ADMISSION & EXAMINATION RULES
for
Master of Computer Applications (MCA)

1. OBJECTIVE

To prepare highly skilled professionals, with a strong conceptual and theoretical background in the fields of information technologies, especially in the emerging areas of software technologies.

2. THE PROGRAMME

Highlights of the course are described in the following table:

a.	*Name of the Programme*	Master of Computer Applications (MCA)
b.	*Nature*	Regular and Full Time
c.	*Duration*	Three Years (6 Semesters)
d.	*Total number of credits*	144
e.	*Medium of Instruction and English Examinations*	English
f.	*Eligibility Criteria*	i. Passed B.Tech. / B.E. / B.Sc. (Engg) / BCA / B.Sc. (with Mathematics / IT / CS / Electronics / Physics as one subject passed) examination from a recognized institution/university securing at least 50% marks (or equivalent CGPA) in aggregate. ii. Passed at least one paper of Mathematics at Senior Secondary (12^{th} level) or Bachelor's level. iii. Appeared in the Entrance Test or Interview conducted by Jamia Hamdard.
g.	*Selection procedure*	Entrance Test or Interview will be conducted based on the syllabus of BCA programmes of Jamia Hamdard.
h.	*Total Seats*	60 (50 General + 10 Sponsored, including NRI); in addition to these seats, 06 seats are available for Foreign Nationals.
i.	*Period of Completion*	Not more than 05 years (10 Semesters)
j.	*Commencement of the Programme*	July of the every academic session

3. PROGRAMME STRUCTURE

Semester-wise course structure, guidelines for teaching, practical and associated assessment of **MCA programme** is described in the following tables:

Course Type	**Credits**	**Percentage (%)** *(Approx)*
Departmental Core **(DC)**	110	76
Departmental Electives **(DE)**	26	18
Open Electives **(OE)**	8	6 6
Total	**144**	**100**

L-T-P stands for number of contact hours as Lecture-Tutorial-Practical in a week.

Semester – I

Paper Code	**Title of the Paper**	**Course Type**	**Marks**			**L-T-P**	**Credits**
			Internal Assessment	**Semester Exam**	**Total**		
MCA 101	Programming and Problem solving using 'C'	DC	30	70	100	3-1-0	4
MCA 102	Discrete Computer Mathematics	DC	30	70	100	3-1-0	4
MCA 103	Computer based Numerical and Statistical Techniques	DC	30	70	100	3-1-0	4
	OE – 1	OE	30	70	100	3-1-0	4
	DE – 1	DE	30	70	100	3-1-0	4
MCA 104	'C' Programming Lab	DC	50	50	100	0-0-4	2
MCA 105	Computer based Numerical and Statistical Techniques Lab	DC	50	50	100	0-0-4	2
					Total	**15-5-8**	**24**

Semester – II

Paper Code	Title of the Paper	Course Type	Marks			L-T-P	Credits
			Internal Assessment	Semester Exam	Total		
MCA 201	System Software and Assembly language Programming	DC	30	70	100	3-1-0	4
MCA 202	Data Structures	DC	30	70	100	3-1-0	4
MCA 203	Object-Oriented Programming Using C++	DC	30	70	100	3-1-0	4
MCA 204	Software Engineering	DC	30	70	100	3-1-0	4
	OE – 2	OE	30	70	100	3-1-0	4
MCA 205	Data Structures Lab	DC	50	50	100	0-0-4	2
MCA 206	Object-Oriented Programming Using C++ Lab	DC	50	50	100	0-0-4	2
					Total	**15-5-8**	**24**

Semester – III

Paper Code	Title of the Paper	Course Type	Marks			L-T-P	Credits
			Internal Assessment	Semester Exam	Total		
MCA 301	Data Communication and Computer Networks	DC	30	70	100	3-1-0	4
MCA 302	Operating System	DC	30	70	100	3-1-0	4
MCA 303	Database Management Systems	DC	30	70	100	3-1-0	4
MCA 304	Design and Analysis of Algorithms	DC	30	70	100	3-1-0	4
MCA 305	Java Programming	DC	30	70	100	3-1-0	4
MCA 306	Database Management Systems Lab	DC	50	50	100	0-0-4	2
MCA 307	Java Programming Lab	DC	50	50	100	0-0-4	2
					Total	**15-5-8**	**24**

Semester – IV

Paper Code	Title of the Paper	Course Type	Marks			L-T-P	Credits
			Internal Assessment	Semester Exam	Total		
MCA 401	Formal Languages and Automata Theory	DC	30	70	100	3-1-0	4
MCA 402	Unix and Shell Programming	DC	30	70	100	3-1-0	4
	DE – 2	DE	30	70	100	3-1-0	4
	DE – 3	DE	30	70	100	3-1-0	4
	DE – 4	DE	30	70	100	3-1-0	4
MCA 403	Unix and Shell Programming Lab	DC	50	50	100	0-0-4	2
MCA 404	Lab based on DE-2	DE	50	50	100	0-0-4	2
					Total	**15-5-8**	**24**

Semester – V

Paper Code	Title of the Paper	Course Type	Marks			L-T-P	Credits
			Internal Assessment	Semester Exam	Total		
MCA 501	Advanced Java Programming	DC	30	70	100	3-1-0	4
MCA 502	Multimedia and Web Technology	DC	30	70	100	3-1-0	4
MCA 503	Compiler Design	DC	30	70	100	3-1-0	4
	DE – 5	DE	30	70	100	3-1-0	4
	DE – 6	DE	30	70	100	3-1-0	4
MCA 506	Advanced Java Programming Lab	DC	50	50	100	0-0-4	2
MCA 507	Web Technology Lab	DC	50	50	100	0-0-4	2
					Total	**15-5-8**	**24**

Semester – VI

Paper Code	Title of the Paper	Course Type	Marks			L-T-P	Credits
			Internal Assessment	Viva Voce	Total		
MCA 601	Dissertation/Industrial Project	DC	300	200	500	0-0-48	24

Grand Total of Credits = 144

DEPARTMENTAL ELECTIVES (DE)

Paper Code	Title of the Paper	Marks			L-T-P	Credits
		Internal Assessment	Semester Exam	Total		
DE – 1						
MCA DE11	Computer Organization and Architecture	30	70	100	3-1-0	4
MCA DE12	Computer based Optimization Techniques	30	70	100	3-1-0	4
MCA DE13	Soft Computing	30	70	100	3-1-0	4
MCA DE14	Pattern Recognition	30	70	100	3-1-0	4
DE – 2						
MCA DE21	Software Testing	30	70	100	3-1-0	4
MCA DE22	Cryptography and Network Security	30	70	100	3-1-0	4
MCA DE23	Mobile Computing	30	70	100	3-1-0	4
MCA DE24	Open Source Software	30	70	100	3-1-0	4
DE – 3						
MCA DE31	Data Warehousing and data mining	30	70	100	3-1-0	4
MCA DE32	E-commerce	30	70	100	3-1-0	4
MCA DE33	Advanced DBMS	30	70	100	3-1-0	4
MCA DE34	Advanced Computer Architecture	30	70	100	3-1-0	4
DE – 4						
MCA DE41	Computer Graphics	30	70	100	3-1-0	4
MCA DE42	Image Processing	30	70	100	3-1-0	4
MCA DE43	Programming language Paradigms	30	70	100	3-1-0	4
MCA DE44	Computational Intelligence	30	70	100	3-1-0	4
DE – 5						
MCA DE51	Artificial Intelligence	30	70	100	3-1-0	4
MCA DE52	Distributed Systems	30	70	100	3-1-0	4
MCA DE53	Cloud computing	30	70	100	3-1-0	4
MCA DE54	Software Re-engineering	30	70	100	3-1-0	4
DE – 6						
MCA DE61	Big Data Analytics	30	70	100	3-1-0	4
MCA DE62	Parallel Computing	30	70	100	3-1-0	4
MCA DE63	Network Programming	30	70	100	3-1-0	4
MCA DE64	Computer Vision	30	70	100	3-1-0	4

OPEN ELECTIVES (OE)

Paper Code	Title of the Paper	Marks			L-T-P	Credits
		Internal Assessment	Semester Exam	Total		
OE – 1						
MCA OE11	Accounting and Financial Management	30	70	100	3-1-0	4
MCA OE12	Business Management	30	70	100	3-1-0	4
MCA OE13	Corporate Planning	30	70	100	3-1-0	4
MCAOE14	Foundations of Decision Processes	30	70	100	3-1-0	4
OE – 2						
MCA 0E21	Organizational Structure and Personal Management	30	70	100	3-1-0	4
MCA OE22	Business Economics	30	70	100	3-1-0	4
MCA OE23	Cyber Ethics	30	70	100	3-1-0	4
MCA OE24	Business Finance	30	70	100	3-1-0	4

4. MODE OF CURRICULUM DELIVERY

Mode of curriculum delivery includes classroom teaching, assignments, test, lab work, presentations, participation in relevant events and regularity.

5. ATTENDANCE

a. All students are supposed to attend every lecture and practical classes. However, the attendance requirement for appearing in the examination shall be a minimum of 75% of the classes held.

b. Each one-period teaching shall account for one attendance unit.

c. The concerned teacher will take a roll call in every scheduled class, maintains and consolidate the attendance record, which would be submitted to the Head of the Department at the conclusion of the semester.

d. Attendance on account of participation (with prior permission from the Head of the Department) in the co-curricular/extra-curricular activities can be granted by the Dean on receipt of certificates or recommendations of the respective activity issued by the Head of the Department.

e. Attendance records displayed on the Notice Board from time to time, in respect of short attendance, shall be deemed to be a proper notification and no individual notice shall be sent to the students/local guardian.

f. In case a student is found to be continuously absent from the classes without information for a period of 30 days, the concerned teacher shall report it to the Head of the Department.

g. Head of the Department may recommend for striking off the name of a student from rolls, after ensuring '**one month continuous absence'**, from all the concerned teachers.

h. A student, whose name has been struck off on account of long absence may apply to the Dean for readmission within 15 days of the notice of striking off the name. The readmission shall be effected on payments of prescribed readmission fees.

i. A student with less than 75% attendance in a subject shall not be allowed to appear in that subject in the semester examination. The Head of the Department shall recommend all such cases to the Dean of the School.

j. The Dean, on the recommendation of the Head of the Department, may consider the relaxation of attendance up to 10% on account of sickness and /or any other valid reason. No application for relaxation of attendance (duly certified by a Registered Medical Practitioner/Public hospital or a competent authority) will be entertained after 15 days from the recovery from illness etc.

6. INTERNAL ASSESSMENT

a. Internal assessment, to be made by concerned teachers, will be based on minor tests, quizzes, presentation, programming test, demonstrations and assignments.

b. Maximum of Three minor tests, with a total of 20 marks, for each theory paper shall be mandatory. Other modes of assessment shall account for remaining 10 marks.

c. A minor test each shall be scheduled after the completion of first and second term.

d. Dates for minor test will be announced at the beginning of the semester, by the examination coordinator.

e. The teacher concerned shall maintain a regular record of the marks obtained by students in minor tests and display the same in due course.

f. The concerned teachers shall submit the compiled internal assessment marks to the Head of the Department, on the conclusion of teaching of the current semester.

g. The Head shall display a copy of the compiled sheet, of internal assessment marks of all the papers, before forwarding it to the Controller of Examination, i.e. at the conclusion of the semester.

h. A promoted candidate, who has to reappear in the examination of a paper, will retain internal assessment marks.

i. In the case of re-admission, the candidates shall have to go through the internal assessment process afresh and shall retain nothing of the previous year.

7. SEMESTER EXAMINATIONS

Prescriptions for conducting semester examinations of theory and lab papers, those shall be conducted after the conclusion of each of the semesters, are presented in the following table:

a.	Mode	(Theory Papers)	Written only
		(Lab Papers)	Written, Demo, Programming and viva- voce.
b.	Duration	(Theory paper)	03 Hours
c.	Total Marks	(Theory Papers)	70 (Seventy only)
		(Lab Papers)	50 (Fifty only)

8. DISSERTATION/INDUSTRIAL PROJECT

a. Each student of the final semester will have to go for a Dissertation/Industrial Project work either in the industry or in the Department under the guidance of one or two faculty members.
b. Period of completion of Dissertation/Industrial Project work shall be full one semester.
c. There shall normally be two supervisors-one internal and one *external (in the case of industry project form the place where the student is pursuing project-work)*.
d. All the students, who are pursuing the Dissertation/Industrial project work, shall be continuously in touch with the internal supervisor.
e. ***There shall be a mid-term evaluation of the progress*** and the internal supervisors will conduct it. However, an internal supervisor may ask the student to submit a confidential progress-report from the external supervisor *(in the case of industry project).*
f. All the candidates shall submit ***Three (03***) hard copies of the project reports that are duly approved and signed by internal as well as external *(if applicable)* supervisors.
g. An external examiner, appointed for the purpose, shall evaluate the project report.
h. The Head of the Department shall fix a date and time for viva-voce examinations, on receipt of the evaluation-report of the project reports from the external examiner.
i. Head of the Department shall forward the compiled total marks (awarded in internal assessment, project Report and Viva-voce Examination), in the project-semester of each of the candidate, to the Controller of Examination.

9. EXAMINATION

a. The performance of a student in a semester shall be evaluated through continuous class assessment and end semester examination. The continuous assessment shall be based on class tests, assignments/ tutorials, quizzes/ viva voce and attendance. The end semester examination shall be comprised of written papers, practical and viva voce, inspection of certified course work in classes and laboratories, project work, design reports or by means of any combination of these methods.
b. The marks obtained in a subject shall consist of marks allotted in end semester theory paper, practical examination and sessional work.
c. The minimum pass marks in each subject including sessional marks (Theory, Practical or Project etc.) shall be 40%.

10. PROMOTION SCHEME

a. A student will be promoted from 1st year to 2nd year/2nd year to 3rd year provided that he/she is **not having more than 06 (Six) backlog papers** (including Labs; excluding non-credit papers) in total. A student who fails to satisfy the criteria mentioned for the promotion shall be **detained** in the same year.
b. A **detained** Student is not allowed to re-appear in the minor tests. His/her old internal assessment marks will remain same. However, he/she will be required to re-appear in the semester examination for those papers in which he/she had failed, when these

papers are offered again (Examination for Odd semester paper will be held in Odd semester, and for Even semester papers will be held in Even semester).

c. **Supplementary Examination:** For the final year students, students can appear in supplementary examinations in their all backlog papers after the declaration of their Final semester results only.

11. THE GRADING SYSTEM

As per University Rule

12. CALCULATION OF SGPA AND CGPA OF A STUDENT IN A SEMESTER

As per University Rule

After having passed all the SIX semesters, the students shall be eligible for the award of **Master of Computer Applications (MCA)** degree of JAMIA HAMDARD.

13. CLASSIFICATION OF SUCCESSFUL CANDIDATES

The result of successful candidates, who fulfill the criteria for the award of **Master of Computer Applications (MCA)**, shall be classified at the end of last semester, on the basis of his/her final CGPA (to be calculated as per university rule).

SYLLABUS

MCA 101 (PROGRAMMING AND PROBLEM SOLVING USING 'C')

Unit – I

Introduction to Programming: Concept of algorithms, Flow Charts, Programming using C: Concept of variables, program statements and library functions, data types, int, char, float etc., expressions, arithmetic operation, relational and logic operations, assignment statements, extension of assignment of the operations. C primitive input output using getchar and putchar, scanf and printf functions

Unit – II

Conditional Statements and Iterations: conditional executing using if, else, switch and break statements, Concept of loops, for, while and do-while, continue. One dimensional arrays and 2-d arrays and Use in matrix computations.

Unit – III

Subprograms: Concept of Sub-programming, functions Example of functions. Argument passing.

Unit – IV

Pointers and Strings: Pointers, relationship between arrays and pointers, Argument passing using pointers, Array of pointers, Passing arrays as arguments. Strings and C string library.

Unit – V

Structures and File Handling: Structure and Unions. Defining C structures, Programming examples. File handling in C

TEXT BOOKS

- *Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.*
- *Herbert Schildt, "C:The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.*

REFERENCE BOOKS

- *Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.*
- *Kernighan & Ritchie, "C Programming Language", The (ANSI C Version), PHI, 2nd Edition.*

MCA 102 (DISCRETE COMPUTER MATHEMATICS)

Unit – I

Mathematical Logic: Introduction; Logical Connectives like Conditional, Bi-conditional, OR, AND, NOR, X-OR, NAND ; Tautology and Contradictions; Algebra of Propositions; Duality Law; Mathematical Induction

Unit – II

Set Theory, Permutations and Combinations: Introduction to sets; Types of set; Cardinality of set; Subset and superset; Power set; various Operations on sets; introduction to Venn Diagrams; The multiplications Principle; Addition Principle; Pigeon hole principle; simple problems on permutation and combinations

Unit – III

Functions and Relations : Defining a function; domain and range of a function; types of functions; graph of functions ; compositions of functions; inverse function; equality of functions; Introduction to relations; Types of relations like binary, inverse, identity, reflexive, irreflexive, equivalence, symmetric relation etc; Partial Order Relations ; creating Graphs from a relation and vice versa.

Unit – IV

Recurrence Relations and Boolean Algebra: Introduction; characteristic equation of recurrence relations; linear recurrence relation with constant coefficients and their solutions; homogeneous solutions of recurrence relations.Introduction to logic gates; combinatorial circuits; Boolean Algebra; laws of boolean algebra; Minimization of boolean expressions - (SOP and POS) forms; K-Maps

Unit – V

Graph Theory: Introduction and Definitions of graphs; types of graphs; graph traversals; graph coloring defining trees , tree traversals , minimum spanning trees; Euler's formula; Euler and Hamiltonian paths and circuits;

TEXT BOOKS

- *Keneth H. Rosen, "Discrete Mathematics and Its Applications", TMH, 1999.*
- *C.L. Liu, "Elements of Discrete Mathematics", TMH, 2000.*

REFERENCE BOOKS

- *Kolman, Busby & Ross, "Discrete Mathematical Structures", PHI, 1996.*
- *Narsingh Deo, "Graph Theory With Application to Engineering and Computer Science", PHI, 2004.*
- *J. P. Trembly & P. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw Hill, 1997.*

MCA 103 (COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES)

Unit – I

Numeric Computation: Computer Arithmetic: Floating point numbers, operation, Normalizations and their consequences. Approximations and errors and computing –inherent errors, numerical errors, blunders etc.Error propagation, errors and estimation, minimizing the total errors. Finding roots of non-liner equations: Iterative methods, False position method, False position method, Newton-Raphson method, Convergence of the roots in the above methods, Aitken's method for accelerating the convergence.

Unit – II

Solving linear equations: Solving the set of simultaneous linear equations existence of solution Unique solution, Infinite solution and ill conditioned solution, Solution by elimination method: Gauss elimination, Gauss-Jordan method. Solution by iterative method: Jacobi iteration method, Gauss – Seidel method, convergence of iterative methods.

Unit – III

Interpolation: Introduction, Errors in polynomial interpolation, Linear Interpolation, Lagrange interpolation, Newton interpolation, Interpolation with equidistant point: Forward difference, Backward Difference. Gauss' central difference Formula. Divided difference and their properties. Curve fitting: Least square curve fitting, fitting a straight line, fitting transcendental equation, fitting polynomial function.

Unit – IV

Numerical Analysis: Numerical differentiation: differentiating continuous functions and tabulated function, Numerical integration: Trapezoidal rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule. Numerical solution of Differential equations: Taylor series method, Euler's method, Runge-Kutta method Predictor-Corrector method.

Unit – V

Statistical Techniques: Frequency charts, Regression analysis and Algorithms, Time series and forecasting, moving averages, forecasting models and methods statistical quality control methods, factor analysis, Analysis of Variance (ANOVA),

TEXT BOOKS

- *Balagurusamy, Numerical Methods, Tata McGraw Hill*
- *Gerald and Wheatly, Applied Numerical Analysis, Person Education*
- *Sastry, Introductory method of Numerical Analysis, PHI*
- *Meyer,, Introductory probability and statistical applications, Addison Wesley.*

MCA 201 (SYSTEM SOFTWARE AND ASSEMBLY LANGUAGE PROGRAMMING)

Unit – I

Introduction: System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming.

Unit – II

Assemblers: Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example - MASM assembler.

Unit – III

Loaders and Linkers: Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features – Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic
Linking – Bootstrap Loaders - Implementation example - MSDOS linker.

Unit – IV

Macro Processors: Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro-Implementation example - MASM Macro Processor – ANSI C Macro language.

Unit – V

Assembly Language Programming: Introduction to 8086 Microprocessor, Programmer's view, Instruction set, Type of Instructions, Addressing modes, The Processor flags, Arithmetic, Logical, Bit manipulation, Data transfer, sting, and Processor control instructions. Interrupts: Hardware & software Interrupts, Interrupt vector table, Interrupt processing sequence and Interrupt Service Routines (ISR). Programming: Writing a Software Driver, Searching Data Tables, Sorting, String operations, Number Conversions, Control Application etc.

TEXT BOOKS

- *Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2006.*

REFERENCE BOOKS

- *D. M. Dhamdhere, "Systems Programming and Operating Systems", Second*
- *Revised Edition, Tata McGraw-Hill, 2000.2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 2000.*
- *John R. Levine, Linkers & Loaders – Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000*

MCA 202 (DATA STRUCTURE)

Unit – I

Arrays and Linked Lists: Storage structures for arrays, matrix, row-major, column-major, Sparse matrices. Linked list, Doubly linked lists, Circularly linked lists – Operations on polynomials, Dynamic storage management - Garbage collection and compaction.

Unit – II

Stack and Queue

Stacks and queues: insertion, deletion, Stack and queue using linked list, Circular queue, Prefix, postfix, infix notation and conversions.

Unit – III

Trees

Binary tree insertion, deletion, traversal (inorder, preorder and postorder), Binary Search Tree, Threaded binary tree, AVL tree, B-tree, B+-tree.

Unit – IV

Sorting and Searching

Selection sort, Insertion sort, Bubble sort, Merge Sort, Heap sort, and Quick sort, sorting in linear time, Hash Tables.

Unit – V

Graph

Representation of Graphs, Breadth First Search, Depth First Search, Topological Sort, Strongly Connected Components, Algorithm for Kruskal's and Prim's for Finding Minimum cost Spanning Trees, Dijkstra's Algorithm for finding Single source shortest paths.

TEXT BOOKS

- *Seymour Lipschutz, "Data Structures with C", Schaum's Outline Series*
- *Langsam Yedidyah, Augenstein J Moshe, Tenenbaum M, "Data Structures using C and C++", PHI*

REFERENCE BOOKS

- *Horowitz, Sahni, Freed, "Fundamentals of Data Structures in C", Silicon Press*
- *Kruse R., "Data Structures and Program Design in C", Pearson Education India*

MCA203 (OBJECT- ORIENTED PROGRAMMING USING C++)

Unit – I

Introduction: Introducing Object-Oriented Approach Comparisons with Procedural Approach, Characteristics of Object-Oriented Languages. Basic terms and ideas: Abstraction, Encapsulation, Information hiding, Inheritance, Polymorphism, Review of C, Difference between C and C++, cin, cout, new, delete operators.

Unit – II

Classes and Objects: Abstract data types, Object & classes, attributes, methods, Reference variable, C++ class declaration, State identity and behavior of an object, Constructors and destructors, copy Constructor, Static Class Data, inline function, default arguments, const arguments Friend Functions.

Unit – III

Inheritance: Inheritance, Types of Inheritance, Class hierarchy, derivation – public, private & protected, Hybrid Inheritance and virtual base class Aggregation, composition vs classification hierarchies, function overriding and constructor calls in different types of Inheritance

Unit – IV

Polymorphism: Type of Polymorphism – Compile time and runtime, Method polymorphism, Polymorphism by parameter, This Pointer ,Operator overloading and Type Conversions, Parametric polymorphism, Virtual Functions, Virtual Destructors, Generic Programming – template function and Template Classes

Unit – V

Files and Exception Handling: Console I/O :Stream, stream classes, unformatted I/O operations, formatted I/O operations, manipulators.File I/O Basics of data files, creating/ opening & closing a file, reading data from file, writing data into file, error-handing functions, random access of data files. Namespaces and Exception handling

TEXT BOOKS

Balagurusamy, "Object Oriented Programming with C++", TMH

REFERENCE BOOKS

- *Stephen Prata "C++ Primer Plus" Pearson Education*
- *Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.*
- *D . Parasons, "Object Oriented Programming with C++", BPB Publication*
- *A R.Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997.*

MCA 204 (SOFTWARE ENGINEERING)

Unit – I

Introduction, Software Model and Process: Software Crisis, Need and Definition of Software Engineering, Software Myths, Process Model: Waterfall Model, V-Model, Incremental Model, Evolutionary Model,

Unit – II

Requirement Engineering: Inception, Elicitation, Elaboration, Negotiation, Specification, Validation, Requirements, Analysis & Model: Domain Analysis, Data Flow Modeling, Class-based Modeling, CRC Modeling.

Unit – III

Software Design Concepts: Abstraction, Modularity, Cohesion, Coupling, Software Design: Architectural Design, Data Design: Entity Relationship Design, User Interface Design, Object Oriented Design, Web Application Design: Aesthetic Design, Content Design, Navigation Design

Unit – IV

Testing and Quality: Software Testing, Verification and Validation, Test Strategy: Unit Testing, Integration Testing, System Testing, User Acceptance Testing: Alpha & Beta Testing, Internal and External View of Testing: White Box Testing, Black Box Testing, Quality Concepts, Garvin's Quality Dimension, McCall's Quality Factors, ISO 9126 Quality Factors

Unit – V

Maintenance and Software Metrics: Maintenance: Corrective, Perfective, Adaptive, Metrics: Size Oriented Metrics, Function Point Metrics, CK Metrics suite, Introduction to Risk Management

TEXT BOOKS

- *R. S. Pressman, "Software Engineering – A practitioner's approach", 7th Edition, McGraw Hill Int. Ed., 1992.*
- *K. K. Agarwal and Yogesh Singh, Software Engineering, New Age*

REFERENCE BOOKS

- *P. Jalote, "An Integrated approach to Software Engineering", Narosa, 1991.*
- *Stephen R. Schach, "Classical & Object Oriented Software Engineering", IRWIN, 1996.*
- *James Peter, W Pedrycz, "Software Engineering", John Wiley & Sons*

MCA - 301 (DATA COMMUNICATION AND COMPUTER NETWORKS)

Unit – I

Transmission Media: Twisted pair, Coaxial Cable, Fiber Optics, Wireless transmission, Bluetooth, Radio, Microwave, Infrared.

Network Classifications: Study of various Types of Networks (LAN, MAN, WAN, WLAN, PAN, etc.) , Comparison of various enterprise network infrastructures (Internet, Intranet, and Extranet), Introduction to IEEE 802 family.

Unit – II

Introductory Concepts - Network hardware - Network software - Physical layer – Guided transmission media, OSI reference model

Data Link Layer –Error Detection and Correction, Data link control and protocol, Design issues - Channel allocation problem - Multiple access protocols -Ethernet - Wireless LAN - 802.11 architecture.

Unit – III

Network Layer – Addressing, Design issues, Routing algorithms, Congestion control algorithms Quality of Service , Internetworking.

Unit – IV

Transport Layer - Transport service - Elements of transport protocols - User Datagram Protocol - Transmission Control Protocol.

Unit – V

Application Layer - DNS - Electronic mail - World Wide Web - Multimedia – Network security.

TEXT BOOKS

- *A.S.TANENBAUM, "Computer Networks", Pearson Education, IV Edition, 2003*
- *W.STALLINGS, "Data and Computer Communication", Pearson Education, 2001*
- *B.A Forouzan "Data Communication and Networking"TMH*

REFERENCE BOOKS

- *Shanmavgaon, K.S. "Digital and Analog Communication System", John Wiley and Sons.*
- *Roden, M.S. "Analog and Digital Communication System", P.H.I.*
- *Scheber, W.L. "Data Communication", MGH.*

MCA - 302 (OPERATING SYSTEM)

Unit – I

Introduction

Services Provided, Evolution: Serial, Batch, Multiprogramming, Real & Distributed Operating System, Layered Approach, System Calls, Nucleolus of Operating System,

Unit – II

Process

Concept, Process Control Block, States, State Transitions Diagram, Operations on Process, Interrupt Processing Swapping , Context Switching, Co-operating Processes, Deadlock Introduction, Examples Indefinite Postponement, Necessary Conditions, Prevention. Avoidance, Detection & Recovdery, Bankers Algorithm, Case Study: UNIX.

Unit – III

Scheduling

Introduction, Levels of Scheduling, Objectives, Pre-emptive & Non-pre-emptive Scheduling, CPU Scheduling Algorithms: FCFS, RR, SJF, SRT, HRRN, Multi-Level Feedback Queues, Illustrative Examples, Fair share scheduling, Scheduling In Distributed Systems.

Unit – IV

Process Synchronization

Introduction, Critical Section, Race Conditions, Mutual Exclusion Primitives, Dekker Algorithm, Peterson Algorithm, Bakery Algorithm, Hardware Solution, Semaphores, Classical Problems: Producer Consumer Problem, Sleeping barber Problem, Dinning Philosopher Problem.

Unit – V

Memory Management

Introduction, Contiguous & Non-Contiguous, Paging, Segmentation, Paging with Segmentation, Virtual Memory Management: Introduction, Demand Paging, Page Replacement, Locality, Working set, Page Fault Frequency. Auxiliary Memory Management: File Systems: Introduction, File system Structure, Directory Structure, File system Implementation, Directory Implementation, Allocation Methods, Free space Management.

TEXT BOOKS

- *Silberschatz, Galvin, Gagne, Operating System Concept,John Willey*
- *Milan Milenkovic, Operating Systems: Concepts & Design*

REFERENCE BOOKS

- *H.M. Deitel, Operating System, Pearson Education*
- *Operating System by William Stallings, Pearson Education*
- *Andrew S. Tanenbaum, Modern Operation Systems, Pearson Education*
- *Maurice J. Bach, The Design of UNIX Operating System ,Pearson Education*

MCA - 303 (DATABASE MANAGEMENT SYSTEMS)

Unit – I

Introduction to DBMS

Basics of File Processing Systems and Database Systems, Difference between traditional file system and DBMS, Responsibilities of Database Administrator, Three level Architecture of Database System, Physical and Logical data independence.

Unit – II

Introduction to various Database Models

Entity Relationship Model and its importance, Introduction to various Symbols used In ERD (Entity: Types of Entities, week Entity, Composite Entity, Strong Entity, Attribute: Types of Attribute, Relationship: Type of relationship, Connectivity, Cardinality), Conversion of ER diagram to tables, Comparative study of Network, Hierarchical and Relational Models, Codd's 12 Rules, Comparison of Object Oriented Database and Object Relational Database.

Unit – III

Normalization in DBMS

Normalization and its various forms(1NF, 2NF, 3NF and BCNF), Functional Dependencies, Multi-valued Dependencies, Study of various Database Integrity like Domain, Entity, Referential Integrity Constraints.

Unit – IV

SQL

Categories of SQL Statements, The CREATE Statement, The DROP Command, The ALTER Command, Integrity Constraints, DML Statements: The SELECT Statement, The INSERT Statement, The DELETE Statement, The UPDATE Statement, SQL Operators: Simple Selects Comparison Operators, IN and NOT IN Operators, BETWEEN Operator, The LIKE Operator Logical Operators, IS NULL and IS NOT NULL, ANY, ALL, SQL FUNCTIONS, Joining Tables, SQL Subqueries, GROUP BY Clause, HAVING Clause

Unit – V

Transactions

Basic concepts, ACID Properties . Concurrency control techniques: Items, locks, Deadlocks, serializability, Locking two phase locking, Database recovery technique**:** Failure classification, recovery concepts, recovery techniques based on deferred and immediate update, Shadow paging.

TEXTBOOKS

- *R. Elmasri & S.B. Navathe, Fundamentals of Database Systems, Pearson Education, 6th edition, 2010.*

REFERENCE BOOKS

- *Silberschatz, H. Korth & S. Sudarshan, Database System Concepts, TMH, 5th Edition, 2010.*
- *R. Ramakrishnan & J. Gehrke, Database Management Systems, 3rd edition, TMH, 2007.*

MCA - 304 (DESIGN AND ANALYSIS OF ALGORITHMS)

Unit – I

Algorithm Analysis

Time Space Tradeoff – Asymptotic Notations – Conditional asymptotic notation – Removing condition from the conditional asymptotic notation, Properties of big-Oh notation – Recurrence equations – Solving recurrence equations – Analysis of linear search.

Unit – II

Divide and Conquer

General Method – Binary Search – Finding Maximum and Minimum – Merge Sort – Greedy Algorithms: General Method – Container Loading – Knapsack Problem.

Unit – III

Dynamic Programming

General Method – Multistage Graphs – All-Pair shortest paths – Optimal binary search trees – 0/1 Knapsack – Travelling salesperson problem .

Unit – IV

Backtracking

General Method – 8 Queens problem – sum of subsets – graph coloring – Hamiltonian problem – knapsack problem.

Unit – V

Graph Traversals

Graph Traversals - Connected Components – Spanning Trees – Biconnected components – Branch and Bound: General Methods (FIFO & LC) – 0/1 Knapsack problem – Introduction to NP-Hard and NP-Completeness.

TEXTBOOKS

- *E. Horowitz, S. Sahni, & S. Rajsekaran, Fundamentals of Computer Algorithms, Galgotia Publication.*
- *T. H. Cormen, C. E. Leiserson, R. L. Rivest & C. Stein, Introduction to Algorithms, 3rd Edition, PHI, 2010.*
- *Sara Baase, Computer Algorithms: Introduction to design and analysis, 3rd Edition, Pearson, 2002.*

REFERENCE BOOKS

- *J. Kleinberg & E. Tardos, Algorithm Design, 1st Edition, Pearson, 2012.*
- *S. Dasgupta, C. Papadimitriou & U. Vazirani, Algorithms, 1st Edition, TMH, 2013.*

MCA - 305 (JAVA PROGRAMMING)

Unit – I

Java Basics

Java and Internet, Difference between C++ and Java, Byte code and platform independence, Features of Java, Java Standard Edition (Java SE), Java Runtime Environment (JRE), Java Just In Time (JIT) Compiler, Installing JDK, Compiling and executing Java Application, Java Program Structure, Java Keywords, Data types, Variables, Arrays, Expressions, Operators, Control Statements, for each statement, Command Line Arguments.

Unit – II

Object-Oriented Programming – I

Class and Encapsulation, Objects, Methods, Default and parameterized Constructors, Inheritance, super and this Keywords, Static Methods, Polymorphism, Overloading, Overriding, Dynamic Method Dispatch.

Unit – III

Object-Oriented Programming – II

Abstract class, final Keyword, Interface and Multiple Inheritance, Package, Creating Package, Using Imports, static import, Access Controls, public, private, protected and default Control, Using Scanner Class for Formatted Input, Universal Superclass Object, toString() Method, Variable Argument List.

Unit – IV

String, Exception handling and Multithreading

String, Methods of String, StringBuffer and StringBuilder, Exception, try and catch Statement, Multiple catch Statements, Nested try Statement, throw, throws and finally Statements, Creating Exception Subclasses, Thread, Advantages of Thread, Creating Threads by Extending Thread Class and Implementing Runnable Interface, Creating Multiple Threads, Life Cycle of a Thread, Thread Priorities, Thread Synchronization.

Unit – V

GUI Programming

Applet and AWT Basics, Applet Vs. Application, Applet Life Cycle, Passing Parameters to Applets, Drawing Line, Rectangle, Ellipse and Arc, Font and Color Class, Frame, FlowLayout, BorderLayout and GridLayout Manager, Delegation Event Model, Listeners, Action and Item Events, Handling Mouse and Keyboard Events, Using Components, Text Field, Label, Button, Choice, List.

TEXT BOOKS

- *Herbert Schildt, Java: The Complete Reference, Seventh Edition, DEC-06, ISBN: 9780072263855*
- *Joel Murach and Andrea Steelman, Murach's Java SE 6, ISBN-10: 1-890774-42-1; ISBN-13: 978-1-890774-42-4*

REFERENCE BOOKS

- *Katherine Sierra, Kathy Sierra, Bert Bates, SCJP Sun Certified Programmer for Java 6 Study Guide: Exam (310-065), McGraw-Hill Companies, June 2008, ISBN-13: 9780071591065*
- *Jeff Friesen, Beginning Java SE 6 Platform: From Novice to Professional, Apress*
- *Deital and Deital, Java How to Program, 8/e, Prentice Hall, 03/17/2009, ISBN: 0136123716*
- *Khalid Mughal, Rolf Rasmussen, A Programmer's Guide to Java SCJP Certification: A Comprehensive Primer, 3/e, ISBN: 0321556054*

MCA 401 (FORMAL LANGUAGES AND AUTOMATA THEORY)

Unit – I

INTRODUCTION: Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other.

Unit – II

REGULAR EXPRESSION (RE) AND REGULAR LANGUAGES: Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to 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, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III

CONTEXT FREE GRAMMAR (CFG) AND CONTEXT FREE LANGUAGES (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

Unit – IV

PUSH DOWN AUTOMATA (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

Unit – V

COMPUTABILITY: Turing Machines: Turing machine as a model of Computation, Universal Turing machine, Language Acceptability, Decidability, Halting Problem.

TEXTBOOKS

- *P. Linz, An Introduction to Formal Languages and Automata, 5th Edition, Jones Barlett, 2011.*
- *John E. Hopcroft, Rajeev Motwani & Jeffery D. Ullman, Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2007.*

REFERENCE BOOKS

- *John C. Martin, Introduction to Languages and the Theory of Computation, 4th edition, TMH, 2011.*
- *Daniel I. A.Cohen, Introduction to Computer Theory**, 2**nd edition, John Wiley, 1997.*
- *Harry R. Lewis, Christos H. Papadimitriou, Elements of the Theory of Computation, 2nd edition, Pearson Education, 1998.*

MCA 402 (UNIX AND SHELL PROGRAMMING)

Unit – I

INTRODUCTION TO UNIX: The UNIX Operating System, The UNIX Architecture, Features of UNIX, Internal And External Commands, Command Structure. GENERAL-PURPOSE UTILITIES: cal, date, echo, printf, bc, script, passwd,PATH, who, uname, tty, stty, pwd, cd, mkdir, rmdir, od. 91 G V P College of Engineering (Autonomous) 2013 HANDLING FILES: The File System, cat, cp, rm, mv, more, file, ls, wc, pg, cmp, comm, diff, gzip, tar, zip, df, du, mount, umount, chmod, The vi editor ,security by file Permissions. NETWORKING COMMANDS: ping, telnet, ftp, finger, arp, rlogin.

Unit – II

INTRODUCTION TO SHELLS: Unix Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell Edition Environment Customization. FILTERS: Filters, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Ordering a File, uniq.

Unit – III

REGULAR EXPRESSIONS: Atoms, operators GREP: Operation, grep Family, Searching for File Content. SED: Scripts, Operation, Addresses, commands, Applications, grep and sed. AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications, awk and grep, sed and awk.

Unit – IV

INTERACTIVE KORN SHELL: Korn Shell Features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process. KORN SHELL PROGRAMMING: Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

Unit – V

INTERACTIVE C SHELL: C shell features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, On-Off Variables, Startup and Shutdown Scripts, Command History, Command Execution Scripts. C SHELL PROGRAMMING: Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables

TEXT BOOKS

- *Sumitabha Das, "Unix Concepts And Applications", 4thEdition. TMH, 2006.*
- *Behrouz A. Forouzan, Richard F. Gilbery, "Unix and shell Programming", 1st Edition, Cengage Learning India, 2003.*

REFERENCE BOOKS

- *Graham Glass, King Ables, "Unix for programmers and users", 3rd Edition, Pearson Education*
- *Yashwanth Kanitkar,"Unix Shell programming", 1stEdition, BPB Publisher, 2010.*

MCA 501 (ADVANCED JAVA PROGRAMMING)

Unit – I

Java Database connectivity (JDBC): Introduction to JDBC, Two Tier and Three Tier Database Design, JDBC API, Different types of JDBC drivers, Statement, PreparedStatement, Batch update, Scrollable and Updatable ResultSet, Transaction, Overview of JDBC 2.0 API.

Unit – II

Java Servlets: HTML forms and controls, Static Vs Dynamic web pages, Difference between Post and Get, Introduction to Servlet and Java Web Server, Servlet API, Basic Servlet structure, Servlet life cycle, Handling the Client request and FORM data, HttpRequest and HttpResponse, Handling cookies, Session Tracking, Using servlet to access database with JDBC.

Unit – III

Java Server Page (JSP) and Java Beans: Introduction to JSP, Components of JSP page, JSP Comments, Scripting elements, Declaration, Directives, implicit objects, Introduction to Java bean, Bean naming conventions, Getter and Setter methods, Advantages of Java Bean, Integrating Java Beans with JSP for reading information from forms, Integrating Servlet, JSP and Bean, Accessing database using JSP.

Unit – IV

Introduction to RMI & EJB: Overview of RMI, Architecture of RMI, Advantages of RMI, Difference between RPC and RMI, Stub and Skeleton, Writing a sample RMI program to add two numbers, Introduction to EJB, EJB architecture, Overview of entity, session and message beans.

Unit – V

Introduction to Java Frameworks: Introduction to Spring and Spring MVC framework, Advantages and disadvantages of Spring framework, Introduction to Struts 2 framework, Advantages and disadvantages of Struts 2 framework Introduction to Java Server Faces (JSF) framework, Advantages and disadvantages of JSF framework, Introduction to Hibernate framework, Advantages and disadvantages of Hibernate framework, Introduction to Google Web Toolkit (GWT) framework, Advantages and disadvantages of GWT framework.

TEXT BOOKS

- *By Marty Hall, Larry Brown, Core Servlets and JavaServer Pages Volume 1: Core Technologies, Pearsons*
- *Bert Bates, Kathy Sierra, Bryan Basham, Head First Servlets and JSP, O'Reilly*

REFERENCE BOOKS

- *Budi Kurniawan, Java for the Web with Servlets, JSP, and EJB: A Developer's Guide to J2EE Solutions, New Riders Publishing*
- *Monica Pawlan, Writing Enterprise Applications with Java 2 SDK, Enterprise Edition, Sun Microsystems, Inc.*
- *Advanced Java 2 Platform HOW TO PROGRAM, Deitel & Deitel, PHI.*

MCA 502 (MULTIMEDIA AND WEB TECHNOLOGY)

Unit – I

INTRODUCTION: Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment Products ,Stages of Multimedia Projects: Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

Unit – II

MULTIMEDIA BUILDING BLOCKS: Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit – III

EMERGENCE OF THE INTERNET: Terminology, Accessibility: Language & Connectivity, Services of the Internet: E-Mail, World Wide Web (WWW), Remote Access, Collaboration, File Sharing, Internet Telephony; Use & Culture: Usenet, From gopher to WWW, Search Engines: Wais, Archie, Web Search Engine.

Unit – IV

INTRODUCTION AND WEB DEVELOPMENT STRATEGIES: History of Web, Protocols governing Web, Creating Websites for individual and Corporate World, Cyber Laws, Web Applications, Writing Web Projects, Identification of Objects, Target Users, Web Team, Planning and Process Development.

Unit – V

CONCEPTS OF WEB PROGRAMMING: Developing Web using HTML, DHTML, CSS, XML, Using Scripting Languages such as JavaScript

TEXTBOOKS

- *Tay Vaughan, Multimedia, Making IT Work, MGH*
- *Rajkamal, Web Technology, TMH, 2001..*

REFERENCE BOOKS

- *David Hillman, Multimedia technology and Applications, Galgotia Publications.*
- *Rosch, Multimedia Bible, Sams Publishing.*
- *Stephen Holzner, HTML Black Book , Wiley Dreamtech.*
- *Deitel & Deitel, Goldberg, Internet and world wide web – How to Program, Pearson Education.*

MCA 503 (COMPILER DESIGN)

Unit – I

INTRODUCTION: Introduction to Translators (interpreter, compiler & cross-compiler), Phases of compilation and overview, Introduction to GCC.

LEXICAL ANALYSIS (SCANNER): Regular language, finite automata, regular expression and their applications to lexical analysis, from regular expression to finite automata, Implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, ambiguity, YACC.

Unit – II

SYNTAX ANALYSIS (PARSER): Context-free language and grammar

BASIC PARSING TECHNIQUES: Parsers, Top down parsing, Shift reduce parsing, operator grammar, operator precedence parsing, predictive parsers. LL(1) grammar, LR(0), SLR(1), LR(1), LALR(1) grammars and Bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc,bison).

Unit – III

SYNTAX-DIRECTED TRANSLATION: Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser.

Unit – IV

SEMANTIC ANALYSIS: Attribute grammar, syntax directed definition, evaluation and flow of attribute in a syntax tree.

SYMBOL TABLE: Data structure for symbols tables, representing scope information, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit – V

INTERMEDIATE CODE GENERATION: Translation of different language features, different types of intermediate codes.

CODE IMPROVEMENT (OPTIMIZATION): Analysis: control-flow, data-flow dependence etc., Code improvement local optimization, global optimization, loop optimization, peep-hole optimization

TEXTBOOKS

- *Alfred V. Aho, Monica S. Lam, Ravi Sethi & Jeffrey D. Ullman, Compilers: Principles, Techniques, and Tools, 2nd edition, Prentice Hall, 2006.*

REFERENCE BOOKS

- *Allen I. Holub, Compiler Design in C , PHI, 2003.*
- *C. N. Fischer and R. J. LeBlanc, Crafting a compiler with C, Benjamin Cummings, 2003.*
- *J.P. Bennet, Introduction to Compiler Techniques, 2nd Edition, TMH, 2003.*
- *Henk Alblas and Albert Nymeyer, Practice and Principles of Compiler Building with C, PHI, 2001.*

DEPARTMENTAL ELECTIVES (DE)

MCA DE11 (COMPUTER ORGANIZATION AND ARCHITECTURE)

Unit – I

BASIC FUNCTIONAL BLOCKS OF A COMPUTER AND ITS REPRESENTATION: Functional units, Basic operational concepts, Bus structures, Performance and metrics, Instructions and instruction sequencing, Hardware–Software Interface, Instruction set architecture, Addressing modes, RISC, CISC, ALU design, Fixed point and floating point operations, Case study of a CPU (Intel Atom Board)

Unit – II

CPU CONTROL UNIT DESIGN: Execution of a complete instruction, Multiple bus organization, Hardwired control, Micro programmed control, Computer arithmetic, Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication - shift-and-add, Booth multiplier etc.

Unit – III

PIPELINE: Basic concepts, Data hazards, Instruction hazards, Influence on instruction sets, Data path and control considerations, Performance considerations, Exception handling. Case Study of Intel Atom Board.

Unit – IV

MEMORY SYSTEM DESIGN: Basic concepts, Semiconductor RAM – ROM, Speed, Size and cost, Cache memories, Improving cache performance, Virtual memory, Memory management requirements, Associative memories, Secondary storage devices. Case study of Intel Atom Board.

Unit – V

I/O ORGANIZATION: Accessing I/O devices, Programmed Input/Output, Interrupts, Direct Memory Access, Buses, Interface circuits, Standard I/O Interfaces (PCI, SCSI, USB), I/O devices and processors.

TEXTBOOKS

- *John P. Hayes, Computer Architecture and Organization, MGH, 1998.*
- *William Stallings, Computer Organization and Architecture: Designing for Performance, Pearson Education, 2010.*
- *M. Morris Mano, Computer System Architecture, 2nd Edition, PHI.*

REFERENCE BOOKS

- *David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Elsevier, 2012.*
- *Carl Hamachar, Zvonco Vranesic and Safwat Zaky, Computer Organization, MGH, 1990.*
- *Vincent P. Heuring and Harry F. Jordan, Computer Systems Design and Architecture, 2nd Edition, Pearson Education, 1996.*

MCA DE12 (COMPUTER BASED OPTIMIZATION TECHNIQUES)

Unit – I

INTRODUCTION: Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

LINEAR PROGRAMMING: Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

Unit – II

TRANSPORTATION PROBLEMS: Types of transportation problems, mathematical models, transportation algorithms.

ASSIGNMENT: Allocation and assignment problems and models, processing of job through machines.

Unit – III

NETWORK TECHNIQUES: Shortest path model, Max-Flow problem and Min-cost problem.

PROJECT MANAGEMENT: Phases of project management, guidelines for network construction, CPM and PERT.

Unit – IV

THEORY OF GAMES: Rectangular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

QUALITY SYSTEMS: Elements of Queuing model, generalized poisson queing model, single server models.

Unit – V

INVENTORY CONTROL: Models of inventory, operation of inventory system, quantity discount.

TEXTBOOKS

- *Wayne L. Winston, Operations Research, Thomson Learning, 2003.*
- *Hamdy H. Taha, Operations Research-An Introduction, Pearson Education, 2003.*

REFERENCE BOOKS

- *R. Panneer Seevam, Operations Research, PHI Learning, 2008.*
- *V. K. Khanna, Total Quality Management, New Age International, 2008.*

MCA DE13 (SOFT COMPUTING)

Unit – I

NEURAL NETWORKS: History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptron, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

Unit – II

FUZZY LOGIC: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation.

OPERATIONS ON FUZZY SETS: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

FUZZY ARITHMETIC: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Unit – III

FUZZY LOGIC: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges Uncertainty based Information: Information & Uncertainty,

INFERENCING: Mamadani and T-S models

APPLICATION OF FUZZY LOGIC: Medicine, Economics etc.

Unit – IV

Neuro-Fuzzy Systems: Introduction to Neuro-Fuzzy Systems, Architecture of Neuro Fuzzy Networks.

Unit – V

EVOLUTIONARY OPTIMIZATION TECHNIQUES: Genetic Algorithm: An Overview, GA in problem solving, Implementation of GA, Particle Swarm Optimization.

TEXTBOOKS

- *J. A. Anderson, An Introduction to Neural Networks, PHI, 1999.*
- *Hertz J. Krogh, R.G. Palmer, Introduction to the Theory of Neural Computation, Addison-Wesley, California, 1991.*
- *G.J. Klir & B. Yuan, Fuzzy Sets & Fuzzy Logic, PHI, 1995.*

REFERENCE BOOKS

- *J. A. Freeman, D.M. Skapura, Neural Networks: Algorithms, Applications and Programming Techniques, Addison Wesley, 1992.*
- *Melanie Mitchell, An Introduction to Genetic Algorithm, PHI, 1998.*

MCA DE14 (PATTERN RECOGNITION)

Unit – I

INTRODUCTION: Paradigms for pattern recognition, Statistical and Syntactic pattern recognition, Soft and Hard computing schemes for pattern recognition. Statistical Pattern Recognition- Patterns and classes, Supervised, Semi-supervised, and Unsupervised classification.

REPRESENTATION: Vector space representation of patterns and classes, patterns and classes as strings, Tree-based representations, Frequent itemsets for representing classes and clusters, Patterns and classes as logical formulas.

Unit – II

DIMENSIONALITY REDUCTION: Feature selection: Branch and bound, Sequential feature selection, Feature extraction: Fisher's linear discriminant, Principal components as features; Nearest Neighbor Classifiers- Nearest neighbor classifier, Soft nearest neighbor classifiers, Efficient algorithms for nearest neighbor classification, K-nearest neighbor classifier, minimal distance classifier, condensed nearest neighbor classifier and its modifications.

Unit – III

BAYES CLASSIFIER: Bayes classifier, naïve Bayes classifier, Belief net.

DECISION TREES: Axis-parallel and oblique decision trees, Learning decision trees, Information gain and Impurity measures.

Unit – IV

LINEAR DISCRIMINANT FUNCTIONS: Characterization of the decision boundary, Weight vector and bias, Learning the discriminant function, Perceptrons, Support Vector Machines- Maximizing the margin, Training support vector machines, Kernel functions.

Unit – V

CLUSTERING: Clustering process, Clustering algorithms, Clustering large datasets; Module 8: **COMBINATION OF CLASSIFIERS**: AdaBoost for classification, Combination of homogeneous classifiers, Schemes for combining classifiers.

TEXTBOOKS

- *V. Susheela Devi and M. Narasimha Murty, Pattern Recognition: An Introduction, Universities Press, Hyderabad, 2011.*

REFERENCE BOOKS

- *R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, John Wiley and Sons, 2000.*

MCA DE21 (SOFTWARE TESTING)

Unit – I

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit – II

White Box and Black Box Testing: White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit – III

Integration, System, and Acceptance Testing: Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution

Unit – IV

Test Selection & Minimization for Regression Testing: Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Unit – V

Test Management and Automation: Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

TEXT BOOK

- *S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.*
- *Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.*

REFERENCES BOOKS

- *Naik and Tripathy, "Software Testing and Quality Assurance", Wiley*
- *K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.*

MCA DE22 (CRYPTOGRAPHY AND NETWORK SECURITY)

Unit – I

INTRODUCTION: Introduction to security attacks, services and mechanism, introduction to cryptography.

CONVENTIONAL ENCRYPTION: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers.

MODERN BLOCK CIPHERS: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.

Unit – II

MATHEMATICAL FOUNDATION: ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms.

Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie–Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, ElGamal encryption.

Unit – III

MESSAGE AUTHENTICATION AND HASH FUNCTION: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA).

DIGITAL SIGNATURES: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

Unit – IV

AUTHENTICATION APPLICATIONS: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

Unit – V

IP SECURITY: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

TEXTBOOKS

- *William Stallings, Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.*
- *Johannes A. Buchmann, Introduction to Cryptography, Springer-Verlag.*

REFERENCE BOOKS

- *Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in Public World, 2nd Edition, Pearson Education.*
- *Atul Kahate, Cryptography and Network Security, TMH, 2003.*

MCA DE23 (MOBILE COMPUTING)

Unit – I

Introduction to Mobile Communications and Computing : Mobile Computing (MC) : Introduction to MC, novel applications, limitations, and architecture. GSM : Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

Unit – II

Wireless Medium Access Control : Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

Unit – III

Mobile Network Layer : Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

Unit – IV

Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

Unit – V

Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, pushbased mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

TEXTBOOKS

- *Jochen Schiller, "Mobile Communications," Addison-Wesley, 2009.*
- *Frank Adelstein & Sandeep Ks Gupta, Fundamentals of Mobile & Pervasive Computing, TMH.*

REFERENCE BOOKS

- *R. Dayem, Mobile Data & Wireless Lan Technologies, Prentice-Hall, 2005.*
- *Charles Perkins, Ad hoc Networks, Addison Wesley*

MCA DE24 (OPEN SOURCE SOFTWARE)

Unit – I: Introduction

Introduction to Open sources – Need of Open Sources – Advantages of Open Sources– Application of Open Sources. Open source operating systems: LINUX: Introduction – General Overview – Kernel Mode and user mode – Process – Advanced Concepts – Scheduling – Personalities – Cloning – Signals – Development with Linux. .

Unit – II: Open Source Database

MySQL: Introduction – Setting up account – Starting, terminating and writing your ownSQL programs – Record selection Technology – Working with strings – Date and Time– Sorting Query Results – Generating Summary – Working with metadata – Usingsequences – MySQL and Web.

Unit – III: Open Source Programming Languages

PHP: Introduction – Programming in web environment – variables – constants – data;types – operators – Statements – Functions – Arrays – OOP – String Manipulation and regular expression – File handling and data storage – PHP and SQL database – PHP and LDAP – PHP Connectivity – Sending and receiving E-mails – Debugging and error handling – Security – Templates.

Unit – IV: Python

Syntax and Style – Python Objects – Numbers – Sequences – Strings – Lists and Tuples – Dictionaries – Conditionals and Loops – Files – Input and Output – Errors and Exceptions – Functions – Modules – Classes and OOP – Execution Environment.

Unit – V: Perl

Perl backgrounder – Perl overview – Perl parsing rules – Variables and Data – Statements and Control structures – Subroutines, Packages, and Modules- Working with Files –Data

TEXTBOOKS

- *Remy Card, Eric Dumas and Frank Mevel, "The Linux Kernel Book", Wiley Publications*
- *Steve Suchring, "MySQL Bible", John Wiley*
- *Rasmus Lerdorf and Levin Tatroe, "Programming PHP", O'Reilly*
- *Wesley J. Chun, "Core Phython Programming", Prentice Hall*

REFERENCE BOOKS

- *Martin C. Brown, "Perl: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint*
- *Steven Holzner, "PHP: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint*

MCA DE31 (DATA WAREHOUSING AND DATA MINING)

Unit – I

DATA WAREHOUSING: Basic concepts in data warehousing, Collecting the requirements of data warehouse, Data Warehouse Architecture, Design, Implementation & Maintenance, OLAP in data warehouse, Data warehousing and the web, Data Cube Technology, From Data Warehousing to Data Mining.

Unit – II

DATA MINING CONCEPTS: Data mining primitives, Basics of data mining, Query language, Architectures of data mining system

Unit – III

MINING ASSOCIATION RULES IN LARGE DATABASES: Association Rule Mining, Mining Single Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint Based Association Mining.

Unit – IV

CLASSIFICATION AND PREDICTION: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy.

Unit – V

CLUSTER ANALYSIS IN DATA MINING: Types of Data in Cluster Analysis. A Categorization of Major Clustering Methods, Partitioning Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Outlier Analysis.

MINING COMPLEX TYPES OF DATA: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time Series and Sequence Data, Mining Text Databases.

TEXTBOOKS

- *Alex Berson & Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Tenth Reprint, TMH, 2007.*
- *Jiawei Han & Micheline Kamber, Data Mining Concepts and Techniques, 2nd Edition, Elsevier, 2007.*

REFERENCE BOOKS

- Pang-Ning Tan, Michael Steinbach & Vipin Kumar, *Introduction To Data Mining*, Pearson Education, 2007.
- G. K. Gupta, *Introduction to Data Mining with Case Studies*, Easter Economy Edition, PHI, 2006.
- Daniel T. Larose, *Data Mining Methods and Models*, Wile-Interscience, 2006.

MCA DE32 (E-COMMERCE)

Unit – I

Introduction: Electronic Commerce - Technology and Prospects, Definition of E- Commerce, Economic potential of electronic commerce, Incentives for engaging in electronic commerce, forces behind E-Commerce, Advantages and Disadvantages, Architectural framework, Impact of E-commerce on business. Network Infrastructure for E- Commerce: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

Unit – II

Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device, Mobile Computing Applications.

Unit – III

Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

Unit – IV

Encryption: Encryption techniques, Symmetric Encryption- Keys and data encryption standard, Triple encryption, Asymmetric encryption- Secret key encryption, public and private pair key encryption, Digital Signatures, Virtual Private Network.

Unit – V

Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking. EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

TEXTBOOKS

Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.

REFERENCE BOOKS

Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH 3. P. Loshin, John Vacca, "Electronic commerce", Firewall Media, New Delhi

MCA DE33 (ADVANCED DBMS)

Unit – I

OVERVIEW: PL/SQL, Introduction to PL/SQL, Declare, begin statements, Variables, Control Structure, PL/SQL Transactions, Savepoint, Cursor, PL/SQL Database Objects, Procedures, Functions, Packages, Triggers. Programmatic SQL, Embedded SQL, Dynamic SQL, and ODBC Standard.

Unit – II

TRANSACTION PROCESSING AND CONCURRENCY CONTROL: Definition of Transaction and ACID properties. Transaction Processing - Transaction-processing monitors, transactional workflows, main-memory databases, real-time transaction systems, long-duration transactions, transaction management in multi-databases. Concurrency Control – Locks, Optimistic Concurrency Control (Backward and Forward validations), Timestamping Concurrency Control.

Unit – III

OBJECT-BASED DATABASES: Object-based databases – Complex data types, structured types and inheritance in SQL, table inheritance, array and multiset types in SQL, object identity and reference types in SQL, implementing O-R features.

Unit – IV

OVERVIEW OF STORAGE AND INDEXING: Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks. Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete. Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendable vs. Linear Hashing.

Unit – V

DATABASE SECURITY: Security and integrity threats, Defense mechanisms, Statistical database auditing & control. Security issue based on granting/revoking of privileges, Introduction to statistical database security. PL/SQL Security – Locks – Implicit locking, types and levels of locks, explicit locking, Exception Handlers.

TEXTBOOKS

- *Raghu Ramakrishnan & Johannes Gehrke, Data base Management Systems, TMH*
- *A. Silberschatz, H.F. Korth, S. Sudarshan, Data base System Concepts, McGraw hill*
- *Ramez Elmasri, Shamkant & B.Navathe, Fundamentals of Database Systems, 5th edition, Pearson Education, 2008.*

REFERENCE BOOKS

- *P. K. Das Gupta, Database Management System Oracle SQL and PL/SQL, PHI.*
- *Peter Rob & Carlos Coronel, Database System Concepts, Cengage Learning, 2008.*

MCA DE34 (ADVANCED COMPUTER ARCHITECTURE)

Unit – I

PARALLEL COMPUTER MODELS: The state of computing, Classification of parallel computers, Multiprocessors and multicomputer, Multivector and SIMD computers.

PROGRAM AND NETWORK PROPERTIES: Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms.

Unit – II

SYSTEM INTERCONNECT ARCHITECTURES: Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

PROCESSORS AND MEMORY HIERARCHY: Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors.

Unit – III

MEMORY TECHNOLOGY: Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology.

BACKPLANE BUS SYSTEM: Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Cache addressing models, Direct mapping and associative caches.

Unit – IV

PIPELINING: Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines.

Unit – V

VECTOR PROCESSING PRINCIPLES: Vector instruction types, Vector-access memory schemes. Synchronous Parallel Processing: SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, SIMD Computers and Performance Enhancement.

TEXT BOOKS

- *Kai Hwang, Advanced computer architecture, TMH, 2000.*
- *J. P.Hayes, Computer Architecture and organization, TMH, 1998.*
- *M.J Flynn, Computer Architecture, Pipelined and Parallel Processor Design, Narosa Publishing, 1998.*

REFERENCE BOOKS

- *D. A. Patterson, J. L. Hennessy, Computer Architecture: A quantitative approach, Morgan Kauffmann, 2002.*
- *Hwang and Briggs, Computer Architecture and Parallel Processing, MGH, 2000.*

MCA DE41 (COMPUTER GRAPHICS)

Unit – I

Graphic System Primitives and Transformations: Display devices-Refresh cathode-Ray Tubes, Raster Scan Displays, Random Scan Displays, Color CRT Monitor, DVST, Flat-Panel displays, LCD, Three Dimensional Viewing Devices, Stereoscopic and Virtual reality Systems, Raster-Scan vs. random-Scan Systems. Input and Output Devices. Homogeneous Coordinate System for 2D and 3D, Various 2D, 3D Transformation matrices (Translation, Scaling, Rotation, Shear), Rotation about an arbitrary point (2D), Rotation about an arbitrary axis (3D)

Unit – II

Lines and Curves: Bresenham's Line Drawing Algorithm , Mid-point Circle Drawing Algorithm ,Clipping Algorithms: Line and Polygon Clipping Algorithms , Bezier Curves, 4 point and 5 point Bezier curves using Bernstein Polynomials, Conditions for smoothly joining curve segments, B-Spline Curves, Cubic B-Spline curves using uniform knot vectors

Unit – III

Projection and Solid Modelling: Parallel Projection, Oblique Projection on xy plane, Isometric Projection, Perspective Projection, One Vanishing Point (V.P.) projection from a point on z axis, Generation of 2 V.P. Projection, Isometric Projection, Perspective Projection, one vanishing Point (VP), projection from 0 point on z axis, Solid Modelling.

Unit – IV

Illumination and Shading: Shading, Illumination Model for diffused Reflection, Effect of ambient lighting, distances, Specular Reflection Model, Computing Reflection Vector, Gourard Shading, Phong Model

Unit – V

Hidden Surface Removal: Back Face Detection, Depth Buffer (Z-Buffer, A-Buffer) Method, Scan Line Method, Depth Sorting Method, Area Subdivision Method.

TEXT BOOKS

- *D. Hearn and P. Baker, "Computer Graphics", Prentice Hall, 1986.*
- *Foley et. al., "Computer Graphics Principles & practice", Addison Wesley, 1999.*

REFERENCES BOOKS

- *D. Rogers and J. Adams, "Mathematical Elements for Computer Graphics", MacGraw-Hill International Edition, 1989.*
- *David F. Rogers, "Procedural Elements for Computer Graphics", McGraw Hill Book Company, 1985.*
- *R. Plastock and G. Kalley, "Theory and Problems of Computer Graphics", Schaum's Series, McGraw Hill, 1986.*

MCA DE42 (IMAGE PROCESSING)

Unit – I

INTRODUCTION AND DIGITAL IMAGE FUNDAMENTALS: The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations.

Unit – II

IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN: Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

Unit – III

IMAGE ENHANCEMENT IN THE FREQUENCY DOMAIN: Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphic Filtering.

IMAGE RESTORATION: A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invarient Degradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Mean Filter, Geometric Transformations.

Unit – IV

IMAGE COMPRESSION: Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards.

IMAGE SEGMENTATION: Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation.

Unit – V

REPRESENTATION AND DESCRIPTION: Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms.

TEXTBOOK

- *Rafael C. Gonzales, Richard E. Woods, Digital Image Processing, 3rd Edition, Pearson Education, 2010.*

REFERENCE BOOKS

- *Anil Jain, Fundamentals of Digital Image Processing, PHI Learning Pvt. Ltd., 2011.*
- *Jayaraman S., Esaki Rajan S., T.Veera Kumar, Digital Image Processing, 2nd Reprint, TMH, 2010.*
- *Bhabatosh Chanda & Dwejesh Dutta Majumder, Digital Image Processing and analysis, 2nd Edition, PHI, 2011.*

MCA DE43 (PROGRAMMING LANGUAGE PARADIGMS)

Unit – I

OBJECT-ORIENTED PROGRAMMING – FUNDAMENTALS

Review of OOP - Objects and classes in Java – defining classes – methods - access specifiers – static members – constructors – finalize method – Arrays – Strings - Packages – JavaDoc comments

Unit – II

OBJECT-ORIENTED PROGRAMMING – INHERITANCE

Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword – abstract classes – the Object class – Reflection – interfaces – object cloning – inner classes – proxies

Unit – III

EVENT-DRIVEN PROGRAMMING

Graphics programming – Frame – Components – working with 2D shapes – Using color, fonts, and images - Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View-Controller design pattern – buttons – layout management – Swing Components

Unit – IV

GENERIC PROGRAMMING

Motivation for generic programming – generic classes – generic methods – generic code and virtual machine – inheritance and generics – reflection and generics – exceptions – exception hierarchy – throwing and catching exceptions – Stack Trace Elements - assertions – logging

Unit – V

CONCURRENT PROGRAMMING

Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – thread-safe Collections – Executors – synchronizers – threads and event-driven programming

TEXT BOOKS

- *Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.*

REFERENCE BOOKS

- *K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.*
- *Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.*
- *C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2006.*

MCA DE44 (COMPUTATIONAL INTELLIGENCE)

Unit – I

Fuzzy Logic Systems: Notion of fuzziness, fuzzy modeling, operations on fuzzy sets, T-norms and other aggregation operators, basics of approximate reasoning, compositional rule of inference, fuzzy rule based systems, (Takagi-Sugeno and Mamdani-Assilian models), schemes of fuzzification, inferencing, defuzzificatin, fuzzy clustering, fuzzy rule based classifier

Unit – II

Genetic Algorithms: Genetic operators, building block hypothesis, evolution of structure, genetic algorithms based on tree and linear graphs, applications in science and engineering

Unit – III

Artificial Neural Networks: The neuron as a simple computing element, the perceptron, multilayer neural networks, accelerated learning in multilayer neural networks

Unit – IV

Rough Sets: Information Systems, decision tables, indiscernibly relation, set approximation, approximation of family of sets, analysis of decision tables.

Unit – V

Machine Learning: Definition, Goal of Machine Learning, Learning Problem, Designing a Learning System, Types of Machine Learning, Supervised, Unsupervised, Reinforcement

TEXT BOOKS

- *K.H. Lee, First Course on Fuzzy Theory and Applications, Springer, 2005*
- *D. E.Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley, Reading, 1989*

REFERENCE BOOKS

- *E. Alpaydin, Introduction to Machine Learning, Prentice-Hall of India, 2004.*
- *J.Stepaniuk, Rough-Granular Computing in Knowledge Discovery and Data Mining, Springer, 2008*

MCA DE51 (ARTIFICIAL INTELLIGENCE)

Unit – I

INTRODUCTION: Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent Approaches, Introduction to intelligent agents.

Unit – II

PROBLEM SOLVING AND SEARCHING TECHNIQUES: Problem Characteristics, Breadth First Search, Depth First Search, Bidirectional Search, Local Search, Heuristics Search Techniques, Best First Search, A* Algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min Max and Alpha Beta Pruning.

Unit – III

KNOWLEDGE REPRESENTATION: Introduction to First Order Predicate Logic, Resolution Principle, Unification. Rule based Systems: Forward versus backward reasoning, conflict resolution, Structured Knowledge Representation: Semantic Nets, Frames, conceptual dependency.

Unit – IV

PROGRAMMING IN LOGIC: Fundamental and concepts of Programming languages like Prolog. Relationship of languages with Knowledge representation and inferences.

PLANNING: The Planning Problem, Planning with State Space Search, Partial Order Planning.

Unit – V

RESEARCH ISSUES IN AI: Study of Computational Intelligence methodology such as machine learning, fuzzy systems and swarm intelligence.

TEXTBOOKS

- *Russell & Norvig, Artificial Intelligence- A Modern Approach, 3rd edition, Prentice Hall, 2010.*
- *Elaine Rich, Kevin Knight, Shivashankar & B. Nair, Artificial Intelligence, 3rd edition, TMH, 2009.*
- *D W Patterson, Artificial Intelligence and Expert Systems, Prentice Hall of India, 2002.*
- *William F. Clocksin, Christopher S. Mellish, Programming in Prolog, 5th edition, Springer-Verlag, 2003.*

REFERENCE BOOKS

- *Saroj Kaushik, Artificial Intelligence, 1st edition, Cengage Learning, 2011.*
- *Ivan Bratko, Prolog Programming for Artificial Intelligence, 4th edition, Pearson Education, 2011.*

MCA DE52 (DISTRIBUTED SYSTEMS)

Unit – I

CHARACTERIZATION OF DISTRIBUTED SYSTEMS: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges.

SYSTEM MODELS: Architectural models, Fundamental Models,

THEORETICAL FOUNDATION FOR DISTRIBUTED SYSTEM: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection.

DISTRIBUTED MUTUAL EXCLUSION: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Unit – II

DISTRIBUTED DEADLOCK DETECTION: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

AGREEMENT PROTOCOLS: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Unit – III

Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study.

Security: Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies: Needham Schroeder, Kerberos, SSL & Millicent.

Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System, Recent advances.

Unit – IV

TRANSACTIONS AND CONCURRENCY CONTROL: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

DISTRIBUTED TRANSACTIONS: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

Unit – V

DISTRIBUTED ALGORITHMS: Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to Wave & traversal algorithms, Election algorithm. CORBA Case Study: CORBA RMI, CORBA services.

TEXTBOOKS

- *Singhal & Shivaratri, Advanced Concept in Operating Systems, McGraw Hill.*
- *Coulouris, Dollimore, & Kindberg, Distributed System: Concepts and Design, Pearson.*

REFERENCE BOOKS

- *Gerald Tel, Distributed Algorithms, Cambridge University Press.*

MCA DE53 (CLOUD COMPUTING)

Unit – I

INTRODUCTION TO COMPUTING AND CLOUD COMPUTING: Trends in Computing, Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. Concept and Evolution of cloud computing paradigm. Business driver for adopting cloud computing. Benefits and challenges of cloud computing. Various types of cloud computing. Cloud Computing Architecture: Cloud delivery model, SPI framework, SPI evolution, SPI vs. traditional IT Model.

Unit – II

INFRASTRUCTURE AS A SERVICE (IAAS): IaaS service providers, Amazon EC2, GoGrid, Microsoft soft implementation and support, Amazon EC service level agreement, recent developments, Benefits.

SOFTWARE AS A SERVICE (SAAS): SaaS service providers, Google App Engine, Salesforce.com and google platfrom, Benefits, Operational benefits, Economic benefits, Evaluating SaaS.

PLATFORM AS A SERVICE (PAAS): PaaS service providers, Right Scale, Salesforce.com, Rackspace, Force.com , Services and Benefits.

Unit – III

VIRTUALIZATION: Virtualization concept and Operating System, Need of virtualization, cost, administration, fast deployment, reduce infrastructure cost, limitations. Types of hardware virtualization: Full virtualization, partial virtualization, para virtualization. Desktop virtualization: Software virtualization, Memory virtualization, Storage virtualization, Data virtualization, Network virtualization. Microsoft Implementation: Microsoft Hyper V, VMware features and infrastructure, Virtual Box, Thin client.

Unit – IV

CLOUD DEPLOYMENT MODEL: Public clouds, Private clouds, Community clouds, Hybrid clouds, Advantages of Cloud computing, Performance and Resource management, load balancing, Energy model.

Unit – V

BEST PRACTICE CLOUD IT MODEL: Analysis of Case Studies when deciding to adopt cloud computing architecture, How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO), Security aspects in cloud.

TEXTBOOKS

- *Barrie Sosinky, Cloud Computing, Wiley Publishing House, 2011.*
- *Michael J. Kavis, Architecting the cloud: Design decision for cloud computing, John Wiley & Sons, 2014.*

REFERENCE BOOKS

- *Anthony T.Velte, Toby J. Velte & Robert Elsenpeter, Cloud computing a practical approach, MGH, 2009.*
- *Thomas Erl, Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Prentice Hall, Pearson Publications, 2013.*

MCA DE61 (BIG DATA ANALYTICS)

Unit – I

INTRODUCTION: Introduction to BigData Platform , Challenges of Conventional Systems, Intelligent data analysis , Nature of Data, Analytic Processes and Tools, Analysis vs Reporting, Modern Data Analytic Tools.

STATISTICAL CONCEPTS: Sampling Distributions, Re-Sampling, Statistical Inference, Prediction Error.

Unit – II

MINING DATA STREAMS: Introduction To Streams Concepts , Stream Data Model and Architecture , Stream Computing , Sampling Data in a Stream , Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments , Counting Oneness in a Window, Decaying Window, Real time Analytics Platform(RTAP) Applications , Stock Market Predictions.

Unit – III

HADOOP: History of Hadoop, The Hadoop Distributed File System, Components of Hadoop, Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFSBasics, Developing a Map Reduce Application, How Map Reduce Works, 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 ENVIRONMENT: Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop, Administering Hadoop, HDFS – Monitoring Maintenance-Hadoop benchmarks, Hadoop in the cloud

Unit – V

FRAMEWORKS: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper, IBM InfoSphere BigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications.

TEXTBOOKS

- *Michael Minelli , Michele Chambers , Ambiga Dhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications, 2013.*
- *Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, TMH, 2011.*

REFERENCE BOOKS

- *Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.*
- *Tom White, Hadoop: The Definitive Guide, 3rd Edition, O'reilly Media, 2012.*

MCA DE62 (PARALLEL COMPUTING)

Unit – I

SEQUENTIAL & PARALLEL COMPUTATIONAL MODELS: Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

Unit – II

PERFORMANCE: Performance Measures of Parallel Algorithms, speed-up and efficiency of PA.

COST OPTIMALITY: Cost optimality, An example of illustrate Cost-optimal algorithms- such as summation, Min/Max on various models.

Unit – III

PARALLEL MERGING AND SORTING NETWORK: Parallel Merging Algorithms on CREW/EREW/MCC/, Parallel Sorting Networks on CREW/EREW/MCC/, linear array.

Unit – IV

PARALLEL SEARCHING ALGORITHM: Kth element, Kth element in X+Y on PRAM.

MARIX MULTIPLICATION: Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication.

Unit – V

GRAPH ALGORITHMS: Connected Graphs, search and traversal, Combinatorial Algorithms, Permutation, Combinations, Derrangements.

TEXTBOOKS

- *M. J. Quinn, Designing Efficient Algorithms for Parallel Computer, MGH.*

REFERENCE BOOKS

- *S.G. Akl, Design and Analysis of Parallel Algorithms, 1st Edition, PHI.*
- *S. G. Akl, Parallel Sorting Algorithm, Academic Press.*

MCA DE63 (NETWORK PROGRAMMING)

Unit – I

INTRODUCTION: Day Time Client/Server, Concurrent Client/Server, Error Handling, Protocol Independence, Port Numbers.

SOCKETS: Address structures, value – result arguments, Byte ordering and manipulation function and related functions, Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers, Close and related function.

Unit – II

TCP CLIENT SERVER: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.

Unit – III

I/O MULTIPLEXING AND SOCKET OPTIONS: I/O Models, Select function, Batch input, shutdown function, Poll function, TCP Echo server, getsockopt and setsockopt functions. Socket states, Generic socket option, IPV6 socket option, ICMPV6 socket option, IPV6 socket option and TCP socket options.

Unit – IV

ELEMENTARY UDP SOCKETS: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.

ELEMENTARY NAME AND ADDRESS CONVERSIONS: Domain Name System, gethostbyname function, RES_USE_INET6 Resolver option, gethostbyname2 function and IPv6 support, gethostbyaddr function, uname function, gethostname function, getservbyname and getservbyport functions.

Unit – V

I**PV4 AND IPV6 INTEROPERABILITY:** IPv4 client, IPv6 server, IPv6 client, IPv4 server.

NETWORK MANAGEMENT AND DEBUGGING: Troubleshooting a Network, ping, traceroute, netstat, Packet Sniffers, Network Management Protocols, SNMP.

TEXTBOOKS

- *R. W. Stevens, B. Fenner, A. M. Rudoff, Unix Network Programming: The Sockets Networking API, 3rd edition, vol.1, PHI, 2010.*
- *E. Nemeth, G. Snyder, T. R. Hein, B. Whaley, UNIX and Linux System Administration Handbook 4th Edition, Pearson Education 2011.*

REFERENCE BOOKS

- *A.S. Tanenbaum; Computer Networks, 5th edition, Pearson, 2012.*
- *B.A. Forouzan, Data Communications and Networking, 4th edition, Tata McGraw Hill, 2006.*

MCA DE64 (COMPUTER VISION)

Unit – I

INTRODUCTION: Machine vision systems, optics and lenses, image sensors, human vision and Neuro-visual model; Marr's paradigm; Imaging geometry - world co-ordinate system and camera co-ordinate system, co-ordinate transformations, projection geometry, camera calibration, radiometry.

Unit – II

EARLY PROCESSING AND IMAGE FILTERING: Noise removal, region segmentation, concept of primal sketch, scale space, edge detection and localization, edge linking, Hough transform, corner and junction detection. Reflectance map and photometric stereo: Image brightness and radiometry, image formation and surface reflectance under different conditions, reflectance map and bidirectional reflectance distribution function, photometric stereo recovering albedo and surface orientation, shape from shading.

Unit – III

RANGE MEASUREMENT AND RECOVERING SCENE GEOMETRY: Binocular technique stereo pair, epipolar line and plane, Stereo matching, photogrammetry, monocular technique - texture processing and shape from texture, depth from focusing and symmetry, different range finder (active) - laser range finder, light-stripe method.

Unit – IV

MOTION ESTIMATION: Motion field, optical flow - smoothness, boundary conditions, discontinuities of optical flow, block based method, pre-recursive method, Bayesian method, Motion segmentation method, motion from points and lines, token tracking, stereo and motion tracking, use of Kalman filter, focus of expansion, structure from motion, motion compensated filtering and restoration, video compression, active and passive surveillance.

Unit – V

REPRESENTATION AND ANALYSIS OF POLYHEDRAL SCENE: understanding line drawings, gradient and dual space, generalized cylinder, volumetric representation, edge and junction labelling; Labelling and recognition of scene objects; Construction of model-base and visual learning, model based recognition system - Acronym, model based recognition from sparse range data, 3D model based vision system, scene understanding.

TEXTBOOKS

- *D. H. Ballard and C. M. Brown, Computer Vision, Prentice Hall, New York, 1986.*
- *R. M. Haralick, L. G. Shapiro, Computer and Robot Vision, Addison-Wesley, 1992.*

REFERENCE BOOKS

- *Y. Shirai, Three-Dimensional Computer Vision, Springer-Verlag Berlin, 1988.*
- *B. K. P. Horn, Robot Vision, MIT Press, Cambridge, 1986.*

OPEN ELECTIVES (OE)

MCA OE11 (ACCOUNTING AND FINANCIAL MANAGEMENT)

Unit – I

Introduction: Basics of accounting, Accounting equation, Conventions underlying preparation of Financial Statements-balance sheet, profit and loss statement; accounting processes; basic accounts, trail balance and financial statements; issues such as provisions for bad debts tax, dividends, losses such as bad debts, missing information, classification effect, cost of assets, rentals etc.;

Unit – II

Income measurement (revenue; recognition and matching cost and revenues; inventory valuation); Depreciation Accounting; Intangible assets Accounting; Understanding published annual accounts including funds flow statement.

Unit – III

Basic Cost Concept: Cost classification; allocation, appointment, and absorption; Cost analysis for Managerial Decisions (direct costing, break-even analysis; relevant costs; pricing; pricing-joint costs; make or buy; relevant fixed costs and sunk costs), Cost Analysis for control (standard costing; variances; material, labor, overhead, sales and profit); Standard Cost Accounting (budgeting and control; elements of budgeting; control of manufacturing and manufacturing expenses; performance appraisal, evaluation of cost control systems).

Unit – IV

Financial Management: Introduction to Management Control systems; Goals, Strategies, and Key variables; Finance function (concepts, scope and its relationship with other functions), Tools of financial analysis (funds and cash flow analysis, ration-analysis);

Unit – V

Financial forecasting (cash flow forecasting under uncertainty, financial planning), Estimation and management of working capital (operation cycle concepts, inventory, accounts receivables, cash and accounts payables, working capital requirements).

TEXT BOOKS

- *Robbins, Essentials of Management, Pearson Education*

REFERENCE BOOKS

- *Bhattacharya, S.K., and Dearden, John, Accounting for Management, Prentice Hall of India, New Delhi.*
- *Chadwick, The Essence of Financial Accounting, Prentice Hall of India, New Delhi.*

MCA OE12 (BUSINESS MANAGEMENT)

Unit – I

Basics of management; Planning, scheduling, organising, staffing, directing, controlling Managerial economics and financial management, productivity management

Unit – II

Human resource development and management, selection, training and role of IT , Introduction to management control systems: goals, strategies; Performance measures

Unit – III

Strategy: firm and its environment, strategies and resources, industry structure and analysis, corporate strategies and its evaluation, strategies for growth and diversification, strategic planning

Unit – IV

International Business Environment – Globalization – Forces, Meaning, (25) dimensions and stages in Globalization – Introduction to theories of International Trade by Adam Smith, Ricardo and Ohlin & Heckler – Trading Environment of International Trade – Tariff and Non-tariff Barriers – Trade Blocks – Rise of new economies like Japan, South East Asia and China as compared to India.

Unit – V

Global sourcing and its impact on Indian Industry – Globalization and internal reform process – India's competitive advantage in industries like IT, Textiles, Gems & Jewellery etc. – Potential and threats

TEXT BOOKS

- *Essentials of Management, Koontz, TMH*
- *Management:Text & Cases, Satya Raju,2nd Ed, PHI*

REFERENCE BOOKS

- *BO and Principles of Management, A. Roy, TMH*
- *Mgmt. Text & Cases, V.S. P. Rao & Harikrishna, EXCEL BOOKS*
- *Mgmt. Concept & Strategies, Chandan,VIKAS*
- *Management Science,Rao,Scitech*

MCA OE13 (CORPORATE PLANNING)

Unit – I

Concept of strategy : a) Defining strategy b) Levels at which strategy operates c) Strategic Decision Making and Approaches to Strategic Decision making d) Mission and Purpose, Objectives and Goals e) Strategic Business Units f) Corporate Planning Process

Unit – II

Environment Analysis and Diagnosis : a) Concept of Environment and its components b) Environment scanning and appraisal c) organizational appraisal d)Strategic advantage analysis and diagnosis e) SWOT analysis

Unit – III

Strategy Formulation and Choice of Alternatives : a) Strategies – Modernization, Diversification, Integration, Merger, Take-over and Joint Venture strategies, Turnaround – divestment and Liquidation strategies b) Process of Strategic Choice – Industry, competitor and SWOT analysis; Synergy and Dysergy, GAP Analysis; Porter's Five forces Model of competition; Mckinsey's 7's framework; GE-9 Cell Model, Bostan's Consultancy Model c) Distinctive competitiveness; d) Selection of matrix e) Factors affecting Strategic Choice – Cost, Leadership, Differentiation focus, value chain analysis, bench-marking, service blue printing.

Unit – IV

Strategy Implementation :a) Inter-relationship between formulation and implementation; b) Issues in strategy implementation, Resource Allocation, Budgets, Organization structure c) Matching structure and strategy d) Behavioural Issues – Leadership styles, Corporate culture and values power e) Social Responsibilities – Ethics, Building capable organization; f) Functional Issues – Financial, Marketing, Operations and Personnel Plans and Policies

Unit – V

Strategy and Structure: Structural Considerations, Structure for strategies, Organizational design and change. Strategy Evaluation: Importance, Symptoms of malfunctioning of strategy, Overview of strategic evaluation, strategic control, techniques of strategic evaluation and control, Operational Control.

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TEXT BOOKS

- *Managing Business Enterprise : Strategies, Structures and Systems – S.K. Bhattacharya and N.Venkatraman – VHP*
- *Business Policy – Kaxmi Azhar – Tata McGraw Hill*

REFERENCE BOOKS

- *Strategic Management - Thompson and Strickland – Tata Mcgraw Hill*
- *Strategic Management – David Fred R. – PHI*
- *Implementing Strategic Management – H.Igor Ansoff – PHI*
- *Strategic Management in Action – Coulter Mary K. – PHI*

MCAOE14 (FOUNDATIONS OF DECISION PROCESSES)

Unit – I

Role of decision making in management. Framework. Criteria under conditions of certainty. risk and uncertainty. Baytes theorem. Sequential decision making decision tree analysis.

Unit – II

Theory of utility. Utility function curve. Competitive strategies, game theory. Queuing model. Single channel, single phase waiting line model with Poisson. Distributed arrival rates and exponentially distributed service times. Markov models.

Unit – III

Simulation: Monte Carlo. Application to queuing and inventory models. Applications in functional areas of marketing, production. finance. Behavioural aspects in decision making, open and closed models of decisions.

Unit – IV

Systematic problem analysis and decision making. Decision making in functional areas - case studies.

TEXT BOOKS

Gregory, G. "Decision analysis", Pitman, London, .1988. Johnson. R

MCA OE21 (ORGANIZATIONAL STRUCTURE AND PERSONAL MANAGEMENT)

Unit – I

Classical theories: Classical theories of organization-Elements of Weber's Ideal Bureaucracy, Henry Fayol's Principles of Management, Principles of Scientific Management. Organisation-Definitions, Features/Characteristics of organization, Types of organization-Formal Organisations, Informal Organisations, Features of Formal and Informal organizations; Organisatinal Goals/Objectives-General objectives and Specific objectives, Merits of objectives.

Unit – II

Organisational Behaviour: Definition, Disciplines contributing to the Organisational Behaviour field. Knowledge to management practices/ Role of Organisational behaviour /A managerial Perspective on Organisational Behaviour. Definition of Motivation, Maslow's need Heirarchy, Herzberg's Two-Factor Theory, Theory X and Y, Theory Z.

Unit – III

Personnel Management: Objectives and Principles of Personnel Management, Functions of Personnel Management-Managerial Functions, Operative Functions. Personnel Polices-Definition, Characteristics of a good Personnel Policy. Duties and Responsibilities of Personnel Manager, Future of Personnel Management in India.

Unit – IV

Manpower: Manpower Selection Process; Job Analysis –Job description and Job specification, Sources of Recruitment-Internal sources, External sources, Sources of recruitment commonly used in India. Selection Procedure: Steps in selection process, Qualities of a Personnel Manager

Unit – V

Human Resource: Objective and Scope of Human Resource Management, Functions of Human Resource Management. Purpose of Training and Development, Importance and Objective of Manpower/ Human Resource Training and Development.

TEXT BOOKS

- *Organizational Behavior: L.M. Prasad*
- *Organizational Behavior: Gregory Moorhead & Ricky W. Griffin*

REFERENCE BOOKS

- *Organizational Behavior: Stephen P. Robbins*
- *Human Resource & Personnel Management: K. Aswathappa*
- *Personnel Management: Edwin B. Flippo.*
- *Personnel Management: Garry Dessier.*

MCA OE22 (BUSINESS ECONOMICS)

Unit – I

INTRODUCTION TO ENGINEERING ECONOMICS AND MANAGERIAL ECONOMICS: Concept of Efficiency, Theory of Demand , Elasticity of Demand, Supply and Law of Supply indifference Curves, Budget Line, Welfare Analysis, Scope of Managerial Economics, Techniques and Applications of Managerial Economics.

Unit – II

MARKET STRUCTURE: Perfect Competitions Imperfect- Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions.

Unit – III

DEMAND FORECASTING AND COST ESTIMATION: Characteristics of Forecasts, Forecasting Horizons, Steps to Forecasting, Forecasting Methods, Seasonal Adjustments, Forecasting Performance Measures, Cost Estimation, Elements of cost, Computation of Material Variances Break-Even Analysis.

Unit – IV

MANAGEMENT ASPECTS: Functions of Management, Project Management, Value Engineering, Project Evaluation, Decision Making.

TEXTBOOKS

- *G. J. Thuesen, & W.J. Fabrycky, Engineering Economy, PHI, New Delhi.*
- *William G. Sullivan, James A. Bontadelli & Elin M. Wicks, Engineering Economy, First Indian reprint, Pearson Education Asia.*

REFERENCE BOOKS

- *Donald G. Newnan, Jerome P. Lavelle & ted G. Eschenbach, Engineering Economic Analysis, Engineering press, Austin, Texas.*
- *Seema Singh, Economics for Engineering Students, IK International Publishing House Pvt. Ltd.*