	0	30	70	100
4.	MCA 204	Object Oriented Modeling & Programming	4	4	0	0	30	70	100
5.	MCA 205	lab based on Data structure lab with C++ & CONM Lab	9	0	0	12	00	100 (50+50)	100
		Total Credit	25	Total Marks					500

L* = Lecture T* = Tutorial P* = Practical

MCA - III Semester

S. No.	Subject Code	Name of Paper	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
				L*	T*	P*			
1.	MCA 301	Information and Network Security System	4	4	0	0	30	70	100
2.	MCA 302	Programming with JAVA	4	4	0	0	30	70	100
3.	MCA 303	Theory of Computation	4	4	0	0	30	70	100
4.	MCA 304	Design and Analysis of Algorithms	4	4	0	0	30	70	100
5.	MCA 305	Lab on JAVA & Design and Analysis of Algorithms	9	0	0	12	00	100 (50+50)	100
		Total Credit	25	Total Marks					500

L* = Lecture T* = Tutorial P* = Practical

MCA - IV Semester

S. No.	Subject Code	Name of Paper	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
				L*	T*	P*			
1.	MCA 401	Web Development & .Net Framework	4	4	0	0	30	70	100
2.	MCA 402	Operating System	4	4	0	0	30	70	100
3.	MCA 403	Software Engineering	4	4	0	0	30	70	100
4.	MCA 404	Artificial Intelligence	4	4	0	0	30	70	100
5.	MCA 405	Lab on .NET + Operating System + Seminar	9	0	0	12	00	100 (50+25+ 25)	100
		Total Credit	25	Total Marks					500

L* = Lecture T* = Tutorial P* = Practical

MCA - V Semester

S. No.	Subject Code	Name of Paper	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
				L*	T*	P*			
1.	MCA 501	Modeling & Simulation	4	4	0	0	30	70	100
2.	MCA 502	Computer Graphics	4	4	0	0	30	70	100
3.	MCA 503	Elective – I	4	4	0	0	30	70	100
4.	MCA 504	Elective – II	4	4	0	0	30	70	100
5.	MCA 505	Lab on Computer Graphics and Minor Project	9	0	0	12	00	100 (50+50)	100
		Total Credit	25	Total Marks					500

L* = Lecture T* = Tutorial P* = Practical

List of Elective - I

MCA 503.1: Mobile Computing
MCA 503.2: Image Analysis & Computer Vision
MCA 503.3: Real Time System
MCA 503.4: Embedded System Design
MCA 503.5: System testing

List of Elective - II

MCA 504.1: Natural Language Processing
MCA 504.2: Parallel Processing
MCA 504.3: Compiler Design
MCA 504.4: Artificial Neural Network
MCA 504.5: Software Project Management

Note: Student have to elect one elective paper from each list**.**

MCA – VI Semester

S. No.	Subject Code	Name of Paper	Credit	Contact Hrs.			Internal Marks	External Marks	Total Marks
				L*	T*	P*			
1.	MCA 601	Reading Elective	4	0	0	0	0	100	100
3.	MCA 602	Major Project	16	0	0	0	0	200	400
		Total Credit	20	Total Marks					500

L* = Lecture T* = Tutorial P* = Practical

List of Reading Electives

MCA 601.1: E- Commerce
MCA 601.2: Enterprise Resource Planning
MCA 601.3: Client Server Computing
MCA 601.4: Cloud Computing

Note: The lab credits will be calculated by multiplying 3/4 to the weekly hrs. assigned for lab. For Example if 12 hrs. are assigned for lab weekly then credits will be calculated as 12 * 3/4 = 9 credits.

Distributing of Marks (I to VI Semester)

Minor Project [50] Break-up

SRS (Document + Presentation)	10
SDS (Document + Presentation)	10
Mid-term demo of Project	5
Project Report	10
Viva-Voce + final Presentation	15
Total Marks	**50**

Internal Marks [30] Break-up

Class Test – I	15
Presentation/ Case-Study/ Group Activity/ Class Test/ Lab work	15
Total Marks	**30**

Seminar [25] Break-up

1.	Article Submission (Based on Latest developments in the field of Computer Science)	10
2.	Presentation (Based on Article submitted)	10
3.	Viva-Voce	5
	Total Marks	25

Reading Elective (MCA-VI Sem.) [100] Break-up

4.	*Theory Exam	30
5.	Article (Based on Reading Elective)	30
6.	Presentation (Based on recent developments in the field of Reading Elective)	40
	Total Marks	100

* will be conducted at time of final major project submission.

Major Project (MCA-VI Sem.) [400] Marks Break-up

1. Marks of internal Assessment can be distributed as follows:-

1.	Project Performa sent by the student	40
2.	Mid-term & end evaluation from project guide	40
3.	Synopsis of the project	70
	Total	150

2. Marks of University Exam can be distributed as follows:-

1.	Dissertation & Project	100
2.	Project Report	100
3.	Viva-Voce	50
	Total	250

Total Marks of MCA VI Semester = 100 (Reading Elective) + 150 (Internal) + 250 (External)

Total Marks:	MCA I Semester	MCA II Semester	MCA III Semester	MCA IV Semester	MCA V Semester	MCA VI Semester
	500	500	500	500	500	500
Total Maximum Marks: 3000						

Important Notes:

1. A student**,** who remains absent (defaulter) or fails or want to improve the marks in the internal assessment, may be permitted to appear in the desired paper(s) (only on time) in the same semester with the permission of the concerned Head of Department. A defaulter / improvement fee of rupees 250/- per paper shall be charged from such candidates. Duly forwarded application of such candidates by the teacher concerned shall be submitted to HOD who may permit the candidate to appear in the internal assessment after depositing the defaulter/improvement fee. A record of such candidates shall be kept in the Department.

Passing Rules:

2. Minimum Pass Marks and Rules regarding Determination of Result are recommended as follows:

(i) The candidate shall be declared as pass in a semester examination. If he/she secures at least 40% marks in each theory paper separately in external & internal examination and 50% marks in each practical paper and at least 50% marks in project/dissertation with 50% aggregate marks in that semester.

(ii) A candidate declared as fail/absent in one or more papers at any odd semester examination shall be permitted to take admission in the next higher semester (even semester) of the same academic session.

(iii) A candidate may be promoted in the next academic session (odd semester) if he/she has cleared collectively at least 50 % of the paper of both semester of previous

academic session with 50 % of the aggregate marks. The candidate who does not fulfill the above condition will remain as an ex-student and will reappear in the due paper along with next odd/even semester exams.

(iv) If any student who is provisionally admitted in higher odd semester but could not secure prescribed minimum marks in previous semester will be treated as ex-student and his/her admission fee will be carry forwarded to the next odd semester of forthcoming academic session.

(v) If a candidate, who is declared as pass, wishes to improve his/her performance in the theory papers of previous semester. He/she may re-appear only one time in these papers in next odd/even semester examinations.

(vi) Candidate shall not be permitted to re-appear or improve the marks obtained in the external examination of practical/dissertation in any condition.

(vii) If the number of paper prescribed in a semester examination is an odd number. It shall be increased by one for the purpose of reckoning 50% of the papers for considering the student pass/fail.

(viii) A candidate may be given only two additional chances for passing the semester thus maximum tenure for completing the two years' postgraduate course will be limited to four years, for three years postgraduate programme up to five years.

3. Classification of Successful Candidates after Last Semester Examination is recommended as follows:

Description of Marks Obtained	**Division / Result**
• 80% and above marks in a paper	Distinction in that paper
• A candidate who has secured aggregate 60% and above marks	First Division
• A candidate who has secured aggregate 50% and above but less than 60% marks	Second Division

Fee Refund : As per University Rules.

Semester - I

COMPUTER ORGANIZATION AND ARCHITECTURE (MCA- 101)

Unit-1

Brief introduction to computer organization, representation of data, bits and bytes, Number system (binary, octal, decimal, hexadecimal), Representation of integers, real numbers, positive and negative numbers. Binary arithmetic, Simple concepts and theorems of Boolean Algebra. Representation of characters: BCD, ASCII, EBCDIC Codes, Self Complementary Codes, Error Detecting and Error correcting codes (Parity, Gray& Hamming Codes).

Unit-II

Logic Gates and Boolean Algebra, Basics of logic families, Karnaugh Map, Combinational Circuit Design: Adder, subtractor, Encoder, Decoder, Multiplexer, Demultiplexer, Magnitude Comparator. Sequential Circuits, Flip-Flops, Shift Registers, Asynchronous and Synchronous Counters.

Unit-III

CPU Organization: Design of ALU, design of shifter and accumulator, Status Register, Processor unit, Control unit organization. Micro instruction format, Hardwired and micro-programmed control.

Unit-IV

Data bus and address bus, stack organization, various registers, instruction formats, addressing techniques. I/O Organization – Simple I/O devices and their properties, device interfacing, DMA interface, program & interrupt control transfer.

Unit-V

Semiconductor Memories: Types of Memories, Sequential and Random Access Memory (RAM, ROM, PROM, EPROM), Storage location and address, fixed and variable word length storage, Cache Memory, bubble memory, Secondary Memory devices and their characteristics.

Text/Reference Books

1. Digital Principles and Applications by Malvino C.P., Leach D.P.; Tata Mc- Graw Hill, 1985.

2. Digital Computer Fundamentals, Bartee, Thomas C., 1991, 6th Edition, McGraw Hill.

3. Computer System Architecture, Mano, M.M., Prentice Hall, 1988.

4. Computer Architecture and Organization, Hayes John P., Mc-Graw Hill 1988 (International Edition)

. 5. Nicholas Carter and Raj Kamal, Schaum Series “Computer Architecture and Organization” 2nd Ed. 2010.

Programming in C (MCA- 102)

Unit I

Concept of good program, from problems to programs, Introduction to 'C' Language, History of 'C', 'C' character Set, Identifiers and Keywords, Data types, Constants and Variables, declarations, statement, symbolic constants. Operators and expressions, precedence and order evaluating, formatted and unformatted input and output functions. All types of Control Statements.

Unit-II

Functions and Program Structure: Basics of functions, parameter passing, recursion, the C-pre-processor, and command line arguments.

Unit-III

Pointers and Arrays: concepts of Pointers, pointers and arrays, address arithmetic, pointers and functions, pointer to functions, Concept of dynamic memory allocation.

Unit-IV

Structures: Basics, structures and functions, array of structures, pointers to structures, self referential structures, table look up fields, union and typedef.

Unit-V

File Structure, Concept of Record, file operations: storing, creating, retrieving, updating, deleting, text and library files, File handling, file pointers, file accessing function, low level I/O, Error handling, command line argument.

Text/Reference Books

1. The C Programming Language by Brian W. Kernighan, Dennis M. Ritchie, Prentice Hall Software Series, 2nd Edition.
2. Let us C by Y.Kanetkar, BPB Publications.
3. Mastering C by Vijay Prasad, TMH.
4. Programing with C, Balaguruswamy, Tata McGraw-Hill.
5. How to Solve it by Computers, Dromey, PHI.
6. Schams Dutline of Theory and Problem of Programming with C: Gottfried B.S., TMH.
7. C Project by Kanetkar, BPB Publications,2006.

Discrete Mathematics (MCA- 103)

Unit I

Fundamentals: Sets and Subsets, Operations on Sets, Sequences, Properties of Integers, Matrices, Mathematical Structures. Logic & Propositional Logic: Introduction to Logic, Propositional Logic and Predicate Logic, Elements of Propositional Logic - Negation, Conjunction, Disjunction; Truth Table, Tautology, Connectives, Construction of Proposition, Semantics, normal forms, Reasoning with Propositions, Implications, Proof of Identities, Proof of Implications.

Unit II

Predicate Logic: Well Formed Formula of Predicate Logic, Predicate, Validity, Quantification, Constructing Formulas, Reasoning with Predicate Logic, Quantifiers and Connectives.

Unit III

Verification**:** Model checking, Linear-time temporal logic, program verification. Induction and Recursion, Recurrence Relations, Proof by Induction. Set and Functions: Sets, relations, functions, operations, and equivalence Relations, relation of partial order, partitions, binary relations, Equivalence relations, growth of functions, Complexity of Algorithms.

Unit IV

Combinatorics: Permutation, combinations, Binomial theorem, Counting, Pigenhole principle. Generalized Inclusion-Exclusion Principle (GIEP), Discrete probability.

Unit V

Trees and Graphs**:** Trees, traversals, spanning trees; graphs – path, connectivity, reachability,cycles and circuits, planar graphs, Euler and Hamilonian graphs, graph traversals, topological sorting, graph coloring.

Text/References Books

1. Logic and Discrete Mathematics: A Computer Science Perspective, Winfried Karl Grassmann, Jean-Paul Tremblay, Prentice Hall.
2. Essentials of Discrete Mathematics, David J. Hunter.
3. Element of Discrete Mathematics, C. L. Liu, McGraw-Hill, 2nd Edition, 1985, reprinted 2000.
4. Discrete Mathematical Structures, Bernard Kolman, Robert Busby, Sharon C. Ross, 6/E. Pearson Education.
5. Discrete Mathematics with Graph Theory by Goodaire and Paramenter (www.mhhe.com/math/advmath/rosen/rs/).
6. Discrete Mathematics and its Applications by Kenneth H. Rosen, 5th Edision, McGraw Hill, Inc, 2003.
7. Graph Theory by Narrigh Deo, PHI.

Database Management System (MCA- 104)

Unit-I

Introduction: DBMS, Basic DBMS terminology and Data base System versus file System, Data independence architecture of DBMS. Entity Relationship model : Basic Concepts, keys, design issues, E-R diagram, weak entity sets, extended E-R features, reduction of E-R scheme to tables.

Unit-II

Relational model: structure of relational database relational algebra, tuple relational calculus, domain relational calculus. SQL: Basic structure, set operations, aggregate functions, null values.

Unit-III

Data Base Design: Functional Dependencies, normal forms, first, second and third normal form, BCNF multivalued dependencies, fourth normal form, join dependencies.

Unit-IV

Query processing and optimization: Transaction processing concepts, ACID Properties, Concurrency control technique locking techniques, time stamping, Recovery, Integrity and security of database.

Unit-V

Distributed database system: Fragments of relations, optimization, Distributed Concurrency Control, management of deadlocks and crashes, Database recovery Management.

Text /Reference books

1. Data base system and concepts, H. Korth, A. Silbertz, Sudarshan, Fifth Edition, McGraw – Hill.

2. Fundamentals of Database Systems, Elmasari, Navathe, Addison Wesley

3. An Introduction to Database systems, Date C.J, Addison Wesley

4. Database Management System, Majumdar & Bhattachrya, TMH

5. Database Management System, Ramakrishna, Gehkre, McGraw – Hill

6. database management systems, Leon alexis, leon Mathews, “Vikash publication

7. Database system, Rob, coronel, 7th edition, Congage Learning.

Semester -II

Data Structures (MCA-201)

Unit I

Introduction: structure and problem solving, algorithmic notation, Data Structure, Algorithms and sub algorithms, introduction to algorithm analysis for time and space requirement, rate of growth, basic time and space analysis of an algorithm.

Unit II

Primitive and non primitive data structure concept, representation and manipulation of strings, linear data structures and their sequential storage representation, concept and terminology for non primitive data structure, storage structure for arrays, stacks, queues. Operations on arrays, stacks & queues.

Unit III

Linear data structures and their linked storage representation: pointers and linked allocation, linked linear list, singly linked list, circularly linked lists, doubly linked list, application of linked linear lists.

Unit IV

Non Linear data structure: Trees, types of trees, binary tree, application of trees, Graphs and their representations, applications of graph.

Unit V

Sorting and searching: sorting, selection sort, bubble sort, merge sort, tree sort, radix sort, sequential search, binary search, File structure, sequential files, indexed sequential files, direct files.

Text / Reference Books

1. An Introduction to Data Structures with Applications, Tremblay & Sorensons, Tata Mcgraw hills publications.

2. Data structure and algorithms, Aho., Alfred V., Pearson Education.

3. Fundamentals of Data structure in C, Horowitz, Ellis, Galgotia publication.

4. Introduction to Data Structure and algorithms with C++ , Rowe, Glenn W., Prentice , Hall

5. Data structures using C and C++ , Langsun , Augenstein , Tenenbaum Aaron M, Prentice Hall

Computer Oriented Numerical Methods (MCA- 202)

Unit I

Computer Arithmetic: Floating point representation of numbers, arithmetic operations with normalized floating point numbers and their consequences. Error in number representation-pitfalls in computing.

Unit II

Iterative methods: Bisection, False position, Newton-raphson methods. Discussion of convergence.Polynomial evaluation. Solving polynomial.

Unit III

Solution of simultaneous linear equation and ordinary differential equations: Gauss elimination method-pivoting, Conditioned equations, refinements of solutions, Gauss-seidel methods: Acceleration of its native methods.Taylor series and Euler methods, Local and global error analysis, RungeKutta method, Predictor-corrector method, Automatic Error monitoring Stability of solution.

Unit IV

Interpolation & Approximation: Polynomial interpolation. Difference regression.Polynomial fitting and curve fitting. Approximation of function by Taylor series and chebyshev polynomials.

Unit V

Numerical differentiation and integration : Differentiation formula based on polynomial fit. Pitfalls in

differentiation.Trapezoidal, Simpson rules, Gaussian quadrature.

Text / Reference Books

1. Computer Oriented Statistical and Numerical Method, E. Balagurusamy Macmillan India Ltd.

2. Computer Oriented Numerical Methods, R.S. Salaria, Khanna Book Publishing Co. (P) Ltd.

3. Computer Oriented Numerical Method, by P.K. Jain.

4. Computer Oriented Numerical Method, by Rajaraman, PHI

Data Communication and Computer Networking (MCA- 203)

Unit-1

Introduction to computer networks, advantage of networking, network architecture & strategies. Data transmission: concept and terminology (data and signal), Analog and digital data transmission , transmission impairments.

Unit- II

Transmission media : guided v/s unguided transmission media, multiplexing ; TDM, FDM, SDM & WDM types of network : LAN (Star Ethernet, BUS), VLAN, MAN ,WAN: Configuration, topology ,network hardware (hub, bridge, switch and router).

Unit-III

Principles and purpose of layered approach, ISO-OSI model, protocols and their standards, protocol architecture, different layers and their functions of OSI model, Introduction to TCP/IP models.

Network switching: circuit switching, packet switching; routing and congestion control.

Unit- IV

Network technologies: ATM, Frame relay network, DSL ,cable modem system ,ISDN, SONET/SDH: architecture and functions.

Unit -V

Network management: – functions SNMPV1: architecture and models, Internetworking, Concept of DNS, URL and models RMON. Issues related to network. seliability and security, SSL, firewalls, encryption / decryption and data compression, concept of cyber laws.

Text books/ Reference Books

1. Data and Computer communications, Stallings William Prentice Hall of India, 5th edition.

2. Computer Networks, Tanenlaum, A.S., Andrew S., Tanenbaum, Pretice Hall, 4th Edition.

3. Data Communications & Networking, Forouzon, A. Behrouz, McGraw Hill, 5th edition.

4. Computer Network, "A system approach", peterson & Dovie, Harcoert, 3rd edition, 2005.

5. Computer Networks and Internets, Douglas E. Comer, Pearson/PHI, 4th edition, 2004.

Object Oriented Modeling and Programming (MCA-204)

Unit –I

Introduction to programming with C++, objects and classes, constructors, Destructors, objects as function arguments, friend function, operator and function overloading, concept of inheritance & polymorphism.

Unit II

Introduction: concept of object orientation, what is object oriented development, object oriented themes, evidence for usefulness of object oriented development.

Unit III

Class Modeling: object and classes concept, links and associations concept, generalization and inheritances, Navigation of class models. Advanced class modeling, association ends, N-array association aggregation, abstract classes, generalization as extension and restriction, multiple inheritance, metadata, reification, constraint, derived data, candidate keys. Static modelling and advance data modelling: Events and states, Transition's and conditions, state diagram, state diagram behaviour, operations, nested state diagrams, nested states, single generalization, concurrency, advanced dynamic modelling concept.

Unit IV

Interaction Modeling: use case Model, sequence models, activity models.

Functional Modeling: functional models, DFD, Specifying Operations, constraints, relation of functional to object and dynamic models. Design methodology: OMT as a software engineering methodology, OMT methodology

Unit V

Domain Analysis: Analysing the Problem statement, adding operation, iterating the analysis. System Design: Overview of system design, breaking in to sub system, identifying concurrency, allocating subsystems to processors and tasks, management of data stores, handling global resources, handling boundary conditions, setting tradeoff priorities, common architectural frameworks.

Text / Reference Books

1. Object Oriented Modeling and design, Rambaugh, Blaha et.al , Pearson Education.

2. Mastering C++, Venugopal , K.R. Tata McGraw – Hills.

3. Let us C++, Kanetkar Yashwant P. , BPB Publications.

4. Object Oriented programming with C++, Balaguruswami E., Tata Mc Graw Hill.

5. An Introduction to OOP and Silvertalk – Addison Wesley, L. Pinson and R. Wiener,.

Semester-III

Information and Network Security System (MCA - 301)

Unit-1

Basic Security Concept, Computer Security, Threats to Security, attacks, Security services & Mechanisms, Communication Security-Encryption, Classical Encryption Model, Steganography.

Unit-2

Cryptography- transposition/ substitution, Caesar Cipher, Cryptosystem, Symmetric and Asymmetric crypto primitives, Private Key Cryptography, Block Cipher Principles, Data encryption Standards, Encryption and Decryption using round functions, AES, Triple DES, Random **number** generation, Key distribution.

Unit-3

Message Authentication and hash functions-message digest, strong and weak collision, message authentication code, MD5, Hash functions, Secure Hash algorithm (SHA), Birthday paradox, digital signature, Digital signature standards (DSS).

Unit-4

Public Key Cryptography – Number Theory: Euclidean algorithm, Euler Theorem, Fermat theorem, Totent function, multiplicative and additive inverse. Principles of Public key cryptography, Public Key infrastructure (PKI), RSA algorithm, Key management, Elliptic Curve cryptography, Diffie Hellman Key Exchange.

Unit-5

Network and System Security – Network Attacks, IP Security (IPSec): AH & ESP, Web security: SSL /TLS, Kerberos, E-mail Security: Pretty good Privacy (PGP), S/Mime, Network scanning, System security: intruders, viruses, firewall Design Principles, Intrusion Detection system (IDS), Concept of Cyber Security.

Text/Reference Books

1. Cryptography and Network Security by Willian Stallings, Pearson Education, 6th edition, 2013.
2. Cryptography and Network Security by Behrouz A. Forouzen, Tata McGraw Hill.
3. Cryptography and Network Security by atul Kahate, McGraw Hill Education India (Pvt. Ltd.) 2nd edition, 2009.
4. Handbook of Information Security Management, Micki Krause F tipton- Vol. – 3, CRC Press LLC, 2004.
5. Link: Dr, Gary C. Kersler's An overview of Cryptography: "Pretty good Privacy (PGP)"(HTML).
6. www.Netseurity.net.

Programming with JAVA (MCA- 302)

Unit I:

An overview of Java, JVM, bytecode, Java class libraries, Date types, Variable, Data types and casting,

Operators, operator precedence and Control statements.

Unit II:

Declaring object reference variable, Introducing methods, constructors, the key word, garbage collection,

Overloading methods, String handling, and String buffer.

Unit-III

Inheritance and polymorphism: super class and subclass, protected members, Relationship between super and sub class. Inheritance hierarchy, abstract classes and methods, final methods and classes, nested classes, Packages and Interfaces: Defining a package, importing package, defining an interface, implementing and applying interfaces.

Unit IV:

Exception Handling: Fundamentals, exception types, using try and catch. File handling: Character based file and binary file, Multithreaded Programming: Creating a single and multiple threads , thread priorities, synchronization.

Unit-V

Applets: Applets basics, applets architecture, applets skeleton, the html applet tag, passing parameters in applets, event-handling: event classes and event listener interfaces, introduction to swing and servelets.

Text/Reference Books

1. The complete reference Java - 2, P. Naughton and H. Schildt: Tata Mc-Graw Hill.
2. the java hand books, Patrick Naughton, Michael Morrison, Osborne/McGraw-Hill
3. A Desktop Quick Reference for Java Programmers, David Flanagan, Java in a Nutshell: O'Reilly & Associates, Inc.
4. Programming with Java A Primer, E. Balaguruswamy, TMH.
5. Big Java, Cay Horstmann, Wiley India edition, 2nd Edition.
6. Core Java, Dietel and Dietel, Pearson/Pretice Hall , 7th Edition.
7. Internet and Web-Technologies by Rajkamal, TataMcGraw-Hill, 6th Edition, 2011.

Theory of Computation (MCA- 303)

Unit- I

Mathematical preliminaries, alphabets, strings, Languages, states, transitions, finite automata and regular expressions, applications e.g. Lexical analyzers and text editors.

Unit- II

The pumping Lemma & closure property of regular sets, decision algorithms for regular sets.

Unit- III

Context free grammars, Chomsky and Greibach normal form theorems, ambiguity, Pushdown automata and the equivalence of context free languages to sets accepted by non-deterministic PDA, the Pumping Lemma for CFL's,closure properties of CFL's and decision algorithms for CFL's.

Unit- IV

Turing Machines: Introduction, Turing hypothesis, Turing computability, nondeterministic, multitape and other versions of Turing machine, Church's hypothesis, primitive recursive function, Generalization, recursively enumerable Languages and Turing Computability.

Unit- V

Undecidability: Universal Turing machines and unsolvability of the halting problem, an undecidable problem, Post's Correspondence problem.

Text/Reference Books

1. Introduction to Automata Theory, Languages and Computation,Hopcroft J.E. and Ullman J.D., Narosa Publishing House, 1988.

2. Theory of Computation, Derickwood, Harper & Row Publishers, New York, 1987.

3. Elements of the Theory of Computation,Lewis H.R. & Papadimitriou C.H, Prentice Hall International Inc. 1981.

4. Introduction to the Theory of Computation, Michal Sipear, MA.: Thomson course technology, 2nd edition, 2006.

5. Automata Theory, language and Computation, J. Hoperoft, R. Motwani and Jeffery Ullman, Addison wisely, 3rd edition,2013.

6. Theory of Computer Science: Automata, Language and computation, K.L.P. Mishra, N. Chandrasekaran, PHI Learning Pvt. Ltd.

Design and Analysis of Algorithms (MCA- 304)

Unit-I

Algorithms and structured programming, analysing algorithms, asymptotic behaviour of an algorithm, Order notations, time and space complexities (polynomial, logrithmic and exponential), average and worst case analysis, lower and upper bounds.

Unit-II

Advanced data structures: Threaded trees, B-trees, Heaps and heapsort, sets and relations, Graphs, Hashing.

Basic search & Traversal Techniques (Breadth first and Depth first traversals of Graphs).

Unit-III

Algorithm design strategies: Divide and conquer, Mergesort, Quicksort, matrix multiplication. Greedy method:

General method, knapsack problem, job sequencing with deadlines, minimum cost spanning trees). Dynamic programming (0/1 knapsack, travelling salesman problem).

Unit-IV

Backtracking: 8 - Queens problem, Sum of Subsets, Graph coloring, 0/1 Knapsack. Branch & Bound 0/1 knapsack, Travelling salesman.

Unit-V

Approximation algorithms: Polynomial Time Approximation Schemes. Complexity: - NP-Hard and NP-complete

Problems - Cook's theorem, NP completeness reductions.

Text/Reference Books

1. Fundamentals of Computer Algorithms, E. Horowitz, S. Sahni, Galgotia Publications, 1985.
2. Design & Analysis of Computer Algorithms, Aho, J.E. Hopcroft, & J.D. Ullman, Addition Wesley, 1974.
3. Algorithms - The Construction, Proof & Analysis of Programs, P.Berlions & P. Bizard, John Wiley & Sons, 1986.
4. Data Strucures and Algorithms, K. Melhorn, Vol. I & II, Springer Verlag, 1984.
5. Introduction to Algorithms by A.L. Cormen, leiserson, rivest & Stain, 3rd Edition, PHI Learning pvt. Ltd.

Semester-IV

WEB DEVELOPMENT & .NET FRAMEWORK (MCA- 401)

Unit- I

Introduction to .Net Framework, CLR, MSIL, Metadata, Namespaces, Console Application using .Net Framework, C# Programming: Introduction, Tokens, Data types, Variables, Operators, Control Statements , Methods, Arrays, String, Structures, Enumerations.

Unit- II

Object oriented Programming in C#, Namespaces, Object oriented Programming in C#, Classes and Objects, Encapsulation, Polymorphism, Inheritance, Interfaces and Collections, Exceptions Handling Garbage Collector, Callback Interface, Delegates, Events. Advance C# type Construction Properties & Indexers, Operator Overload, Conversions, Generics, Threading, Late Binding, Attribute-Based Programming, Data access with ADO.NET

Unit- III

Web Application Development using ASP.NET with C#: Web Application in ASP.NET, IIS and Development Server, Migrating ASP Web Application to ASP.NET, Working with HTML Controls, Client Side Scripts, Server Controls, Validations, Working with Classes and Dynamic Link Library (DLL), Master Page, State Management In ASP.NET.

Unit- IV

Data Binding, Data Management with ADO.NET, Portal Frameworks and Web Parts, Creating & Consuming XML, Querying with LINQ, Navigation, Introduction to AJAX, Caching, Cookies, Web Services, Localization, Security, Packaging and Deploying ASP.NET Web Application.

Unit-V

Windows Applications in VB .NET, Windows Forms, Text Boxes, Buttons, Labels, Check Boxes, and Radio Buttons. List Boxes, Combo Boxes. Picture Boxes, Scrollbars, Splitters, Timer, Menus, Built-in Dialogs Image List, Tree Views, List Views, Toolbars, Status Bar and Progress bars., File Handling using File Stream, Stream Writer, Stream Reader, Binary Reader, Binary Writer classes, Developing Multiple Document Interface (MDI) and Dynamic Linked Libraries (DLL).

Text / Reference books

1. Professional ASP.NET 3.5 in C# and VB, Bill Evjen, Wrox Publication
2. C# 2008 Programming covers. NET 3.5 (Black Books), Kogent Solutions, Dreamtech Press
3. The Complete Reference C# 3.0, Herbert Schildt, Tata McGraw-Hill
4. Pro C# with .Net, Andrew Troelsen, Apress Publication
5. Pro VB2008 and The .Net Platform, Andrew Troelsen, Apress Publication

Operating System (MCA- 402)

Unit- I

Operating system as resource Manager: Overview of processor management, memory management, file management, Device management; operating system services; operating system classifications-single user, multiuser, multiprocessing, batch processing, time sharing, real time operating system.

Processor management: Process overview, process states, multiprogramming, levels of schedulers and scheduling algorithms, multi-processor scheduling, deadlock prevention, avoidance, detection and recovery.

Unit- II

Memory management**:** Partition, paging and segmentation; types of memory management schemes, virtual

memory-demand paging, procedure sharing, run time storage allocation.

File Management**:** File supports, access methods, allocation methods- continuous, linked and index allocation; directory systems-single level, tree structured, acyclic graph and general graph directory, file protection, layered file system.

Unit- III

Resource Protection: Mechanism, policy and domain of protection, access matrix and its implementation, dynamic protection structure.

Unit- IV

Device Management**:** Dedicated, shared and virtual devices, sequential access and direct access devices , channel and control units, I/O buffering, I/O schedulers, spooling system.

Unit – V

Concurrent Process and Programming: Precedence graph, Berntein condition, process hierarchy, process synchronization-critical section and mutual exclusion, classical process co-ordination problems, critical region, monitors, concurrent languages.

Text/Reference Books

1. Operating System Concepts, Silberschatz, Galvin and Gagne, Wiley India Ltd., 6 edition.
2. Modern Operating Systems, Andrew S. Tanenbum, Pearson Edition, 2nd edition, 2004.
3. Operating Systems, Gary Nutt, Pearson Education, 3rd Edition, 2004.
4. Operating Systems, Harvey M. Dietal, Pearson Education, 3rd edition, 2004.
5. Fundamentals of Operating Systems, A.M. (1979).

Software Engineering (MCA- 403)

Unit- I

Software engineering concepts, historical perspective, software evaluation, program design paradigms. Software project planning : identifying software scope, resources.

Unit- II

Analysis concept, analysis modeling (behavioral model, data model, functional model), analysis tools & techniques, risk management, project scheduling, tracking Cost estimation : project metrics, cost factors, cost estimation techniques (decomposition, empirical, automated estimation, delphi).

Unit- III

System design: Design concepts & principles (modularization abstraction, refinement, cohesion, coupling) design methods (structured design, object oriented design, real time system design), Implementation : modern programming language features & characteristics, language classes, coding style, efficiency.

Unit- IV

Software Quality Assurance : Quality factors and criteria, SQA metrics, SQA techniques. Verification and

Validation : software testing methods(WBT, BBT), software testing strategy (Unit testing, integration testing, validation system, testing).

Unit- V

Maintenance: Maintenance characteristics, Maintainability, software reuse, re-engineering, reverse engineering, CASE tools.

Text / Reference books

1. Software Engineering: A practitioners approach Roger S. Pressman, McGraw Hill, (Third and Forth Edition), 1992.
2. "An Integrated approach to software Engineering "Pankaj Jalote Narosa Emerging Web Technologies publishing House.
3. Software Engineering, H. Sommervill Ian , Addition Wesley Pub. Co.
4. Software Engineering Concepts" Fairley Richard , "McGraw Hill, 1985.
5. Software Engineering: An object Oriented Perspective by Braude, E.J., Willey, 2001.

Artificial Intelligence (MCA- 404)

UNIT-I

General Issues and Overview of AI: The AI problems, what is an AI technique? Problem Solving, Search and Control Strategies**:** General problem solving, production systems, control strategies: Forward and backward chaining. Exhaustive searches: Depth and Breadth first search.

UNTT-II

Heuristic Search Techniques: Hill climbing, Branch and Bound technique, Best first search & A* algorithm, AND/ OR graphs, problem reduction & AO* algorithm, constraint satisfaction problems, means ends analysis. Knowledge Representation: First order predicate calculus, skolemization, resolution principle & unification, interface mechanism, Horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency.

UNIT-III

AI Programming Language: PROLOG: Introduction, Clauses: Facts, goals and rules. Prolog unification

mechanism, arithmetic operator, list manipulations, Fail and Cut predicates recursion.

UNTT-IV

Planning: Overview-An Example Domain: The block word, component of planning systems, goal stack planning (linear planning), non-linear planning using goal sets. Handling Uncertainty: Probability theory, Bayes theorem and Bayesian networks, Certainty factor, Fuzzy Logic.

UNIT-V

Natural Language Processing: Parsing techniques, context-free grammar, Case and Logic grammars, Semantic Analysis. Expert Systems: Introduction to expert system, knowledge acquisition, case studies: MYCIN.

Text / Reference books

1. Artificial Intelligence, Elaine Rich and Kelvin Knight: Tata McGraw Hill.

2. Introduction to Artificial Intelligence and Expert Systems, D.W. Patterson: Prentice Hall of India.

3. Programming in PROLOG, Clocksin, W.F and Mellish, C.S, Narosa Publishing.

4. Fuzzy logic with engineering Applications, Timothy J. Ross, McGraw Hill, 1995.

5. An Introduction to Generic Algorithm, Melnaic Mitchell, PHI, 1998.

SEMESTER – V

Modeling and Simulation (MCA- 501)

Unit-I

Definition of System: Types of system-continuous and discrete, modelling process and definition of a model.

Unit-II

Computer work load and preparation of its models, verification and validation modelling procedures, comparing model data with real system. Differential and partial differential equation models.

Unit-III

Simulation Process: Use of simulation, advantages and disadvantages of simulation, discrete and continuous simulation procedures, Discrete system simulation: Monte Carlo method, Random Number Generation.

Unit-IV

Evaluation of simulation, length of simulation runs, variance reduction techniques. Project management **:** PERT/CPM techniques, simulation of PERT networks. Model as components of information systems, modelling for decision support.

Unit-V

Simulation languages: A brief introduction to important discrete and continuous simulation language; Simula,

Dyanamo, Stella, Powerism. Their application and Comparison.

Text/Reference Books

1. Introduction to simulation,Payne, J.A: Mcgraw Hill.

2. Computer Aided Modelling and Simulation-Spriet, W. A: Academic Press.

3. Modelling and performance Measurement of Computer systems, Barnes,B:.

4. System Simulation, Gorden, G: Prentice Hall of India.

5. System Simulation, Deo Narsing, Mcgraw Hill.

Computer Graphics (MCA- 502)

Unit- I

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

Unit- II

Graphics Primitives**:** Display devices, primitive operations, The display-file Interpreter, Normalized device coordinates, Display file structure and display-file algorithms, display control, text, the line style primitive.
Polygons **:** Polygon representation, Entering polygons, polygon interfacing algorithms, filling polygons, filling with a pattern, initialization, anialiasing.

Unit- III

Transformations : Matrices, scaling transformations, Rotation, Homogenous co-ordinates and Translations, coordinate transformations, rotation about an arbitrary point, inverse transformations, transformation routines, transformation and patterns initialization and display procedures. Segments **:** Creation of segment, closing, deletion and renaming segments, visibility, image transformations, saving
and showing segments.

Unit- IV

Windowing and clipping **:** The viewing transformation and its implementation, clipping, the Cohen-Sutherland Outcode algorithm, The Sutherland-Hodgman algorithm, clipping of polygons, Generalized clipping, multiple windowing.

Unit- V

Three Dimensions : 3D geometry, 3D primitives and transformations, Parallel projection, Viewing projections and special projections, conversion to view plane co-ordinates, clipping in three dimensions, clipping planes. Hidden surfaces and Lines**:** Back-face algorithm, Z-buffers, Scanline algorithm, Franklin algorithm. Illumination, Reflection, shadows, Ray tracing, halftones.

Text/Reference Books

1. Computer Graphics – C version by D. Hern & P. Baker, Pearson Education, 2nd edition, 2004.
2. Computer Graphics: A programming Approach, Steven Harrington: Publisher
3. Mathematical elements for computer graphics, David F. Rogers, J. Alan Adams: Publisher
4. Procedural elements for computer graphics, David F. Rogers: Publisher.
5. Computer Graphics –principles and Practice by James D. Foley, Andries VanDamet-al, Pearson education 2nd edition,2007.
6. Computer Graphics & Project by B.M. Havaldar, Anmol Publications.

ELECTIVE – I: Mobile Computing (MCA- 503.1)

Unit-I

Introduction to wireless Communication System: Evolution, Generations of wireless communication, Wireless transmission concepts: Frequencies, signals, Antennas. Comparison of wireless communication system: Land- Mobile technologies (GSM, CDMA) , Satellite, Personal Communication Systems.

Unit-II

Wireless MAC Protocols: S/F/T/CDMA, CSMA protocols, specialized MAC, Cellular Systems, Spread Spectrum: DSSS & FHSS; Wireless WAN (GSM: Mobile Service, GSM architecture, Radio Interface, Protocols, Localization & Calling, Handover & security)

Unit-II

Wireless LAN: IEEE 802.11 b/a/g: System architecture, Protocol architecture, MAC management; introduction to HIPERLAN. Concept of Bluetooth - IEEE 802.16.

Unit-IV

Mobile IP – Packet delivery – Registration process, Tunneling and Encapsulation, Routing protocols, DHCP, Unicast & multicast Communication, Wireless TCP- Indirect, Snooping & mobile TCP; Introduction to wireless PAN.

Unit-V

Ad-Hoc Networks- (Infrastructure and Ad-Hoc networks) Routing algorithms, Support for mobility WAP, WAP architecture, Transport Security – Transaction protocol, Session protocol, Introduction to pervasive computing-Applications, Devices, Software. Introduction to Mobile Operating System / Android 5.0/ Windows 8.1 and Macintosh OS.

Text/Reference Books

1. Jochen Schiller. Mobile Communications, Pearson Education
2. Stojmenovic Ivan, HandBook of Wireless Networks and Mobile Computing, John Wiley & Sons
3. Theodore S. Rappaport, Wireless Communications: Principles and Practice, Second Edition, Prentice Hall. 2002.
4. Chander Dhawan, Mobile Computing- A System Integrator's Approach, McGraw-Hill
5. Wireless Communication and Networking – Willam Stallings, PHI, 2003.
6. Ad-hoc Wireless Networks- Architecture and Protocols by C. Siva ram Murthy, B.S. Manoj, Pearson Education, 2nd Edition, 2005.
7. Raj Kamal Oxford Univ. Press "Mobile Computing" 3rd Ed. In Print expected July 2015

ELECTIVE – I: Image Analysis and Computer Vision (MCA- 503.2)

Unit-I

The Digitized Image and its Properties: Applications of image processing, image function, image representation,

sampling, quantization, color images, metrics and topological properties of digital images, histograms, image quality, noise image.

Unit-II

Image Pre-processing: Pixel brightness transformation, geometric transformation, local pre-processing-image

smoothening, zero-crossing, scale in image processing, spatial operation, intensity transformation and spatial filtering, color models, gray scale transformation. Image Restoration: Image degradation and re-storage process.

Unit-III

Morphological properties of image: Erosion and Dilation, opening and closing, basic morphological algorithms.

Segmentation: point, line and edge detection, Threshold detection methods, parametric edge models, edges in multi spectral images, thresholding, Region based segmentation.

Unit-IV

Image representation and description: Representation, border following and chain codes, boundary descriptors, regional descriptors.

Unit-V

Pattern Recognition Fundamentals: Basic concepts of pattern recognition, fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model.

Text/Reference Books

1. Rafel C. Gonzalez Richard E. Woods, Digital Image Processing:, Second edition, Addison-Wisley.

2. A K Jain, Digital Image Processing:, PHI

3. R. M. Haralick, L. G. Shapiro. Computer and Robot Vision.Addison-Wesley, 1993.

4. A. Rosenfeld, A. C. Kak. Digital Picture Processing.Addison-Wesley, 1983

ELECTIVE – I: Real Time Systems (MCA- 503.3)

Unit-I

Introduction to Real-time computing: Characterizing Real-time system & tasks; Performance measures of real time systems, estimation of program run time.

Unit-II

Real-time system design: Hardware requirement, system-development cycle, data transfer techniques, synchronous & asynchronous data communication, standard interfaces.

Unit-III

Task Assignment and Scheduling: Priority scheduling, scheduling with fixed priority dynamic priority scheduling.

Unit-IV

Real-time programming languages & Tool: desired language characteristics, data typing, control structure, run time error handling, overloading & generics, run time support, Real-time databases, Real time communication algorithms.

Unit-V

Fault tolerance techniques: Causes of failure, fault types, fault detection, redundancy, integrated failure handling

Reliability Evaluation techniques: Parameter values, reliability model for hardware redundancy, software error model, Clock synchronization.

Text/ Reference Books

1. C.M. Krishna & K.G. Shen, Real Time Systems, McGraw Hill, 1997.

2. P.D. Lawrence & K. Mauch, Real Time Microcomputer Design: An Introduction, McGraw Hill, 1988.

3. Mathai Joseph, Real Time systems : Specification, Verification & Analysis, Prentice Hall Inc., 1996.

4. Stuart Bennet, Real Time computer control, Prentice Hall Inc., 1988.

5. S. J. Young, Real time languages, John Willey & sons, 1982.

ELECTIVE – I: Embedded System Design (MCA- 503.4)

Unit- I

Overview: Overview of embedded systems, Design challenge, Processor technology, IC technology, Design Technology. Custom-Single purpose processors: Custom single purpose processor design, optimizing custom single processors. General-Purpose Processors: Basic architecture, operation, programmers view, development environment, selecting a microprocessor.

Unit- II

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- III

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

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.

Unit- IV

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, IEEE 802.11.

Unit- V

Digital Camera**:** Case study of embedded system. Control systems: Open loop and closed loop systems, General control systems and PID controllers, Practical issues related to computer based control, Benefits of computer based control implementations.

Text / Reference books

1. Embedded system design: A unified hardware/software Introduction,Frank Vahid& Tony Givargi s: John Wiley & Sons Inc. 2002.
2. Embedded System Desing, Petor Marwedel, Springer- Verlog newyork Incorporated, 2005.
3. Embedded Systems by Rajkamal, TMH.
4. Embedded Systems- Architecture, Programming and Design by Rajkamal, TMH, 2007.
5. Computer Architecture and Parallel Processing by Kai Hwang, faye A.Brigs, McGraw Hill.

ELECTIVE – I: System Testing (MCA 503.5)

Unit- I

Introduction to Software testing, Error fault, Failure, Incident, Test cases, Test Plan, Software testing processes overview, Incremental testing approach, Test outlines, Limitation of Testing.

Unit- II

Functional Testing: Boundary value analysis, Equivalence Class Testing, Decision Table Based Testing and cause effect – graphing Technique.

Unit- III

Structural Testing: Path Testing, Cyclomatic Complexity, Graph metrics, Data Flow testing, Mutation Testing. Object Oriented Testing: Issues, Class Testing, GUI Testing, Object Oriented Integration and System testing, Testing Web Based Systems

Unit- IV

Reducing the number of test cases: Prioritization guidelines, Priority category scheme, Risk analysis, Regression Testing, slice based Testing,

Testing activities: Unit Testing, Levels of Testing, and Integration Testing, System Testing, Debugging, Domain Testing.

Unit – V

Testing Tools: Static Testing Tools, Dynamic testing Tools, and characteristics of Modern Tools.

Building and applying standards to test Documentation: Configuration management, Reviews, Industry Standards – ISO 9001, CMM for Software, IEEE standards.

Text:

1. William Perry, "Effective Methods for Software Testing", John Wiley & Sons, New York, 1995.
2. Cem Kaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Second Edition, Van Nostrand Reinhold, New York, 1993
3. Boris Beizer, "Software Testing Techniques", Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990
4. Louise Tamres, "Software Testing", Pearson Education Asia, 2002

References:

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
2. Boris Beizer, "Software System Testing and Quality Assurance," Van Nostrand Reinhold, New York, 1984.

ELECTIVE – II: Natural Language Processing (MCA- 504.1)

Unit-I

Introduction to Natural Language, Understanding Language as a knowledge base process, Basic linguistics.

Morphology-Types and Parsing, N-gram Model, Maximum Likelihood Estimation, Smoothing techniques on N-gram Model, Words and Word Classes, POS Tagging.

Unit-II

Grammar and Parsing – Top-Down Parsing, Bottom-up Parsing, Dependency Grammar, Parsing Indian Language.

Unit-III

Meaning Representation, First Order Predicate Calculus, Elements of FOPC, Semantics and FOPC, Syntax Driven Semantic Analysis, Principal of Compositionally, Semantic Augmentation of CFG Rules, Robust Semantic Analysis.

Unit-IV

Introduction to Semantic Grammar, Structure of word, Thematic Roles, Word Sense Disambiguation-Selection

Restrictions, Machine Learning Approaches, Dictionary Based Approaches.

Unit-V

Context and World Knowledge: Knowledge Representation and Reasoning. Local Discourse context and Reference. Discourse structure and understanding using World Knowledge, Language Learning and Concept Learning.

Text/Reference Books

1. James Allen, Natural Language Understanding, Pearson Education India.

2. Rich & Knight, Artificial Intelligence, Tata Mc Graw Hill Pub.

3. Dan W. Patterson, Artificial Intelligence: A Modern approach, Pearson Education, India

4. Russell Norwig, Artificial Intelligence: A Modern approach, Pearson Education, India.

5. Speech and Language Processing by Jurafsky and Mrtin, Pretice Hall, 2000.

ELECTIVE – II: Parallel Processing (MCA- 504.2)

UNIT-I

Introduction to Parallel Processing: Flynn's classification, SIMD and MIMD operations, Shared Memory vs. message passing multiprocessors, Distributed shared memory, Hybrid multiprocessors

UNIT-II

Shared Memory Multiprocessors: SMP and CC-NUMA architectures, Cache coherence protocols, Consistency protocols, Data pre-fetching, CC-NUMA memory management, SGI 4700 multiprocessor, Network Processors.

UNIT-III

Interconnection Networks**:** Static and Dynamic networks, switching techniques, Routers, Internet techniques.

UNIT-IV

Message Passing Architectures: Message passing paradigms, Grid architecture, Workstation clusters, User level software.

UNIT-V

Scheduling: Multiprocessor Programming Technique, Scheduling and mapping, Internet web servers, P2P, Content aware load balancing.

Text / Reference books

1. Advanced Computer Architecture parallel processing,HESHAM EL-REWINI, MOSTAFA ABD-EL-BARR, John wiley & Sons INC publication.

2. Advanced Computer Architecture,Kai Hwany, Tata MsGraw Hill Edition.

3. Computer System Architecture, M.Morris Mano, Prentice Hall.

4. Elements of Parallel Processing, V. Rajaraman, Prentice-Hall of India, 1990.

5. Designing Efficient Algorithms on Parallel Computers, Mc-Graw Hill International, NewYork, 1987.

6. Parallel Algorithms, Dhall et. al., Mc-Graw Hill Int.

ELECTIVE – II: Compiler Design (MCA- 504.3)

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. Error Handling.

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. Errors, lexical phase errors, syntactic phase errors. Intermediate languages, postfix notation, syntax trees, parse trees, three address code, triples and indirect triples.

Unit-IV

Translation of assignment statements, Boolean expressions, statements that alter flow of control, array references, procedure calls, declarations, case statement, record structures. *Symbol tables*: operation on symbol tables, 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.

Text/Reference Books

1. Principles of Compiler Design , Aho, Ullman; Narosa Publishing House, 1989
2. Compilers : Principles, techniques and tools , Aho, Sethi, Ullman; Wesley 1988
3. : Compiler Construction : Theory & Practice, Barrat, Eates, CoughtGalgotia 1988
4. Trembly & Sorenson Compiler Writing ; Mc-Graw Hill Book Co.
5. Gries Compiler Construction for Digital Computer ; John Willey & Sons, New York - 1987

ELECTIVE – II: Artificial Neural Network (MCA- 504.4)

Unit-I

Introduction to ANN Features , structure and working of Biological Neural Network ,Trends in Computing Comparison of BNN and ANN, History of neural network research, characteristics of neural networks terminology, models of neuron Mc Culloch – Pitts model, Perceptron, Adaline model, Basic learning laws, Topology of neural network architecture

Unit-II

Backpropagation networks : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input – hidden and output layer computation, backpropagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.

Unit-III

Activation & Synaptic Dynamics : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. Basic functional units of ANN for pattern recognition tasks: Basic feedforward, Basic feed back and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks. a) Feedforward neural networks –
- Linear responsibility X-OR problem and solution.- Analysis of pattern mapping networks summary of basic gradient search methods.b) Feed back neural networks Pattern storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.

Unit-IV
Competitive learning neural networks : Components of CL network pattern clustering and feature mapping network, ART networks, Features of ART models, character recognition using ART network**.**

Unit-V
Applications of ANN :Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron – Recognition of handwritten characters.
NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation.

Text/Reference books

1. Artificial neural Networks, Yegnanarayana PHI.

2. Neural networks, Fuzzy logic and Genetic Algorithms, S. Raj Sekharan , Vijayalakshmi Pari, PHI

Elective-II Software Project Management (MCA-504.5)

Unit-1

Introduction to Software Project Management: The Nature of Software Production, Key Objectives of Effective Management, Quality, Productivity, Risk Reduction, The Role of the Software Project Manager.

Unit-2

Planning the Project: Business Planning, Types of Plans, Plan documentation methods, Determining Objectives,Forecasting demand for the Product, Proposal Writing, Requirements analysis. Technical Planning: Work breakdown structures, PERT and CPM, Gantt Charts, Standards.

Unit-3

Planning for Risk Management and Control, Entry and Exit criteria, Intermediate checkpoints, Performance prediction and analysis People, Capacity Planning, Estimating - what it takes to do the job, Cost (direct and indirect), Resources, Time, Size and complexity of the product, Managing the Project, Feedback and Reporting Mechanisms.

Unit-4

Financial planning - budgeting, Resource Allocation, Managing Product Support and adaptive maintenance,restructuring code, flexibility, reusability, reliability, efficiency, quality assurance, Managing Change, Readjusting Goals and Milestones.

Unit-5

Introduction to Software Architectures, Origin and design process of software architectures, Quality attributes, scope of software architecture, architectural styles, and software architectural design.

Text/Reference Books

1. Tom Gilb, Finzi Susannah, "Principles of Software Engineering Management', Addision-Wisley, England, 1988.
2. Paul Clements, et al., 'Documenting Software architectures: Views and beyond', addision-Wisley, 2002.
3. Mark Norris, Peter Rigby, Malcolm Payne, 'The healthy Software Project-A Guide to Successful Development & Management', John Wiley & Sons, 1993.
4. 'Software Architecture : System Design, Development and maintenance', Edited by Jan Bosch, Morven Gentleman, Christine Hofmeister, Juha Kusela, Kluwer academic Publishers, 1992.
5. Barbee Mynatt, 'Software Engineering with Student Project Guidance', Prentice Hall, New Jersey, 1990.
6. Mary Shaw and David Garlan, 'Software Architecture: Perspectives on an Emerging Discipline', Prentice-Hall, 1996.
7. Neal Whitten, 'Managing Software Development projects', John Wiley, 1995.

SEMESTER – VI

READING ELECTIVE: E-Commerce (MCA – 601.1)

Unit-I

E-commerce: Objectives, Advantages and disadvantages, Forces driving E-Commerce, Traditional commerce and E-commerce, E-Commerce opportunities for industries.

Unit-II

E-Commerce Models: Business to consumer, Business to Business, Consumer to Consumer, other models – Brokerage Model, Aggregator Model, Info-mediary Model, Community Model and value chain Model.

Unit-III

Electronic Payment Systems: Special features required in payment systems, Types of E-payment systems, Smart Card, Electronic Purses, E-Cash, E-cheque, credit card.

Unit-IV

E-Marketing, E-Customer Relationship Management, E-Supply Chain Management.

Unit-V

Security Issues in E-Commerce: Security risk of E-Commerce, Types of threats, Security tools and risk management approach. Cyber laws, Business Ethics, EDI Application in business.

Text/Reference Books

1. E - Commerce An Indian Perspective by P.T. Joseph, S.J., PHI
2. Doing Business on the Internet E – Commerce (Electronic Commerce for business) by S. Jaiswal, Galgotia Publications.
3. E-Commerce by Scneider, Thomson Publication.
4. E-commerce: Strategy – Technologies and Application by Whiteley David, TMH, India.
5. Electronic Commerce by Greensteen, TMH.

READING ELECTIVE: Enterprise Resource Planning (MCA – 601.2)

UNIT - I

ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

UNIT - II

Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

UNIT - III

ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, The Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

UNIT – IV

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.

UNIT - V

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study.

Text/Reference books

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill.
2. Rahul V. Altekar “Enterprisewide Resource Planning”, Tata McGraw Hill.
3. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI .
4. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology.
5. Mary Summer, “Enterprise Resource Planning”- Pearson Education.

READING ELECTIVE: Client Server Computing (MCA – 601.3)

Unit-I

Overview: definition, history, myths, transition to client server computing, database architectures, advantages and disadvantages of client server architecture. Components : client, server, network, role and services of client-server, selection of operating system as client & server, types of client & servers, connectivity, messaging and peer-to-peer communication, role of OSI layer in client server, TCP/IP networks.

Unit-II

Middle-ware: definition, role, 2 tier v/s 3 tiers, network file system, network operating system, API, RPC model & implementation, IPC.

Unit-III

Database Server: memory and process architecture, SQL and PL SQL. Client/Server Processing: transaction
processing, remote processing, distributed processing.

Unit-IV

Developing and Managing C/S Applications: development tools, network management, backup and recovery, data integrity & security. Distributed objects: CORBA, COM, DOOM, OLE, Java-RMI, etc., ODBC & JDBC connectivity.

Unit-V

Data warehousing: operational data & analytical data, architecture. Distributed Computing: XML web services and services oriented architectures.

Text/Reference books

1. Amjad Umar, Distributed computing: a practical synthesis of networks, client-server systems, distributed

applications, and open systems, PTR Prentice Hall, 1993.

2. Patrick Smith, Client/server computing, Sams, 1992.

3. Jeffrey D. Schank, Novell's guide to client-server applications and architecture, Novell Press, 1994.

4. Robert Orfali, Dan Harkey, Jeri Edwards, Client/server survival guide, John Wiley, 1999.

READING ELECTIVE: Cloud Computing (MCA – 601.4)

Unit -I

Cloud Computing Fundamentals: Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing , usage scenarios and Applications , Business models around Cloud – Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, CloudSim.

Unit -II

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 App Engine, Amazon EC2, Microsoft Azure, Sales force. Introduction to MapReduce, GFS, HDFS, Hadoop Framework.

Unit -III

Collaborating on Calendars, Schedules and Task Management – Collaborating on Event Management, Contact Management, Project Management – Collaborating on Word Processing ,Databases – Storing and Sharing Files- Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Collaborating via Social Networks – Collaborating via Blogs and Wikis.

Unit -IV

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 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.

Text/Reference books

1. Bloor R., Kanfman M., Halper F. Judith Hurwitz “Cloud Computing for Dummies” (Wiley India Edition),2010
2. John Rittinghouse & James Ransome, “Cloud Computing Implementation Management and Strategy”, CRC Press, 2010.
3. Antohy T Velte ,Cloud Computing : “A Practical Approach”, McGraw Hill,2009

4. Michael Miller, Cloud Computing: “Web-Based Applications That Change the Way You Work and Collaborate Online”, Que Publishing, August 2008.
5. James E Smith, Ravi Nair, “Virtual Machines”, Morgan Kaufmann Publishers, 2006.