CH CHARAN SINGH UNIVERISTY

MEERUT

Evaluation Scheme & Syllabus

for

MCA First Year

On

Choice Based Credit System

(Effective from the Session: 2016-17)

Ch Charan singh University, Lucknow

Study and Evaluation Scheme

MCA (Master of Computer Applications)

(Effective From Session 2016-17)

Year – I Semester - I

Sl. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Session Exams			ESE	Subject Total	
						CT	TA	Total			
1	MCA 111	Professional Communication	3	1	0	20	10	30	70	100	04
2	MCA 112	Computer Concepts & Principals of Programming	3	1	0	20	10	30	70	100	04
3	MCA 113	Accounting & Financial Management	3	1	0	20	10	30	70	100	04
4	MCA 114	Discrete Mathematics	3	1	0	20	10	30	70	100	04
5	MCA 115	Computer Organization & Architecture	3	1	0	20	10	30	70	100	04
Practical											
6	MCA151	Professional Communication Lab	0	0	3	30	20	50	50	100	02
7	MCA152	Programming Lab	0	0	3	30	20	50	50	100	02
		Total	15	4	5					700	24

Year – I Semester - II

Sl. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Session Exams			ESE	Subject Total	
						CT	TA	Total			
1	MCA211	Computer Based Numerical & Statistical Techniques	3	1	0	20	10	30	70	100	04
2	MCA212	Data Structures	3	1	0	20	10	30	70	100	04
3	MCA213	Introduction to Automata Theory & Languages	3	1	0	20	10	30	70	100	04
4	MCA214	Innovation & Entrepreneurship	3	1	0	20	10	30	70	100	04
5	MCA215	Human Values & Professional Ethics	3	0	0	20	10	30	70	100	03
Practical											
6	MCA251	Computer Based Numerical & Statistical Techniques Lab	0	0	3	30	20	50	50	100	02
7	MCA252	Data Structure Lab	0	0	6	30	20	50	50	100	03
		Total	14	4	6					700	24

STUDENT PERFORMANCE AND LEARNING OUTCOMES
Session :- 2018-2019
Department of Computer Application

Program Outcome for all program offered by the Institution:-
Program Outcome (PO) - MCA

- Apply knowledge of Computing fundamentals, Computing specialization, Mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements for employability.
- Identify, formulate, research literature, and solve complex Computing problems reaching substantiated conclusions using fundamental principles of Mathematics, Computing sciences, and relevant domain disciplines for advance higher studies. .
- Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
- Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.
- Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice for enhancing skills.
- Recognize the need, and have the ability, to engage in independent learning for continual development as a Computing professional .
- Demonstrate knowledge and understanding of computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.
- Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.
- Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.
- Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Specific Programme Outcomes (SPO) - MCA

- To prepare graduates who will create systems through software development to solve problems in Industry domain areas.
- To Prepare Graduates who will contribute to societal growth through research in their chosen field.
- To prepare graduates who will perform both as an individual and in a team through good analytical, design and implementation skills.
- To prepare graduates who will be lifelong learners through continuous professional development.

Professional Communication (M C A – 111)

Course Outcomes

1. Exhibit adequate verbal and non-verbal communication skills .
2. Demonstrate effective discussion, presentation and writing skills.
3. Increase confidence in their ability to read, comprehend, organize, and retain written information. Improve reading fluency.
4. Write coherent speech outlines that demonstrate their ability to use organizational formats with a specific purpose; Deliver effective
5. speeches that are consistent with and appropriate for the audience and purpose.
6. Develop proper listening skills; articulate and enunciate words and sentences clearly and efficiently.
7. Show confidence and clarity in public speaking projects; be schooledin preparation and research skills for oral presentations.

MCA I Semester

Unit-1:

Fundamentals of Communication Technical Communication: features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communications; The flow of Communication: Downward, Upward, Lateral of Horizontal (Peer group): Importance of technical communication; Barriers to Communication.

Unit-II:

Constituents of Technical Written Communication Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; Correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph

Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation-various steps.

Unit-III

Business Communication Principles, Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance, Negotiation & Business Presentation skills

Unit-IV

Presentation Strategies and Listening Skills. Defining Purpose; Audience & Local; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Listening Skills: Active Listening, Passive Listening. methods for improving Listening Skills

Unit-V

Value-Based Text Readings Following essays form the suggested text book with emphasis on Mechanics of writing.

(i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior

(ii) The Language of Literature and Science by A. Huxley
(iii) Man and Nature by J.Bronowski
(iv) The Social Function of Literature by Ian Watt
(v) Science and Survival by Barry Commoner
(vi) The Mother of the Sciences by A.J.Bahm
(vii) The Effect of Scientific Temper on Man by Bertrand Russell.

Text Books

1. Improve Your Writing ed. V.N.Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi
2. Technical Communication: A Practical Approach: Madhu Rani and Seema Verma- Acme Learning
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press

Reference Books

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt.Ltd,2011, New Delhi
2. Business Correspondence and Report Writing by Prof. R.C.Sharma & Krishna Mohan, Tata McGraw Hill & Co.Ltd.,2001, New Delhi
3. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. &Distributors, 2009,Delhi.
4. Developing Communication Skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi
5. Manual of Practical Communication by L.U.B.Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi
6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi
8. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi

MCA 1st Semester

ffective from 2016-17

COMPUTER CONCEPTS AND PRINCIPLES OF PROGRAMMING (MCA-112)

Course Outcomes

1. To learn the basics of different types of programming
2. To understand the syntax and building blocks of the C- program.
3. To learn to solve a problem using the CProgram.
4. To compile and debug a C- Program.
5. To generate an executable file from program.

UNIT 1: **08 Hours**

Introduction to Computers:

Generations of Computer, Classification of Computers on various Parameters viz. Size, Purpose, Number of Users, Software, Application and System Software, Computer Hardware, Storage Devices, Memory Hierarchy, Magnetic Tape, Flash Memory, Cache and its Levels, SSD.

Number System: Binary, Octal and Hexadecimal Number Systems, Inter-Conversions in Various Numbers Systems, BinaryArithmetic.

UNIT 1: **06 Hours**

Introduction to Operating System, Its Various Functions, Popular Operating Systems— Android, Windows, Difference between Linux and Unix, iOS, Google Chrome, Modern Computing Models: Cloud Computing Model and Its Benefits, Grid Computing, Green Computing, Internet of Things (IoT), Big Data Analytics, Modern Applications of IT

UNIT 1: **10 Hours**

A Short History of Programming Languages, Development of Early Languages, Evolution of Software Architectures, Role of Programming Languages, Attributes of a Good Language?Approaches to Problem Solving, Concept of Algorithm andFlow Charts, Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Language Standardization and InternationalizationTranslators and Virtual Architectures, Binding Times, Syntactic Elements of a Programming Language, Program-Sub Program Structure, Stages in Translation, Analysis of Source Program, Synthesis of Object Program, Introduction to Python Programming.

UNIT 1: **08 Hours**

Data Objects, Variables and Constants, Data Types, Declarations, Type Checking and Type Conversion, Assignment and Initialization, Condition Checking, Looping, Structured Data Types, Arrays, Records, Lists, Executable Objects, Methods

UNIT 1: **08 Hours**

Naming and Referencing Environments, Recursive Sub Programs,Static and Dynamic Scope, Encapsulation, Abstraction, Abstract Data Types, Classes, Inheritance, Objects and Message Passing,

Text Books:

1. Programming Languages: Design and Implementation by Terrance W. Pratt, Marvin V. Zalkowitz, T. V. Gopal, Fourth Edition, Pearson
2. Fundamentals of Computers, V. Raja Raman and Neeharika Adabala, Sixth Edition, PHI
3. Concepts, Techniques and Models of Computer Programming by Peter Van Roy and Seif Haridi, MIT Press
4. Computer Concepts: Introductory by June Jamrich Parsons & Dam Oja Eighth Edition Cengage Learning

Reference:

1. Programming Languages: Design and Implementation,Terrence W. Pratt, Prentice Hall Publishers
2. 2. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition [India Edition], 2007.
3. Object- Oriented Programming with C++ by E. Balagurusamy

MCA I Semester

ACCOUNTING AND FINANCIAL MANAGEMENT (MCA-113)

Course Outcomes

1. Define bookkeeping and accounting.
2. Explain the general purposes and functions of accounting.
3. Explain the differences between management and financial accounting.
4. Describe the main elements of financial accounting information – assets, liabilities, revenue and expenses.
5. Identify the main financial statements and their purposes

Unit I: (6 Hrs)

Overview: Accounting concepts, conventions and principles; Accounting Equation, International Accounting principles and standards; Matching of Indian Accounting Standards with International Accounting Standards

Unit II: (12 Sessions)

Mechanics of Accounting: Double entry system of accounting, journalizing of transactions; preparation of final accounts, Trading Account, Manufacturing Accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Policies related with depreciation, inventory and intangible assets like copyright, trademark, patents and goodwill.

Unit III (12 Sessions)

Analysis of financial statement: Ratio Analysis- solvency ratios, profitability ratios, activity ratios, liquidity ratios, market capitalization ratios ; Common Size Statement ; Comparative Balance Sheet and Trend Analysis of manufacturing, service & banking organizations.

Unit IV (10 Sessions)

Funds Flow Statement: Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis ; Cash Flow Statement: Various cash and non-cash transactions, flow of cash, preparation of Cash Flow Statement and its analysis.

Suggested Readings

1) Narayanswami - Financial Accounting: A Managerial Perspective (PHI, 2nd Edition)
2) Mukherjee - Financial Accounting for Management (TMH, 1st Edition)
3) Ramchandran&Kakani - Financial Accounting for Management (TMH, 2nd Edition)
4) Ghosh T P - Accounting and Finance for Managers (Taxman, 1st Edition).
5) Maheshwari S.N &Maheshwari S K – An Introduction to Accountancy (Vikas, 9th Edition)
6) Ashish K. Bhattacharya- Essentials of Financial Accounting (PHI, New Delhi)
7) Ghosh T.P- Financial Accounting for Managers (Taxman, 3rd Edition)
8) Maheshwari S.N &Maheshwari S K – A text book of Accounting for Management (Vikas, 1st Edition)
9) Gupta Ambrish - Financial Accounting for Management (Pearson Education, 2nd Edition)
10) Chowdhary Anil - Fundamentals of Accounting and Financial Analysis (Pearson Education, 1st Edition).

DISCRETE MATHEMATICS (MCA – 114)

Course Outcomes

1. Be familiar with constructing proofs.
2. Be familiar with elementary formal logic.
3. Be familiar with set algebra.
4. Be familiar with combinatorial analysis.
5. Be familiar with recurrence relations.
6. Be familiar with graphs and trees, relations and functions, and finite automata.
7. Be exposed to the strategies for compare relative efficiency of algorithms

MCA I Semester

Unit-I: (10 Hrs)

Set Theory: Introduction, Size of sets and cardinals, Venn diagrams, Combination of sets, Multisets, Ordered pairs and Set identities.

Relations & Functions: Relations - Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation. Functions - Definition, Classification of functions, Operations on functions, Recursively defined functions.

Notion of Proof: Introduction, Mathematical Induction, Strong Induction and Induction with Nonzero base cases.

Unit-II: (08 Hrs)

Lattices: Introduction, Partial order sets, Combination of partial order sets, Hasse diagram, Introduction of lattices, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.

Unit-III: (08 Hrs)

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Boolean functions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

Unit-IV: (08 Hrs)

Propositional & Predicate Logic: Propositions, Truth tables, Tautology, Contradiction, Algebra of propositions, Theory of Inference and Natural Deduction. Theory of predicates, First order predicate, Predicate formulas, quantifiers, Inference theory of predicate logic.

Unit-V:
(06 Hrs)

Recurrence Relations: Introduction, Growth of functions, Recurrences from algorithms, Methods of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle, Pólya's Counting Theory.

Text Books:

1. Discrete Mathematics and Its Applications, Kenneth H. Rosen, McGraw-Hill, 2006.
2. Discrete Mathematical Structures, B. Kolman, R. C. Busby, and S. C. Ross, Prentice Hall, 2004.
3. Discrete and Combinatorial Mathematics, R.P. Grimaldi, Addison Wesley, 2004.
4. Discrete Mathematical Structures, Y N Singh, Wiley-India, First Edition, 2010.

Computer Organization (MCA-115)

Course Outcomes

1. Understand the theory and architecture of central processing unit.
2. Analyze some of the design issues in terms of speed, technology, cost, performance.
3. Design a simple CPU with applying the theory concepts.
4. Use appropriate tools to design verify and test the CPU architecture.
5. Learn the concepts of parallel processing, pipelining and interprocessor communication.
6. Understand the architecture and functionality of central processing unit.
7. Exemplify in a better way the I/O and memory organization.
8. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

MCA I Semester

Unit-1: Digital Electronics (08 Hrs)

Data Representation in Computer Systems

Introduction, Positional Numbering Systems, Converting Between Bases, Signed Integer Representation, Floating-Point Representation, Character Codes

Arithmetic

Overview, Fixed Point Addition and Subtraction, Fixed Point Multiplication and Division, Floating Point Arithmetic

Boolean Algebra and Digital Logic

Introduction, Boolean Algebra, Boolean Expressions, Boolean Identities, K-Maps & Map minimization , Logic Gates, Digital Components, Combinational Circuits, Sequential Circuits

Unit-2: Memory, Register and Register transfer (08 Hrs)

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro-operation, Arithmetic Logic Shift Unit, Design of Fast address, Arithmetic Algorithms (addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers.

Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2D and $2^{1/2}$D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware

Unit 3: Control Design (08 Hrs)

Hardwired & Micro Programmed (Control Unit): Fundamental Concepts (Register Transfers, Performing of arithmetic or logical operations, Fetching a word from memory, storing a word in memory), Execution of a complete instruction, Multiple-Bus organization, Hardwired Control, Micro programmed control(Microinstruction, Microprogram sequencing, Wide-Branch addressing, Microinstruction with Next-address field, Prefetching Microinstruction).

Unit 4: (08 Hrs)

Processor Design: Processor Organization: General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer.

Input-Output Organization:I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Programmed I/O, Direct Memory access, Input-Output processor, Serial Communication.

Unit 5: **(8 Hrs)**

RISC & CICS Architecture, Basic MIPS Implementation, Pipelining, Instruction-level Parallelism, Parallel Processing Challenges, Flynn's Classification, Hardware Multi-threading, Multicore processing.

Text-Books(TB)

1. Logic and Digital Design, ***Morris mano and Kimicharels 4th Edition, Prentice Hall.***

2.Computer System Architecture, M. Mano(PHI)

3.Computer Organization, Vravice, Zaky&Hamacher (TMH Publication)

Reference Books (RB)

1. Structured Computer Organization, Tannenbaum(PHI)
2. Computer Organization, Stallings(PHI)
3. Computer Organization, John P.Hayes (McGraw Hill)

Professional Communication Lab MCA151

Course Outcomes

1. To provide an overview of Prerequisites to Business Communication.
2. To put in use the basic mechanics of Grammar.
3. To provide an outline to effective Organizational Communication.
4. To underline the nuances of Business communication.
5. To impart the correct practices of the strategies of Effective Business writing.

Lab Assignments

1. Group Discussion: participating in group discussions- understanding group dynamics.
2. GD strategies-activities to improve GD skills. Practical based on Accurate and Current Grammatical Patterns.
3. Interview Etiquette-dress code, body language attending job interview – Telephone/Skype interview one to one interview &Panelinterview.
4. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistic/ Kinesics, practicing word stress, rhythm in sentences, weak forms, intonation.
5. Oral Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics voice modulation ,Audience Awareness, Presentation plan visualaids.
6. Speaking:-Fluency & Accuracy in speech- positive thinking, Improving Self expression Developing persuasive speaking skills, pronunciation practice (for accept neutralization) particularly of problem sounds, in isolated words as well as sentences.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress andIntonation.
9. Comprehension Skills based on Reading and Listening Practical's on a model Audio-VisualUsage.

Programming Lab MCA152

Course Outcomes

1. Use the fundamentals of C programming in trivial problem solving
2. Enhance skill on problem solving by constructing algorithms
3. Identify solution to a problem and apply control structures and user
4. defined functions for solving the problem

5. Demonstrate the use of Strings and string handling functions
6. Apply skill of identifying appropriate programming constructs for problem solving

Lab Assignments

1. Program to implement conditional statements in Clanguage.
2. Program to implement switch-case statement in Clanguage
3. Program to implement looping constructs inClanguage.
4. Program to perform basic input-output operations in Clanguage.
5. Program to implement user defined functions in Clanguage.
6. Program to implement recursive functions in Clanguage.
7. Program to implement one-dimensional arrays in C language.
8. Program to implement two-dimensional arrays in C language.
9. Program to perform various operations on two-dimensional arrays in Clanguage.
10. Program to implement multi-dimensional arrays in Clanguage.
11. Program to implement string manipulation functions in Clanguage.
12. Program to implement structure in Clanguage.
13. Program to implement union in Clanguage.
14. Program to perform file handling operations in Clanguage.
15. Program to perform graphical operations in Clanguage

MCA – II Semester

Computer Based Numerical & Statistical Techniques (MCA-211)

Course Outcomes

1. To develop the mathematical skills of the students in the areas of numerical methods.
2. To teach theory and applications of numerical methods in a large number of engineering subjects which require solutions of linear systems, finding eigen values, eigenvectors, interpolation and applications, solving ODEs, PDEs and dealing with statistical problems like testing of hypotheses.
3. To lay foundation of computational mathematics for post-graduate courses, specialized studies and research.

1. **Unit-I**
2. **Floating point Arithmetic:** Representation of floating point numbers,Operations, Normalization, Pitfalls offloating point representation, Errorsin numericalcomputation
3. **Iterative Methods:**Zeros of a single transcendental equation and zeros of polynomial using BisectionMethod, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.
4.
5. **Unit-II**
6. **Simultaneous Linear Equations:** Solutions of system of Linear equations, Gauss Elimination directmethod and pivoting, Ill Conditioned system of equations, Refinement of solution. Gauss Seidaliterative method, Rate of Convergence**Interpolation and approximation:** Finite Differences, Difference tablesPolynomial Interpolation:Newton's forward and backward formula
7. Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's
8. **Interpolation with unequal intervals:**Langrange's Interpolation, Newton Divided difference formula
9.
10. **Unit-III**
11. **Numerical Differentiation and Integration:** Introduction, Numerical Differentiation, NumericalIntegration, Trapezoidal rule, Simpson's rules, Boole's Rule
12. **Solution of differential equations:** Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods, Predictor-corrector method, Automatic error monitoring, stability of solution.
13.
14. **Unit-IV**
15. **Curve fitting, Cubic Spline and Approximation:** Method of least squares,fitting of straight lines,polynomials, exponential curves etc
16. **Frequency Chart:** Different frequency chart like Histogram, Frequency curve, Pi-chart.

17. **Regression analysis:**Linear and Non-linear regression, Multiple regression
18.
19. **Unit-V**
20. Time series and forecasting: Moving averages, smoothening of curves, forecasting models and methods.
21. **Testing of Hypothesis:** Test of significance, Chi-square test, t-test, F-TestApplication to medicine, agriculture etc.
22.
23. **References:**

24. 1.Rajaraman V., "Computer Oriented Numerical Methods", PHI
25. 2.Gerald& Wheatley, "Applied Numerical Analyses", AW
26. 3.Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int.
27. 4.Grewal B. S., "Numerical methods in Engineering and Science", Khanna Publishers, Delhi
28. 5.T. Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods", TMH
29. 6.PradipNiyogi, "Numerical Analysis and Algorithms", TMH
30. 7.FrancisScheld, "Numerical Analysis", TMH
31. 9. Gupta S. P., "Statistical Methods", Sultan and Sons

MCA II Semester
Subject: Data Structures (MCA-212)

Course Outcomes

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
2. Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
3. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs
4. Demonstrate different methods for traversing trees
5. Compare alternative implementations of data structures with respect to performance
6. Compare and contrast the benefits of dynamic and static data structures implementations
7. Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack
8. Design and implement an appropriate hashing function for an application
9. Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

1. **Unit –I:** Introduction:
2. Basic Terminology, ElementaryData Organization, Data Structure operations, AlgorithmComplexity and Time-Space trade-off.
3. **Arrays:** Array Definition, Representation and Analysis, Single and Multidimensional Arrays, addresscalculation, application of arrays, Ordered List, Sparse Matrices and Vectors.
4. **Stacks:**Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, ArrayRepresentation of Stack, Linked Representation of Stack, Operations Associated with Stacks,
5. **Application of stack:** Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Recursion: Recursive definition and processes, recursion in C, example ofrecursion, Tower of HanoiProblem, simulating recursion.
6.
7. **Unit - II**
8. **Queues:** Array and linked representation and implementation of queues, Operations on Queue: Create, Add,Delete, Full and Empty. Circular queue, Deque, and Priority Queue.
9. **Linked list:** Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversingand Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists algorithm(Beginning, end and middle), Doubly linked list, Linked List in Array, Polynomial representation and addition,Generalized linked list, Garbage Collection and Compaction.
10.
11. **Unit - III**

12. **Trees:** Basic terminology, Binary Trees, Binary Tree Representation, Algebraic Expressions, Complete BinaryTree. Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Traversing Threaded Binary trees,
13.
14. **Binary Search Trees:** Binary Search Tree (BST), Insertion and Deletion in BST,Complexity of SearchAlgorithm, Path Length, AVL Trees.
15. .
16. **Unit -IV**
17. **Searching :** Sequential search, binary search, comparison and analysis
18.
19. **Sorting:** Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on DifferentKeys, Practical consideration for Internal Sorting
20. .
21. **Unit - V**
22. **Graphs:**
23. Terminology & Representations, Graphs & Multi-graphs, DirectedGraphs, SequentialRepresentations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.
24. **File Structures:** Physical Storage Media File Organization, Organization of records into Blocks, SequentialFiles, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Techniques and their Comparisons.
25.
26. **References**
27.
28. **Text Books**
29. 1.Y. Langsam, M. Augenstin and A. Tannenbaum, Data Structures using C and C++, Pearson Education Asia, 2nd Edition, 2002.
30. 2.Ellis Horowitz, S. Sahni, D. Mehta Fundamentals of Data Structures inC++, GalgotiaBook Source, New Delhi.
31.
32. **Reference Books**
33. 1.S. Lipschutz, Data Structures Mc-Graw Hill International Editions
34. 2.Jean-Paul Tremblay, Paul. G. Soresan, An introduction to data structures with Applications, Tata Mc-Graw Hill International Editions
35. 3. A. Michael Berman, Data structures via C++, Oxford University Press
36. 4. M. Weiss, Data Structures and Algorithm Analysisin C++, Pearson Education

Introduction to Automata Theory & Formal Languages (MCA-213)

Course Outcomes

1. To provide a formal connection between algorithmic problem solving and the theory of languages and automata and develop them into a mathematical (abstract) view towards algorithmic design and in general computation itself.
2. The course should in addition clarify the practical view towards the applications of these ideas in the engineering part as well.
3. Become proficient in key topics of theory of computation, and to have the opportunity to explore the current topics in this area

MCA II Semester

1. **Unit-I:**

Basic concepts of Automata Theory: Alphabets, Strings and Languages, Deterministic Finite Automata (DFA) and Nondeterministic Finite Automata (NFA) – Definition, Representation using Transition Tables and State Diagrams, Language of DFA and NFA. NFA with ε-transitions, Language of NFA with ε-transitions, Equivalence of NFA and DFA

38.

2. **Unit – II:**
3. **Regular Expressions and Languages:** Introduction, Definition of regular expression, Kleen's Theorem, Equivalence of regular expression and Finite Automata, Pumping Lemma for regular Languages, Closure properties of Regular Languages, Decision properties of Regular Languages, Finite Automata with Output: Moore and Mealy Machine, Equivalence of Moore and Mealy Machines.
4.
5. **Unit – III:**
6. **Non-Regular Grammars:** Definition of Grammar, Classification of Grammars, Chomosky's Hierarchy. Context Free Grammars (CFG) and Context Free Languages (CFL) - Definition, Examples, Derivation trees, Ambiguous Grammars, Simplification of Grammars, Normal forms of CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs, Pumping lemma for CFLs. Push Down Automata (PDA): Definition and Description, Language of PDA and its applications.
7.
8. **Unit – IV:**
9. **Turing Machines:** Introduction, Basic Features of a Turing Machine, Language of a Turing Machine, Variants of Turing Machine: Multitapes, Nondeterministic Turing Machine, Universal Turing Machine. Turing Machine as Computer of Integer functions, Halting problem of Turing Machine, Church-Turing Thesis
10. 10.
11. **Unit – V:**
12. **Undecidability:** Introduction, Undecidable problems about Turing Machines, Rice's Theorem, Post's Correspondence problem (PCP) and Modified PCP. Tractable and Intractable Problems: P and NP, NPComplete Problems, Introduction to recursive function theory
13. 13.
14. 14.
15. **Text Books:**
16. 1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
17. 2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw

Hill
18. 3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI
19. 4. Mathematical Foundation of Computer Science, Y.N.Singh, New Age International

Subject: Innovation and Entrepreneurship (MCA-214)

MCA II Semester

Course Outcomes

1. Key concepts underpinning entrepreneurship and its application in the recognition and exploitation of product/ service/ process opportunities
2. Key concepts underpinning innovation and the issues associated with developing and sustaining innovation within organisations
3. How to design creative strategies for pursuing, exploiting and further developing new opportunities
4. Issues associated with securing and managing financial resources in new and established organizations

Unit-I: Innovation and Entrepreneurship (8 Hrs)

What is innovation and entrepreneurship? Innovation Types and sources, recognizing opportunities, acting on the opportunities, innovation strategies and management, strengthening the national innovation system, fostering innovation and entrepreneurship

Unit II: Entrepreneurship (8 Hrs)

Meaning, Definition and concept of Enterprise, Entrepreneurship and Entrepreneurship Development, Evolution of Entrepreneurship, Theories of Entrepreneurship, Characteristics and Skills of Entrepreneurship, Entrepreneurship and Economic Development; Classification and Types of Entrepreneurs; Entrepreneurial Competencies; Factor Affecting Entrepreneurial Growth – Economic, Non-Economic Factors; Concepts of Intrapreneurship, Entrepreneur v/s Intrapreneur, Traits/Qualities of an Entrepreneur; Manager Vs. Entrepreneur, Problems of Entrepreneurship.

Unit III: Opportunity / Identification and Product Selection (8 Hrs)

Meaning and concept of Entrepreneurial Competency, Developing Entrepreneurial Competencies, Entrepreneurial Culture, Entrepreneurial Mobility, Factors affecting Entrepreneurial mobility, Types of Entrepreneurial mobility. Entrepreneurial Opportunity Search and Identification; Criteria to Select a Product; Conducting Feasibility Studies; Project Finalization; Sources of Information

Unit IV: (8 Hrs)

Role of Government in promoting Entrepreneurship, MSME policy in India,

Agencies for Policy Formulation and Implementation: District Industries Centers (DIC), Small Industries Service Institute (SISI),Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB),

Financial Support System: Forms of Financial support, Long term and Short term financial support, Sources of Financial support, Development Financial Institutions, Investment Institutions

Unit V: (8 Hrs)

Women Entrepreneurship: Meaning, Characteristic features, Problems of Women Entrepreneurship in India, Developing Women Entrepreneurship in India, Concept of Social Enterprise and Social Entrepreneurship, Social Entrepreneurs, Sustainability Issues in Social Entrepreneurship, Rural Entrepreneurship, Family Business Entrepreneurship

Project Management: Concept, Features, Classification of projects, Issues in Project Management, Project Identification, Project Formulation, Project Design and Network Analysis, Project Evaluation, Project Appraisal, Project Report Preparation, Specimen of a Project Report

Case Studies - At least 4 (four) during this Course

Suggested Readings:

1. Lall & Sahai:Entreprenurship(Excel Books)
2. Couger, C- Creativity and Innovation (IPP, 1999)
3. Kakkar D N - Enterpreneurship Development(Wiley Dreamtech)
4. A.K.Rai – Entrepreneurship Development, (Vikas Publishing)
5. Sehgal & Chaturvedi-Entrepreneurship Development(UDH Publishing)
6. R.V. Badi & N.V. Badi - Entrepreneurship (Vrinda Publications)
7. Holt - Entrepreneurship : New Venture Creation (Prentice-Hall).
8. Barringer M J - Entrepreneurship (Prentice-Hall)
9. Nina Jacob, - Creativity in Organisations (Wheeler, 1998)Desai, Vasant (2003). Small-Scale Industries and Entrepreneurship. Himalaya Publishing House,Delhi.

10. Kaulgud, Aruna (2003). Entrepreneurship Management. Vikas Publishing House, Delhi.38
11. Cynthia, L. Greene (2004). Entrepreneurship Ideas in Action. Thomson Asia Pvt. Ltd., Singapore.
12. Chandra, Ravi (2003). Entrepreneurial Success: A Psychological Study. Sterling Publication Pvt.Ltd., New Delhi.
13. Balaraju, Theduri (2004). Entrepreneurship Development: An Analytical Study. Akansha Publishing House, Uttam Nagar, New Delhi.
14. David, Otes (2004). A Guide to Entrepreneurship. Jaico Books Publishing House, Delhi. Taneja (2004). Entrepreneurship. Galgotia Publishers.

Human Values & Professional Ethics (MCA-215)

Course Outcomes

1. Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
2. Identify the multiple ethical interests at stake in a real-world situation or practice
3. Articulate what makes a particular course of action ethically defensible
4. Assess their own ethical values and the social context of problems
5. Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects

Morals, Values and Ethics - Integrity - work Ethic - Service Learning - Civic Virtue - Respect for others – Living peacefully - Caring - Sharing - Honesty - Courage - Valuing time - Co-operation - Commitment - Empathy - Self-Confidence - Character - Spirituality - The role of engineers in modern society - social expectations.

Sense of 'Engineering Ethics' - Variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - Consensus and controversy - Models of Professional Roles & Professionalism - theories about right action - Self-interest - customs and religion - uses of ethical theories.

Engineering as experimentation - engineers as responsible experimenters - Research ethics -Codes of ethics - Industrial Standard - Balanced outlook on law - the challenger case study.
Safety and risk - assessment of safety and risk - Riysis - Risk benefit analysis and reducing risk - Govt.

Regulator's approach to risks - the three mile island and Chernobyl case studies & Bhopal - Threat of Nuclear power, depletion of ozone, greenery effects - Collegiality and loyalty - respect for authority – collective bargaining - Confidentiality - conflicts of interest - occupation crime - professional rights - employees' rights - Intellectual Property rights (IPR) - discrimination.

Multinational corporations - Business ethics - Environmental ethics - computer ethics - Role in Technological Development - Weapons development engineers as managers - consulting engineers - engineers as expert witnesses and advisors - Honesty - leadership - sample code of conduct ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of

Materials Management Institution of electronics and telecommunication engineers (IETE), India, etc.,.

Text Books:
1. Mika martin and Roland Scinger, 'Ethics in Engineering', Pearson Education/Prentice Hall, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V.S, 'Engineering Ethics', Prentice Hall of India, New Delhi, 2004.
3. Charles D. Fleddermann, 'Ethics in Engineering', Pearson Education/Prentice Hall, New Jerssy, 2004 (Indian Reprint)
Reference Books:
1. Charles E Harris, Michael S. Protchard and Michael J Rabins, 'Engineering Ethics - Concept and Case',
Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
2. 'Concepts and Cases', Thompson Learning (2000)
3. John R Boatright, 'Ethics and Conduct of Business', Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, 'Fundamentals of Ethics for Scientists and Engineers', Oxford
University of Press, Oxford, 2001.

Computer Based Numerical & Statistical Techniques Lab (MCA-251)

Course Outcomes

1. Students will be able to understand about different methods to solve algebraic and transcendentalequations and interpolation methods.
2. Students will be able to understand numerical technique for applying in engineering andStatisticalproblem.
3. Students will be able to present and discuss results of output generated by hand or from software packagespreferably in C Programming language.

Lab Assignments

1. Find the roots of the equation by bisection method.

2. Find the roots of the equation by secant/Regula−Falsi method.

3. Find the roots of the equation by Newton's - Raphson method.

4. Find the solution of a system of nonlinear equation using Newton's method.

5. Find the roots of the equation by Iteration method.

6. Find the solution of system of equations using Jacobi/Gauss-Seidel method.

7. Find the cubic spline interpolating function.

8. Solve the boundary value problem using finite difference method.

9. Solve the initial value problem using Euler's method and compare the result with the exact solutions.

Data Structure Lab (MCA-252)

Course Outcomes

1. Be capable to identity the appropriate data structure for given problem
2. Have practical knowledge on the applications of data structures
3. Write functions to implement linear and non-linear data structure operations
4. Suggest appropriate linear / non-linear data structure operations for solving a given problem
5. Appropriately use the linear / non-linear data structure operations for a given problem
6. Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.
7. Apply stack, Queues, Link List, Searching and Sorting techniques

Lab Assignments

1. To implement addition and multiplication of two 2Darrays.
2. To transpose a 2Darray.
3. To implement stack usingarray
4. To implement queue usingarray.
5. To implement circular queue usingarray.
6. To implement stack using linkedlist.
7. To implement queue using linkedlist.
8. To implement BFS using linkedlist.
9. To implement DFS using linkedlist.
10. To implement LinearSearch.
11. 11.To implement BinarySearch.
12. To implement BubbleSorting.
13. To implement SelectionSorting.
14. To implement InsertionSorting.
15. To implement MergeSorting.
16. To implement HeapSorting.
17. To implement Matrix Multiplication by strassen'salgorithm
18. Find Minimum Spanning Tree using Kruskal'sAlgorithm

CH CHARAN SINGH UNIVERISTY
MEERUT

EVALUATION SCHEME &SYLLABUS
First Year
FOR

Evaluation Scheme and Syllabus

For

Second Year M.C.A.

(Master of Computer Application)

(Effective from the Session: 2017-18)

Master of Computer Application

Third Semester

S. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Sessional			ESE	Total	
						CT	TA	Total			
1.	MCA-311	Operating Systems	3	1	0	20	10	30	70	100	04
2.	MCA-312	Web Technology	3	1	0	20	10	30	70	100	04
3.	MCA-313	Design & Analysis of Algorithms	3	1	0	20	10	30	70	100	04
4.	MCA-314	Computer Based Optimization Techniques	3	1	0	20	10	30	70	100	04
5.	MCA-315	Cyber Security	3	0	0	20	10	30	70	100	03
6.*	MCA -316	Introduction to Programming and Computer Organization*	3	0	0	20	10	30	70	100	--
Practical											
7.	MCA-351	Operating Systems Lab	0	0	3	30	20	50	50	100	02
8.	MCA-352	Design & Analysis of Algorithms Lab	0	0	6	30	20	50	50	100	03
Total										700	24

Fourth Semester

S. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Sessional			ESE	Total	
						CT	TA	Total			
1.	MCA-411	Database Management Systems	3	1	0	20	10	30	70	100	04
2.	MCA-412	Computer Networks	3	1	0	20	10	30	70	100	04
3.	MCA-413	Artificial Intelligence	3	1	0	20	10	30	70	100	04
4.	MCA-414	Compiler Design	3	1	0	20	10	30	70	100	04
5.	MCA-415	Mobile Computing Elective –I	3	1	0	20	10	30	70	100	03
6.*	MCA416	Fundamental of Data Structure, Numerical and Computational Theory*	3	0	0	20	10	30	70	100	--
Practical											
7.	MCA-451	Mini Project	0	0	6	30	20	50	50	100	03
8.	MCA-452	Database Management Systems Lab	0	0	3	30	20	50	50	100	02
		Total	15	5	6					700	24

***Note:** MCA Lateral Entry candidates are required to qualify following two audit courses also. These courses will be of qualifying nature and shall not be considered towards semester total of marks.*

* Audit Courses to be completed by MCA Lateral Entry Students only.

1. *Audit Course 1: RCA-A01*
2. *Audit Course 2: RCA-A02*

List of Electives

Elective – I

1. RCA-E11: Design & Development of Applications
2. RCA-E12: Client-Server Computing
3. RCA-E13: Data Warehousing & Data Mining
4. RCA-E14: Advanced Computer Architecture
5. RCA-E15: Mobile Computing

Operating Systems (MCA-311)

Course Outcomes

1. Explain main components, services, types and structure of Operating Systems.
2. Apply the various algorithms and techniques to handle the various concurrency control issues.
3. Compare and apply various CPU scheduling algorithms for process execution.
4. Identify occurrence of deadlock and describe ways to handle it.
5. Explain and apply various memory, I/O and disk management techniques.

UNIT I–INTRODUCTION: - Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.

UNIT II–PROCESSES: - Process States, Process Description and Process Control. Processes and Threads, Types of Threads, Multicore and Multithreading, Windows 7- Thread and SMP Management.

UNIT III-CONCURRENCY AND SCHEDULING:-Principles of Concurrency-Mutual Exclusion, Semaphores, Monitors, Readers/Writers problem. Deadlocks-prevention-avoidance-detection, Scheduling- Types of Scheduling-Scheduling algorithms.

UNIT IV–MEMORY:- Memory management requirements, Partitioning, Paging and Segmentation, Virtual memory - Hardware and control structures, operating system software, Linux memory management, Windows memory management.

UNIT V - INPUT/OUTPUT AND FILE SYSTEMS: - I/O management and disk scheduling – I/O devices, organization of I/O functions; OS design issues, I/O buffering, disk scheduling, Disk cache. File management – Organization, Directories, File sharing, and Record blocking, secondary storage management.

References:-

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Andrew S. Tanenbaum, "Modern Operating System", PHI Learning
3. Tanenbaum /Woodhaull "Operating System Design and Implementation", Pearson Publication.
4. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
5. Flynn, "Understanding Operating System" , Cengage.
6. D M Dhamdhere, "Operating Systems : A Concept basedApproach", McGraw Hill.
7. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
8. Stuart E. Madnick& John J. *Donovan.Operating Systems.*McGraw Hill.
9. A. K. Sharma, "Operating System", University Press.
10. Achyut S Godbole, Atul kahate , "Operating System", McGraw Hill

Web Technology (MCA-312)

Course Outcomes

1. On completion of this course, a student will be familiar with client server architecture and able to develop a web application using web technologies.
2. Students will gain the skills and project based experience nee Course Outcomes : ded for entry into web application and development careers.
3. Students are able to develop a dynamic webpage by the use of java script and DHTML. Students will be able to write a well formed / valid XML document. Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
4. Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.
5. The course is intended for those who have never done anything with HTML or web pages (static and dynamic), and would like to build this basic knowledge for starting a career as a web developer or for learning how to program HTML for web pages HTML/ HTML5, CSS, JavaScript, VB Script.
6. Web development strategies using server side programming with ASP, JSP, Com/D-Com, PHP and at the end of the course you'll gain knowledge about where to go next to further your front-end web development skills.

UNIT I- INTRODUCTION & WEB DESIGN:- Introduction: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0

Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation.

UNIT II- HTML & STYLE SHEETS:- HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML 5

Style sheets : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

UNIT III- JAVESCRIPT & XML:- JavaScript : Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: JavaScript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and JavaScript, Events and buttons

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT

UNIT IV- PHP:- PHP : Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

UNIT V- MYSQL:- PHP and MySQL : Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and

database bugs

References:-

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
2. Web Technologies, Black Book, Dreamtech Press
3. HTML 5, Black Book, Dreamtech Press
4. Web Design, Joel Sklar, Cengage Learning
5. Developing Web Applications in PHP and AJAX, Harwani, McGraw Hill
6. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel, Pearson

Design and Analysis of Algorithms (MCA-313)

Course Outcomes

1. Argue the correctness of algorithms using inductive proofs and invariants.
2. Analyze worst-case running times of algorithms using asymptotic analysis.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
5. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
6. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.
7. Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.

UNIT-I INTRODUCTION: Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

UNIT-II ADVANCED DATA STRUCTURES: - Red-Black trees, B-trees, Binomial Heaps, Fibonacci Heaps.

UNIT-III DIVIDE AND CONQUER, GREEDY METHOD: Sorting, Matrix Multiplication, Convex hull and Searching. Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, and Minimum Spanning trees-Prim's and Kruskal's algorithms, Single source shortest paths – Dijkstra's and Bellman Ford algorithms.

UNIT–IV DYNAMIC PROGRAMMING, BACKTRACKING AND BRANCH AND BOUND: - Dynamic programming with examples such as Knapsack, All pair shortest paths – Warshall's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Colouring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit -V Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

References:-

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", McGraw Hill, 2005.
3. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
4. Berman, Paul," Algorithms", Cengage Learning.
5. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" ,Pearson Education, 2008.
6. Jon Kleinberg, Eva Tardos, "Algorithm Design" ,Pearson Education.

COMPUTER BASED OPTIMIZATION TECHNIQUES (MCA-314)

Course Outcomes

1. Formulate and solve problems as networks and graphs.
2. Develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transport problems.
3. Solve the problems using special solution algorithms

UNIT I-PRELIMINARIES:- Inventory Models and Replacement problems: Inventory models – various costs-deterministic inventory models, Single period inventory model with shortest cost, stochastic models, Application of inventory models, Economic lot sizes-price breaks, and Replacement problems-capital equipment-discounting costs-replacement in anticipation of failure-group replacement-stochastic nature underlying the failure phenomenon.

UNIT II-LINEAR PROGRAMMING PROBLEMS (LPP):- Definition of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method, and Artificial Variable Method, Two Phase Method, Charnes' Big-M Method, Sensitivity Analysis, Revised Simplex Method, Duality, Dual Simplex Method

UNIT III-INTEGER LINEAR PROGRAMMING PROBLEMS: - Integer Linear Programming Problems, Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method, 0-1 integer linear programming problem. Transportation Problems: Introduction to Transportation Model, Matrix Form of TP, Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution. Assignment Problems: Definition, Hungarian Method for AP.

UNIT IV-INTRODUCTION TO NLP:- Definition of NLP, Convex Programming Problems, Quadratic Programming Problems, Wolfe's Method for Quadratic Programming, Kuhn-Tucker Conditions, Geometrical Interpretation of KT-Conditions, KT-Points etc. Dynamic Programming: Bellman's Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem

UNIT V-QUEUING THEORY:-Introduction to Queues, Basic Elements of Queuing Models, Queue Disciplines, Memoryless Distribution, Role of Exponential and Poisson Distributions, Markovian Process, Erlang Distribution, Symbols and Notations, Distribution Of Arrivals, Distribution of Service Times, Definition of Steady and Transient State, Poisson Queues.

References:-

1. Hadley, G., "Linear Programming, and Massachusetts", Addison-Wesley
2. Taha, H.A, "Operations Research – An Introduction", Macmillian
3. Hiller, F.S., G.J. Lieberman, " Introduction to Operations Research", Holden-Day
4. Harvey M. Wagner, "Principles of Operations R search with e Applications to Managerial Decisions", Prentice Hall of India Pvt. Ltd.
5. Swarup K etal, "Operation Research", S. Chand

Cyber Security (MCA-315)

Course Outcomes

1. Follow a structured model in Security Systems Development Life Cycle (SDLC)
2. Detect attack methodology and combat hackers from intrusion or other suspicious attempts at connection to gain unauthorized access to a computer and its resources
3. Protect data and respond to threats that occur over the Internet
4. Design and implement risk analysis, security policies, and damage assessment
5. Plan, implement and audit operating systems' security in a networked, multi-platform and cross platform environment
6. Provide contingency operations that include administrative planning process for incident response, disaster recovery, and business continuity planning within information security

UNIT I

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

UNIT II

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control.

Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce- Electronic Payment System, e-Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.

UNIT III

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.

UNIT IV

Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement of the Policies.

Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

UNIT V

References:-

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, “Analysing Computer Security”, Pearson

Education India.
2. V.K. Pachghare, “Cryptography and information Security”, PHI Learning Private Limited, Delhi India.
3. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,“Introduction to Information Security and Cyber Law” Willey Dreamtech Press.
4. Schou, Shoemaker, “Information Assurance for the Enterprise”, Tata McGraw Hill.
5. CHANDER, HARISH, “Cyber Laws And It Protection”, PHI Learning Private Limited, Delhi, India

(Qualifying Course-1)

Introduction to Programming and Computer Organization (MCA-316)

Course Outcomes

1. Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.
2. Demonstrate an understanding of computer programming language concepts.
3. Develop confidence for self education and ability for life-long learning needed for Computer language.
4. Understand the theory and architecture of central processing unit.
5. Analyze some of the design issues in terms of speed, technology, cost, performance.
6. Design a simple CPU with applying the theory concepts.
7. Use appropriate tools to design verify and test the CPU architecture

UNIT-I

Natural Numbers: - Well Ordering Principle, Principle of Mathematical Induction.
Set Theory: - Ordered Sets, Relations, Equivalence Relations and Partitions, Modular Arithmetic.
Functions: - Functions, Composition of Functions, one-one, onto and Inverse of a function

UNIT-II

Data representation: - signed and unsigned number representation, fixed and floating point representations.
Basic Electronics: - Digital Logic Boolean algebra. Combinational and sequential circuits, Gate Minimization.
Computers Fundamentals:- Functional Units-Processor, Memory, Input/ output, Register Organized Computer, Buses- Organization, Hierarchical Bus, Types, Control, Timing, Width, Clock.

UNIT-III

CPU Organization: Fundamentals, Instruction Set formats, modes, types, Fixed and Floating point arithmetic.
Architecture Concepts: - Instruction set architecture of a CPU-register, instruction execution cycle.
Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

UNIT-IV

Introduction to programming: - Problem solving and expression of solution through flow chart and algorithm.
Parts of a program: - primitive data types, variables, operators and their precedence, expressions, input/output, conditionals and branching, looping statements.
Stored Programs: Procedures, Functions, Storage classes-scope and life time, recursion.

References:-

1. Discrete Mathematics and Its Applications: Kenneth H. Rosen
2. Digital Logic and Computer Design: M. Morris Mano
3. Fundamentals of Programming Languages: Dipali P. Bavishankar, Technical Publications

Operating Systems Lab (MCA-351)

Course Outcomes

1. Know how data is transmitted and checking of errors.,
2. Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF, Priority, MultilevelQueuing)
3. Simulation of Banker's Algorithm for Deadlock Avoidance, Prevention
4. Program for FIFO, LRU, and OPTIMAL page replacement algorithm
5. The students, after the completion of the course, are expected to
6. Compare the performance of various CPU Scheduling Algorithms.

Lab Assignments

1. To implement CPU Scheduling Algorithms
    - FCFS
    - SJF
    - SRTF
    - PRIORITY
    - ROUND ROBIN
2. Simulate all Page Replacement Algorithms
    - FIFO
    - LRU
3. Simulate Paging Technique of Memory Management

Design & Analysis of Algorithms Lab (MCA-352)
Course Outcomes

1. Design algorithms using divide and conquer, greedy and dynamic programming.
2. Execute sorting algorithms such as sorting, graph related and combinatorial algorithm in a high level language.
3. Analyze the performance of merge sort and quick sort algorithms using divide and conquer technique.
4. Apply the dynamic programming technique to solve real world problems such as knapsack and TSP.

Lab Assignments

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Study of NP-Complete theory.
8. Study of Cook's theorem.
9. Study of sorting network.

Database Management Systems (MCA-411)

Course Outcomes

1. Defines the basics of the relational data model.
2. Lists the database design process steps.
3. Will be able to design and implement properly structured databases that match the standards based under realistic constraints and conditions.
4. Develops an Entity-Relationship model based on user requirements.

UNIT I–INTRODUCTION:-The Evolution of Database Systems- Overview of a Database Management System-Outline of Database-System Studies-The Entity- RELATIONSHIP DATA MODEL: Elements of the E/R Model-Design Principles-The Modelling of Constraints-Weak Entity Sets

UNIT II - THE RELATIONAL DATA MODEL & ALGEBRA: - Basics of the Relational Model-From E/R Diagrams to Relational Designs Converting Subclass Structures to Relations Functional Dependencies-Rules About Functional Dependencies-Design of Relational Database Schemas - Multivalued Dependencies. RELATIONAL ALGEBRA: Relational Operations-Extended Operators of Relational Algebra- Constraints on Relations

UNIT III-SQL:-Simple Queries in SQL-Sub queries-Full-Relation Operations-Database Modifications-Defining a Relation Schema-View Definitions- Constraints and Triggers: Keys and Foreign Keys-Constraints on Attributes and Tuples Modification of Constraints-Schema-Level Constraints and Triggers -Java Database Connectivity- Security and User Authorization in SQL

UNIT IV - INDEX STRUCTURE, QUERY PROCESSING:-Index Structures: Indexes on Sequential Files-Secondary Indexes-B-Trees-Hash Tables-Bitmap Indexes. QUERY EXECUTION: Physical-Query-Plan Operators-One-Pass, two-pass & index based Algorithms, Buffer Management, Parallel Algorithms-Estimating the Cost of Operations-Cost-Based Plan Selection -Order for Joins-Physical- QueryPlan

UNIT V - FAILURE RECOVERY AND CONCURRENCY CONTROL:-Issues and Models for Resilient Operation -Undo/Redo Logging-Protecting against Media Failures

CONCURRENCY CONTROL: Serial and Serializable Schedules-Conflict Serializability-Enforcing Serializability by Locks-Locking Systems with Several Lock Modes-Concurrency Control by Timestamps, validation.

TRANSACTION MANAGEMENT: Serializability and Recoverability-View Serializability-Resolving Deadlocks-Distributed Databases: Commit and Lock

References:-

1. Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom, “Database Systems: The Complete Book”, Pearson Education, Second Edition, 2008.
2. Silberschatz, H. Korth and Sudarshan S., “Database System Concepts”, 6th Edition, McGraw-Hill International, 2010.
3. Elmasri R. and Shamakant B.Navathe, “Fundamentals of Database Systems”, 6th Edition, AddisionWesley , 2011.

COMPUTER NETWORK (MCA-412)

Course Outcomes

1. Describe communication models TCP/IP, ISO-OSI model, network topologies along with communicating devices and connecting media.
2. Apply knowledge of error detection, correction and learn concepts of flow control along with error control.
3. Classify various IP addressing techniques, subnetting along with network routing protocols and algorithms.
4. Understand various transport layer protocols and their design considerations along with congestion control to maintain Quality of Service.
5. Understand applications-layer protocols and elementary standards of cryptography and network security.

UNIT I-DATA COMMUNICATIONS :-

Data communication Components – Data representation and Data flow – Networks – Types of Connections – Topologies – Protocols and Standards – OSI model – Transmission Media – LAN –Wired LANs, Wireless LANs, Connecting LANs, Virtual LANs.

UNIT II – DATA LINK LAYER:-

Error Detection and Error Correction – Introduction–Block coding–Hamming Distance – CRC–Flow Control and Error control – Stop and Wait – Go back – N ARQ – Selective Repeat ARQ – Sliding Window – Piggybacking – Random Access – CSMA/CD,CDMA/CA.

UNIT III – NETWORK LAYER:-

Switching–Logical addressing – IPV4 – IPV6–Address mapping–ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

UNIT IV – TRANSPORT LAYER:-

Process to Process Delivery – User Datagram Protocol – Transmission Control Protocol – SCTP – Congestion Control with Examples.

UNIT V – APPLICATION LAYER:-

Domain Name Space – DDNS – TELNET – EMAIL – File transfer WWW – HTTP – SNMP – Cryptography – Basic concepts.

References:-

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw– Hill, Fourth Edition, 2011.
2. Larry L.Peterson, Peter S. Davie, “Computer Networks”, Elsevier, Fifth Edition, 2012.
3. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.
4. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

Artificial Intelligence (MCA-413)

Course Outcomes

1. Define the meaning of intelligence and study various intelligent agents.
2. Understand, analyze and apply AI searching algorithms in different problem domains.
3. Study and analyze various models for knowledge representation.
4. Understand the basic concepts of machine learning to analyze and implement widely used learning methods and algorithms.
5. Understand the concept of pattern
6. Classification and clustering techniques

Unit-I INTRODUCTION:- Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

UNIT-II INTRODUCTION TO SEARCH:- Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

UNIT-III KNOWLEDGE REPRESENTATION & REASONING:- Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

UNIT-IV MACHINE LEARNING:- Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

UNIT-V PATTERN RECOGNITION:- Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbour (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

References:-

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India

Compiler Design (MCA-414)

Course Outcomes

1. Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc.
2. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers.
3. Understand the parser and its types, Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.
4. Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.
5. Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.
6. Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization

UNIT I - COMPILERS: GRAMMARS & AUTOMATA:- Languages – Grammars – Types of grammars – Context free grammar - regular expression - Recognizing of patterns - finite automation (deterministic & non deterministic) Conversion of NDFA to DFA - Conversion of regular expression of NDFA – Thompson's construction- minimization of NDFA –Derivation - parse tree – ambiguity

UNIT II- LEXICAL ANALYSIS:- Lexical analysis- handles - token specification - design of lexical analysis (LEX) - Automatic generation of lexical analyzer - input buffering - A language for specifying lexical analyzers - implementation of lexical analyzer

UNIT III - SYNTAX ANALYSIS – PARSING:- Definition - role of parsers - top down parsing - bottom-up parsing - Left recursion - left factoring - Handle pruning , Shift reduce parsing - operator precedence parsing – FIRST- FOLLOW- LEADING- TRAILING- Predictive parsing - recursive descent parsing. LR parsing – LR (0) items - SLR parsing – Canonical LR - LALR parsing - generation of LALR - Ambiguous grammars - error recovery

UNIT IV - SYNTAX DIRECTED TRANSLATION:- Intermediate Languages - prefix - postfix - Quadruple - triple - indirect triples – syntax tree- Evaluation of expression - three-address code- Synthesized attributes – Inherited attributes – Conversion of Assignment statements- Boolean expressions –Backpatching - Declaration - CASE statements.

UNIT V -CODE OPTIMIZATION:- Local optimization- Loop Optimization techniques – DAG – Dominators- Flow graphs – Storage allocations- Peephole optimization – Issues in Code Generation.

References:-

1. Alfred V Aho , Jeffery D Ullman , Ravi Sethi, " Compilers , Principles techniques and tools ", Pearson Education 2011
2. Raghavan V., "Principles of Compiler Design", Tata McGraw Hill Education Pvt. Ltd., 2010.
3. David Galles, "Modern Compiler Design", Pearson Education, Reprint 2012.
4. Dasaradh Ramaiah. K., "Introduction to Automata and Compiler Design", PHI, 2011

RCA- E15 MOBILE COMPUTING (MCA-415)

Course Outcomes

1. Study and aware fundamentals of mobile computing.
2. Study and analyze wireless networking protocols, applications and environment.
3. Understand various data management issues in mobile computing.
4. Analyze different type of security issues in mobile computing environment.\
5. Study, analyze, and evaluate various routing protocols used in mobile computing

UNIT – I

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

UNIT - II

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

UNIT – III

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

UNIT - IV

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

UNIT – V

Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

References:-

1. J. Schiller, Mobile Communications, Addison Wesley.
2. A. Mehrotra , GSM System Engineering.
3. M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House.
4. Charles Perkins, Mobile IP, Addison Wesley.
5. Charles Perkins, Ad hoc Networks, Addison Wesley.

(Qualifying Course-2)

RCA-A02 Fundamental of Data Structure, Numerical and Computational Theory

(MCA-416)

Course Outcomes

1. Apply the knowledge of data structure concepts and the various algorithms while designing and developing software and some hardware.
2. Analyze and prove the equivalence of languages and illustrate how to design finite state machines and convert regular expressions to FSA.

UNIT-I

Arrays:- Array Definition, Representation and Analysis, Single and Multidimensional Arrays, Searching: Sequential search, binary search, comparison and analysis, Sorting: Insertion Sort, Bubble sort, Quick Sort, Two Way Merge Sort, Heap Sort.
Linked list:- Representation and Implementation of Singly Linked Lists, Two –way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists algorithm (Beginning, end and middle).

UNIT-II
Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm.
Curve fitting and Approximation: Method of least squares, fitting of straight lines, polynomials, exponential curves.
Regression analysis: Linear and Non-linear regression, multiple regressions

UNIT-III
Time series Analysis and Hypothesis Testing: forecasting models and methods. Test of significance, Chi-square test, t-test, F-Test
Finite State Machines (FSM): Introduction, Deterministic (DFA), Nondeterministic (NFA). Conversions and Equivalence: Equivalence between NFA with and without ε transitions. NFA to DFA conversion. Minimization of FSM.

UNIT-IV
Regular Expression & Regular Set: Definition, Properties, Pumping Lemma, and Decision problem for regular language.
Grammar: Introduction, Definition, Different types, Derivation Tree, Different Normal Forms, Ambiguous Grammar and its implications, Chomsky hierarchy. Different Classes of Languages.
Pushdown Automata (PDA): Definition, PDA and CFL (Context-Free Language), Acceptance of Strings.
Turing Machine: Introduction, Turing Machine Model.

References:-

1. S. Lipschutz, “Data Structures”, Mc-Graw Hill International Editions.
2. K.L.P. Mishra, N. Chandrasekaran, “Theory of Computer Science”, PHI.
3. Rajendra Kumar, “Theory of Automata, Languages and Computation”, Mc-Graw Hill.
4. M. Goyal, “Computer-Based Numerical & Statistical Techniques”, Infinity Science Press.

MCA-451 Mini Project Lab

Course Outcomes

1. Learn to define objective and motivation of your mini - project Work in
2. reference of your Project Title.
3. Learn to explain Hardware and Software technologies used in your project work.
4. Learn to present and explain DFDs of Project (DFD-0, DFD-1, DFD-2 …).
5. Learn to present and explain ER Diagram of Project.
6. Learn to explain Front-End or User Interfaces (One by One) with Purpose and working.
7. Learn to explain Back-End or Database Tables used in your project.
8. Learn to explain Usability or Ultimate output of your project work.
9. Learn to explain Drawback or limitations of your project work.
10. Learn to explain how this work can be carried out in future for improvement.

MCA-452 Database Management Systems Lab

Course Outcomes

1. Implement Basic DDL, DML and DCL commands
2. Understand Data selection and operators used in queries and restrict data retrieval and control the display order
3. Write sub queries and understand their purpose
4. Use Aggregate and group functions to summarize data
5. Join multiple tables using different types of joins
6. Understand the PL/SQL architecture and write PL/SQL
7. code for procedures, triggers, cursors, exception handling etc.
8. Use typical data definitions and manipulation commands.
9. Design applications to test Nested and Join Queries.
10. Implement simple applications that use Views.
11. Implement applications that require a Front-end Tool.
12. Critically analyze the use of Tables, Views, Functions and Procedures.

Lab Assignments

1. Installing oracle.
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE/MYSQL:
    a) Writing basic SQL SELECT statements.
    b) Restricting and sorting data.
    c) Displaying data from multiple tables.
    d) Aggregating data using group function.
    e) Manipulating data.
    f) Creating and managing tables.
4. Normalization in ORACLE.
5. Creating cursor in oracle.
6. Creating procedure and functions in oracle.
7. Creating packages and triggers in oracle.

Design & Development of Applications

Unit I - INTRODUCTION:

Introduction to Android, Activities and Intents, Testing and Debugging, and Backwards Compatibility.

Unit 2- User Interface:

User Interaction and intuitive navigation, Delightful User Experience, Testing your UI

Unit 3- Background Tasks:

Connect to the Internet, Notifications and Background Tasks, Triggering, Scheduling and Optimizing Background Tasks

Unit 4- Data Saving, Retrieving, Loading:

Storing Data in your app, Storing Data using SQLite, Sharing Data: Content Resolvers and Content Providers, Loading Data using Loaders

Unit 5- Polish and Publish:

Permissions and Libraries, Security best practices, Widgets, Publishing your App, Multiple Form Factors, Google Services, Firebase, Google Cloud Messaging ,Making your app data searchable

References:-

1. Trish Cornez & Richard Cornez “Android Programming Concepts”, Jones & Bartlett Learning.

CLIENT SERVER COMPUTING

UNIT I CLIENT/SERVER COMPUTING:- DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.

UNIT II COMPONENTS OF CLIENT/SERVER APPLICATION:- The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA). The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.

UNIT III CLIENT/SERVER NETWORK:- connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.

UNIT IV DATA STORAGE:- magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards. Network protection devices, Power Protection Devices, UPS, Surge protectors. Client Server Systems Development: Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Disk, Remote Systems Management Security, LAN and Network Management issues.

UNIT V CLIENT/SERVER SYSTEM DEVELOPMENT:- Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training. The future of client server Computing Enabling Technologies, The transformational system.

References:

1. Patrick Smith & Steave Guengerich, “Client / Server Computing”, PHI
2. Dawna Travis Dewire, “Client/Server Computing”, TMH
3. Majumdar & Bhattacharya, “Database management System”, TMH
4. Korth, Silberchatz, Sudarshan, “Database Concepts”, McGraw Hill
5. Elmasri, Navathe, S.B, “Fundamentals of Data Base System”, Addison Wesley

RCA-E13 Data warehousing and Mining

UNIT I DATA WAREHOUSING:- Overview, Definition, Data Warehousing Components, 8 Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

UNIT II DATA WAREHOUSE PROCESS AND TECHNOLOGY:- Warehousing Strategy, Warehouse 8 /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design, Data Extraction, Cleanup & Transformation Tools, Warehouse Metadata

UNIT III - DATA MINING:- Overview, Definition & Functionalities, Data 8 Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Red

UNIT IV - DATA MINING TECHNIQUES:- Classification: Definition, Data Generalization, Analytical Characterization, 8 Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction, Large Itemsets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.

UNIT V - DATA VISUALIZATION AND OVERALL PERSPECTIVE:- Aggregation, Historical 8 information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.

References:-

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “ Data Warehousing: Architecture and Implementation”, Pearson
3. Margaret H. Dunham, S. Sridhar, ”Data Mining: Introductory and Advanced Topics” Pearson Education
4. Arun K. Pujari, “Data Mining Techniques” Universities Press
5. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education

RCA- E14 Advanced Computer Architecture

UNIT - I: INTRODUCTION:- Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Cancelling the Threads.

UNIT – II: PIPELINING AND MEMORY HIERARCHY:- Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.

UNIT – III: THREAD AND PROCESS LEVEL PARALLEL ARCHITECTURE:- Introduction to
MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures.

UNIT – IV: PARALLEL ALGORITHMS:- PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quicksort, Hyper Quicksort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies.

UNIT –V: DEVELOPING PARALLEL COMPUTING APPLICATIONS:- OpenMP Implementation in 'C': Execution Model, Memory Model; Directives: Conditional Compilation, Internal Control Variables, Parallel Construct, Work Sharing Constructs, Combined Parallel Work-Sharing Constructs, Master and Synchronization Constructs; Run-Time Library Routines: Execution Environment Routines, Lock Routines, Timing Routines; Simple Examples in 'C'. Basics of MPI.

References:-

1. Kai Hwang," Advance Computer Architecture", TMH
2. Matthew, "Beginning Linux Programming", SPD/WROX
3. Hennessy and Patterson," Computer Architecture: A Quantitative Approach", Elsevier
4. Dezso and Sima, "Advanced Computer Architecture", Pearson
5. Quinn, "Parallel Computing: Theory & Practice", TMH 6. Quinn, "Parallel Programming in C with MPI and Open MP", TMH

CH CHARAN SINGH UNIVERISTY

MEERUT

EVALUATION SCHEME &SYLLABUS

Third Year

(Master of Computer Applications)

On

Choice Based Credit System

(Effective from the Session: 2018-19)

Master of Computer

Applications 2018-19

FIFTH SEMESTER

Sl. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Sessional			ESE	Total	
						CT	TA	Total			
1.	MCA-511	Computer Graphics & Animation	3	1	0	20	10	30	70	100	04
2.	MCA-512	Software Engineering	3	1	0	20	10	30	70	100	04
3.	MCA- 513	Software Testing Elective – II	3	1	0	20	10	30	70	100	04
4.	MCA- 514	Cloud computing Elective-III	3	1	0	20	10	30	70	100	04
5.	MCA- 515	Big Data Elective – IV	3	1	0	20	10	30	70	100	03
Practical											
7.	MCA-551	Computer Graphics & Animation Lab	0	0	6	30	20	50	50	100	03
8.	MCA-552	Project Based on Software Engineering	0	0	3	30	20	50	50	100	02
		Total	15	5	9					700	24

SIXTH SEMESTER

Sl. No.	Subject Code	Subject Name	Period			Evaluation Scheme					Credit
			L	T	P	Session Exams			ESE	Total	
						CT	TA	Total			
1	MCA-611	Colloquium	0	0	8	-	100	100	-	100	04
2	MCA-612	Industrial Project	0	0	40	-	250	250	350	600	20
		Total	0	0	48					700	24

MCA V Semester Electives

Elective : II

1. RCA-E21 : Cryptography and Network Security
2. RCA-E22 : Natural language Processing
3. RCA-E23 : Human Computer Interaction
4. RCA-E24 : Software Testing
5. RCA-E25 : Modern Application Development

Elective: III

1. RCA-E31 : Cloud Computing
2. RCA-E32 : Soft Computing
3. RCA-E33 : Information Storage Management
4. RCA-E34 : Digital Image Processing
5. RCA-E35 : Distributed Systems

Elective : IV

1. RCA-E41 : Distributed Database Systems
2. RCA-E42 : Simulation and Modeling
3. RCA-E43 : Real Time Systems
4. RCA-E44 : Pattern Recognition
5. RCA-E45 : Big Data

Computer Graphics and Animation
(MCA-511)

Course Outcomes

1. Understand the basics of computer graphics,various graphics systems and applications of computer graphics.
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.
4. Extract scene with different clipping methods and its transformation to graphics display device.
5. Explore projections and visible surface detection techniquesfordisplayof3D scene on 2D screen.
6. Render projected objects to naturalize the scene in 2 D view and use of illumination models for this.

UNIT-I: **(8)**

Introduction to Computer Graphics: What is Computer Graphics, Computer Graphics Applications, Computer Graphics Hardware and software, two-dimensional Graphics Primitives: Points and Lines, Line drawing algorithms: DDA, Bresenham's Circle drawing algorithms: Using polar coordinates, Bresenham's circle drawing, mid-point circle drawing algorithm; Filled area algorithms: Scan line: Polygon filling algorithm, boundary filled algorithm.

UNIT-II: (8)

Two/Three-Dimensional Viewing: The 2-D viewing pipeline, windows, viewports, window to view port mapping; Clipping: point, clipping line (algorithms): - 4-bit code algorithm, Sutherland-Cohen algorithm, parametric line clipping algorithm (Cyrus Beck). Polygon clipping algorithm: Sutherland-Hodgeman polygon clipping algorithm. Two dimensional transformations: transformations, translation, scaling, rotation, reflection, composite transformation. Three dimensional transformations: Three-dimensional graphics concept, Matrix representation of 3 D Transformations, Composition of 3-D transformation.

UNIT-III: (8)

Viewing in 3D: Projections, types of projections, mathematics of planner geometric projections, coordinate systems. Hidden surface removal: Introduction to hidden surface removal. Z- buffer algorithm, scanline algorithm, area sub-division algorithm.

UNIT-IV: (8)

Representing Curves and Surfaces: Parametric representation of curves: Bezier curves, B-Spline curves. Parametric representation of surfaces; Interpolation method.

Illumination, shading, image manipulation: Illumination models, shading models for polygons, shadows, transparency. What is an image? Filtering, image processing, geometric transformation of images.

UNIT- V: (8)

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

REFRENCES:

1. Procedural Elements for Computer Graphics – David F. Rogers, 2001, T.M.H Second Edition.
2. Fundamentals of 3Dimensional Computer Graphics by Alan Watt, 1999, Addision Wesley.
3. Computer Graphics: Secrets and Solutions by Corrign John, BPB
4. M.C. Trivedi, NN Jani, Computer Graphics, Jaico Publications

5. Rishabh Anand, Computer Graphics- A practical Approach, Khanna Publishing House
6. Graphics, GUI, Games & Multimedia Projects in C by Pilania&Mahendra, Standard Publ.
7. Computer Graphics Secrets and solutions by Corrign John, 1994, BPV
8. Principles of Multimedia by Ranjan Parekh, McGrawHill Education
9. Computer Graphics Principles and Practices second edition by James D. Foley, Andeies van Dam, StevanK. Feiner and Johb F. Hughes, 2000, Addision Wesley.
10. Computer Graphics by Donald Hearn and M.Pauline Baker, 2nd Edition, 1999, PHI
11. Computer graphics, Multimedia and Animation by Malay. K.Pakhira, PHI, 2nd Edition, 2010

Software Engineering (MCA-512)

Course Outcomes

1. Explain various software characteristics and analyze different software Development Models.
2. Demonstrate the contents of a SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards.
3. Compare and contrast various methods for software design.
4. Formulate testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing.
5. Manage software development process independently as well as in teams and make use of various software management tools for development, maintenance and analysis.

UNIT-I: **(8)**

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT-II: (8)

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

Software Quality Assurance :(SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

UNIT-III:

Software Design: **(8)**

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-IV: (8)

Software Testing: Testing Objectives, UNIT Testing, Integration Testing, 8 Acceptance Testing, Regression Testing, Testing for functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

UNIT-V: (8)

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource allocation Models, Software Risk Analysis and Management.

REFRENCES:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.

2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Deepak Jain," Software Engineering: Principles and Practices",Oxford University Press.
6. Munesh C. Trivedi, Software Engineering, Khanna Publishing House
7. N.S. Gill, Software Engineering, Khanna Publishing House

RCA-E24: Software Testing (MCA-513)

Course Outcomes

1. Apply various software testing methods.
2. Prepare test cases for different types and levels of testing.
3. Prepare test plan for an application.
4. Identify bugs to create defect report of given application.
5. Test software for performance measures using automated testing tools.

UNIT-I **(8)**

Review of Software Engineering: Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing All Paths. Verification: Verification methods, SRS verification, Source code reviews, User documentation verification, and Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.

UNIT–II (8)

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique. Structural Testing: Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, Cyclomatic Complexity, Data Flow Testing, Mutation Testing.

UNIT-III (8)

Regression Testing: What is Regression Testing? Regression Test cases selection, reducing the number of test cases, Code coverage prioritization technique. Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis.

UNIT-IV (8)

Software Testing Activities: Levels of Testing, Debugging, Testing techniques and their Applicability, Exploratory Testing Automated Test Data Generation: Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.

UNIT-V 98)

Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing. Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing.

REFRENCES:

1. Yogesh Singh, "Software Testing", Cambridge University Press, New York, 2012
2. K..K. Aggarwal &Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.

4. Marc Roper, “Software Testing”, McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, “Software System Testing and Quality Assurance”, Van Nostrand Reinhold, New York, 1984.

RCAE-31 Cloud Computing (MCA-514)

Course Outcomes

1. Understand the concepts of Cloud Computing, key technologies, Strengths and limitations of cloud computing.
2. Develop the ability to understand and use the architecture to compute and storage cloud, service and models.
3. Understand the application in cloud computing.
4. Learn the key and enabling technologies that help in the development of cloud.
5. Explain the core issues of cloud computing such as resource management and security.

UNIT-I **(8)**

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

UNIT-II (8)

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

UNIT-III (8)

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

UNIT-IV (8)

Virtualization for Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System Vim, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - supervisors – Xen, KVM, VMware, Virtual Box, Hyper-V.

UNIT-V (8)

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

REFRENCES:

1. David E.Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing : A Practical Approach, Tata McGraw-Hill 2010.
4. Haley Beard, Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
5. G.J.Popek, R.P. Goldberg, Formal requirements for virtualizable third generation Architectures, Communications of the ACM, No.7 Vol.17, July 1974
6. John Rittinghouse & James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.
7. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Que Publishing, August 2008.
8. James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.

RCA-E45 Big Data (MCA-515)

Course Outcomes

1. To Understand the Big Data challenges & opportunities and its applications area.
2. Understand data to big data generation, types and development.
3. Gain conceptual understanding of NOSQL Database.
4. Understanding of concepts of map and reduce and functional programming.
5. Gain conceptual understanding of Hadoop Distributed File System.

UNIT-I **(8)**

Understanding big data: What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data ,credit risk management, big data and algorithmic trading, big data and HealthCare, big data in medicine, advertising and big data, big data technologies, Introduction to Hadoop, open source technologies, cloud and big data mobile business intelligence, Crowd sourcing Analytics ,inter and trans firewall analytics

UNIT-II (8)

NoSQL data management: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases ,materialized views, distribution models ,sharing , masters slave replication , peer-peer replication , sharing and replication , consistency , relaxing consistency , version stamps , map reduce , partitioning and combining , composing map-reduce calculations

UNIT-III (8)

Basics of Hadoop; Data format, analyzing data with Hadoop, scaling out , Hadoop streaming , Hadoop pipes , design of Hadoop distributed file system (HDFS) , HDFS concepts , Java interface , data flow ,Hadoop I/O , data integrity , oppression ,serialization , Avro file-based data structures

UNIT-IV (8)

Map reduce applications; Map Reduce workflows, UNIT tests with MR UNIT, test data and local tests – anatomy of Map Reduce job run , classic Map-reduce , YARN , failures in classic Map-reduce and YARN , job scheduling , shuffle and sort , task execution , MapReduce types , input formats , output formats

UNIT-V (8)

Hadoop related tools; HBase, data model and implementations, Hbase clients, Hbase examples – praxis. Cassandra, cassandra data model, cassandra examples ,cassandra clients , Hadoop integration.Pig , Grunt , pig data model , Pig Latin , developing and testing PigLatin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation – HiveQL queries

REFRENCES:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of
3. Polyglot Persistence", Addison-Wesley Professional, 2012.
4. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
7. V.K. Jain, Big Data & Hadoop, Khanna Publishing House
5. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
6. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
8. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
9. Alan Gates, "Programming Pig", O'Reilley, 2011.

Computer Graphics and Animation Lab (MCA-551)

Course Outcomes

1. Programming User-interface issues
2. Concepts of 2D & 3D object representation
3. Implementation of various scan & clipping algorithms 2D modeling
4. Implementation of illumination model for rendering 3D objects Visibility detection & 3D viewing
5. Implementation of a project based on learned concepts

LIST OF EXPERINETNS

(1) Digital differential Analyzer
(2) Line Drawing Algorithms
(3) Mid-point Circle Generation Algorithm
(4) Creating two-Dimensional Objects
(5) Two-dimensional Transformation
(6) Picture Coloring
(7) Three-Dimensional transformation
(8) Simple Animation using Transformation
(9) Key-Frame Animation
(10) Design Animation using FLASH

Note: Lab can be conducted in "C" language / Virtual Labs /Open GL.

Project Based on Software Engineering (MCA-552)

Course Outcomes

1. To prepare SRS document, design document, test, UML, DFD, ER diagrams
2. cases and software configuration management and risk management related document.
3. Develop function oriented and object oriented software design using tools like rational rose.
4. Able to perform unit testing and integration testing.
5. Apply various white box and black box testing techniques

Students are expected to analyse the problem Statement/ case study and design a solution applying software engineering principles.

Note: Lab can be conducted using Virtual Labs provided by IIT Khargpur/Bombay.

Colloquium (MCA-611)

Course Outcomes

1. Carry out a substantial research-based project
2. Demonstrate capacity to improve student achievement, engagement and retention
3. Demonstrate capacity to lead and manage change through collaboration with others
4. Demonstrate an understanding of the ethical issues associated with practitioner research
5. Analyze data and synthesize research findings
6. Report research findings in written and verbal forms
7. Use research findings to advance education theory and practice.
8. Learn how to create unique, plagiarism free content and how to Publish work.

Industrial Project (MCA-612)

Course Outcomes

1. Learn to work in real practical software and industrial development environment where outer world find and access software services for their particular domain in various technologies.
2. Brush-up their knowledge complete in interested areas and software and web technologies.
3. Demonstrate a sound technical knowledge of their selected project topic.
4. Undertake problem identification, formulation and solution.
5. Design engineering solutions to complex problems utilising a systems approach.
6. Conduct an engineering project.
7. Communicate with engineers and the community at large in written an oral forms.
8. Demonstrate the knowledge, skills and attitudes of a professional engineer.
9. Learn to work in a team to accomplish the desired task in time bound and quality frame form.
10. Learn how to create report of project and presentation with professional required skill set.
11. Student learn Presentation Skills, Discussion Skills, Listening Skills, Argumentative Skills, Critical Thinking, Questioning, Interdisciplinary Inquiry, Engaging with Big Questions, Studying Major Works

RCA-E21: Cryptography and Network Security

UNIT-I **(8)**

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 (8)

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.

UNIT-III (8)

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 (8)

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

UNIT-V (8)

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.

REFRENCES

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security, Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. V.K. Jain, Cryptography and Network Security, Khanna Publishing House
6. Bernard Menezes," Network Security and Cryptography", Cengage Learning. 6. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill

RCA-E22 : Natural language Processing

UNIT-I **(8)**

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

UNIT-II (8)

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

UNIT-III (8)

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

UNIT-IV (8)

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

UNIT-V (8)

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

REFRENCES:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

RCA-E23: Human Computer Interaction

UNIT-1 **(8)**

Introduction: Importance of user Interface – definition, importance of 8 good designs. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface

UNIT-II (8)

Design process – Human interaction with computers, importance of 8 human characteristics human consideration, Human interaction speeds, understanding business junctions.

UNIT-III (8)

Screen Designing : Design goals – Screen planning and purpose, 8 organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT-IV (8)

Windows: New and Navigation schemes selection of window, 8 selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT-V (8)

Software tools: Specification methods, interface – Building Tools. 8 Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

REFRENCES;

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in Human Computer Interaction, Wiley, 2010.
3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0- 321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

RCA-E25: Modern Application Development

UNIT-I **(8)**

Introduction: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT-II (8)

Basic design: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT-III 98)

Advanced design: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT-IV (8)

Technology in android: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wi-fi – Integration with social media applications.

UNIT-V (8)

TECHNOLOGY II – IOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Swift: Introduction to Swift features of swift.

REFRENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS
6 Development: Exploring the iOS SDK”, Apress, 2013.

RCA-E32 Soft Computing

UNIT-I **(8)**

Artificial neural networks: Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self organizing networks - Hopfield network.

UNIT-II (8)

Fuzzy systems: Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition – Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

UNIT-III (8)

Neuro - fuzzy modeling: Adaptive networks based Fuzzy interface systems - Classification and Regression Trees – Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls – Simulated annealing – Evolutionary computation.

UNIT-IV (8)

Genetic algorithms: Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction – Rank method - Rank space method.

UNIT-V (8)

Application of soft computing: Optimization of traveling salesman problem using Genetic Algorithm, Genetic algorithm-based Internet Search Techniques, Soft computing-based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques.

REFRENCES:

1. Sivanandam, Deepa, “ Principles of Soft Computing”, Wiley
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
6. Wang, “Fuzzy Logic”, Springer

RCA-E33 Information Storage Management

UNIT-I **(8)**

Introduction to Storage Technology: Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.

UNIT-II (8)

Storage Systems Architecture; Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.

UNIT-III (8);

Introduction to Networked Storage: JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options,
connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (SCSI, FCIP, FCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances.

UNIT-IV (8)

Introduction to Information Availability: Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques.

UNIT-V (8)

Managing & Monitoring: Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.

REFRENCES:

1. Information Storage and Management Storing, Managing, and Protecting Digital Information, by EMC, Hopkinton and Massachusetts, Wiley, **ISBN:** 97881265214
2. Information storage and management: storing, managing, and protecting digital information by Wiley Pub G Somasundaram, Alok Shrivastava
3. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002
4. Robert Spalding, “Storage Networks: The Complete Reference”, Tata McGraw Hill, Osborne, 2003.
5. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne. 2001.

RCA-E34 Digital Image Processing

UNIT-I **(8)**

Introduction and Fundamentals: Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain: Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Low pass Filters; Sharpening Frequency Domain Filters – Gaussian High pass Filters; Homomorphic Filtering.

UNIT-II (8)

Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III (8)

Image Restoration: A Model of Restoration Process, Noise Models, Restoration in the presence of Noise Only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Band pass Filters; Minimum Mean-square Error Restoration.

UNIT-IV (8)

Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V (8)

Registration:

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level thareholding, Local thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by thareholding, Edge Detector Performance, Line Detection, Corner Detection.

REFRENCES:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.
4. Digital Image Processing, Munesh C. Trivedi, Sanjay M. Shah, Khanna Publishing House

RCA-E35 Distributed Systems

UNIT–I **(8)**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. 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.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

UNIT-II (8)

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.

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.

UNIT–III (8)

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.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory**.**

UNIT–IV (8)

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

UNIT–V (8)

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.

REFRENCES:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Distributed System, Munesh C. Trivedi, Khanna Publishing House
5. Tenanuanbaum, Steen," Distributed Systems", PHI
6. Gerald Tel, "Distributed Algorithms", Cambridge University Press

RCA-E41 Distributed Database System

UNIT-I **(8)**

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascade less schedules.

UNIT–II (8)

Lock based protocols, time stamp-based protocols, Multiple Granularity and Multi version Techniques, enforcing serializability by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

UNIT-III (8)

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT–IV (8)

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT-V (8)

Distributed Query Processing, Multiday Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

REFRENCES:

1. Silberschatz, Korth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Distributed System, Munesh C. Trivedi, Khanna Publishing House
6. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

RCA-E42 Simulation and Modelling

UNIT-1 **(8)**

System definition and components, stochastic activities, continuous and discrete systems, system modeling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

UNIT-II (8)

System simulation, why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

UNIT-III (8)

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot, Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.

UNIT-IV (8)

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams, Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

UNIT-V (8)

Simulation of PERT Networks, critical path computation, uncertainties in activity duration, resource allocation and consideration. Simulation languages and software, continuous and discrete simulation languages, expression-based languages, object-oriented simulation, general purpose vs. application - oriented simulation packages, CSMP-III, MODSIM-III.

REFRENCES:

1. Geoftrey Gordon, "System Simulation", PHI
2. Jerry Banks, John S. C Barry L. Nelson David M. Nicol, "Discrete Event System Simulation", Pearson Education
3. V P Singh, "System Modeling and simulation", New Age International.
4. Averill M. Law, W. David Kelton, "System Modeling and simulation and Analysis", TMH

RCA-E43 Real Time Systems

UNIT-I

(8)

Introduction: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, precedence constraints and Data Dependency.

UNIT-II (8)

Real Time Scheduling: Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate

Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III (8)

Resources Sharing: Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority- Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Pre-emption Ceiling Protocol, Access Control in Multiple-UNIT Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV (8)

Real Time Communication: Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V (8)

Real Time Operating Systems and Databases: Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

REFRENCES:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, "Real Time Systems", Pearson Education
3. Albert M. K. Cheng , "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley.

RCA-E44 Pattern Recognition

UNIT-1 **(8)**

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

UNIT-II (8)

Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

UNIT-III: (8)

Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

UNIT-IV: (8)

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest NeighborRule, Fuzzy classification.

UNIT-V: (8)

Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques:

Iterative square - errorpartitioned clustering – K means, agglomerative hierarchical clustering, Cluster validation.

REFRENCES:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2009.