MCA Structure
Scheme of Instruction and Evaluation
I-VI Semester of MCA Programme
Choice Based Credit System
1st year MCA

Code No	Subject	Theory				Practical		
		Lecture Hrs/Week	Credit Theory	University Marks	Internal Evaluation	Hours/Week L/T	Credit Practical	Marks
	Semester – 1							
MCA 101	Problem Solving and Programming Using C	3	3	100	50	6	3	50
MCA 102	Computer Organization and Architecture	3	3	100	50	2	2	50
MCA 103	Business Information System	3	3	100	50			
MCA 104	Computer Oriented Numerical Methods	3	3	100	50			
MCA 105	Engineering Economics	3	3	100	50			
MCA 106	Business Communication	3	3	100	50	2	1	50
TOTAL		18	18	600	300	10	06	150
TOTAL Marks: 1050								
Total Credits: 24								

FIRST SEMESTER MCA SYLLABUS FOR ADMISSION BATCH 2016-17

Code No	Subject	Theory				Practical		
		Lecture Hrs/Week	Credit Theory	University Marks	Internal Evaluation	Hours/Week L/T	Credit Practical	Marks
	Semester – 2							
MCA 201	Data Structure using C	3	3	100	50	06	2	50
MCA 202	Object Oriented Programming using C ++	3	3	100	50	2	2	50
MCA 203	Operating systems	3	3	100	50	2	2	50
MCA 204	Principles and Practice of Management	3	3	100	50			
MCA 205	Green IT	3	3	100	50			
MCA 206	Mathematical Computing	3-1	3	100	50			
TOTAL		19	18	600	300	10	06	150
TOTAL Marks: 1050								
Total Credits: 24								

FIRST SEMESTER MCA SYLLABUS FOR ADMISSION BATCH 2016-17

Code No	Subject	Theory				Practical		
		Lecture Hrs/Week	Credit Theory	University Marks	Internal Evaluation	Hours/Week L/T	Credit Practical	Marks
	Semester – 3							
MCA 301	Design Analysis and Algorithms	3	3	100	50	2	2	50
MCA 302	Theory of Computation	3	3	100	50			
MCA 303	Computer Networks	3	3	100	50	2	2	50
MCA 304	Database Management Systems	3	3	100	50	2	2	50
MCA 305	Quantitative Techniques (OR & SM)	3	3	100	50			
MCA 306	Advance OS	3	3	100	50			
MCA 307	Minor Project					6	2	100
TOTAL		18	18	600	300	14	08	250
TOTAL Marks: 1150								
Total Credits: 26								

FIRST SEMESTER MCA SYLLABUS FOR ADMISSION BATCH 2016-17

Code No	Subject	Theory				Practical		
		Lecture Hrs/Week	Credit Theory	University Marks	Internal Evaluation	Hours/Week L/T	Credit Practical	Marks
	Semester – 4							
MCA 401	Programming with Java	3	3	100	50	2	2	50
MCA 402	Computer Graphics and Multimedia	3	3	100	50	2	1	50
MCA 403	Software Engineering	3	3	100	50	2	1	50
MCA 404	Compiler Design and Language Processor	3	3	100	50	2	1	50
MCA 405	Personality and Soft Skill Development					6	2	150
MCA 406	Elective I	3	3	100	50			
MCA 407	Group Discussion/Seminar					4	2	100
TOTAL		15	15	500	250	16	09	400
TOTAL Marks: 1200								
Total Credits: 24								

FIRST SEMESTER MCA SYLLABUS FOR ADMISSION BATCH 2016-17

Code No	Subject	Theory				Practical		
		Lecture Hrs/Week	Credit Theory	University Marks	Internal Evaluation	Hours/Week L/T	Credit Practical	Marks
	Semester – 5							
MCA 501	Artificial Intelligence and Expert System	3	3	100	50	2	1	50
MCA 502	Object Oriented Analysis and Design with UML	3	3	100	50	2	1	50
MCA 503	Internet Technology and Enterprise Java	3	3	100	50	2	1	50
MCA 504	**Elective II**	3	3	100	50			
MCA 505	**Elective III**	3	3	100	50			
MCA 506	**Elective IV (Open)**	3	3	100	50			
MCA 507	Professional Ethics	2-1	2	100	50			
MCA 508	Minor In-house Project and Viva					6	3	150
MCA 509	Summer Internship Evaluation					0	2	100
TOTAL		21	20	700	350	12	08	700
TOTAL Marks: 1750								
Total Credits: 28								

Sixth Semester						
	Training cum Project				Evaluation Scheme	
Code	**Course Name**	**Hours/week L/T**	**Credit Theory**	**Total Marks**		**Marks**
MCA 601	Industrial Training cum Project/ Entrepreneurship Training cum Project	30	20	1000	Evaluation by the Industry	500
					Evaluation by the Institute (Report & Institute Viva)	500
Total		30	20	1000		1000
Total Marks:1000						
Total Credits:20						

Elective – I (Choose any one)

1. MCA 406A: **Embedded System**
2. MCA 406B: **Data Mining and Analysis/ Data Mining Techniques**
3. MCA 406C: **Wireless Communication and Mobile Computing**
4. MCA 406D: **ERP and E-commerce**
5. MCA 406E: **PHP and My SQL**

Elective – II (Choose any one)

1. MCA 504A: **Cryptography and Cyber Law**
2. MCA 504B: **Business Analytics and Big Data**
3. MCA 504C: **Cloud Computing**
4. MCA 504D: **Information Security and Management**
5. MCA 504E: **Dot Net Programming**

Elective – III (Choose any one)

1. MCA 505A: **Distributed System/ Distributed technology**
2. MCA 505B: **Parallel Computing**
3. MCA 505C: **Soft Computing**
4. MCA 505D: **Foundations of Statistical Natural Processing(NLP)**
5. MCA505E: **Microprocessor and Assembly Level Language Programming**

Elective – IV (Open - Choose any one)

1. MCA 506A: **Mobile Application Development**
2. MCA 506B: **Software Testing**
3. MCA 506C: **Open Source Technology**
4. MCA 506D: **E-Governance and Practice**
5. MCA506E: **Internet of Things**
6. MCA506F: **Entrepreneurship Development**
7. MCA507G: **Marketing Management**
8. MCA508H: **Environmental Engineering**

Note- Minimum Pass Mark from Industry Evaluation is 300 (i.e. 60%).

Distribution of Credit Semester wise:

Semester	Credit
First	24
Second	24
Third	26
Fourth	24
Fifth	28
Sixth	20
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Total	14

Internal Evaluation Scheme

Assignment	05
Surprise Test	05
Quiz	10
Class Test I & II	30
Total	50
Class Test Time(Hrs.): 1	

Pass Mark in Internal is 50% of total marks i.e. 25

External Evaluation Scheme

University Semester Examination of 3 Hours duration.

Pass mark will be 35% which means students have to score 35 out of 100.

Practical/Sessional Evaluation Scheme

Pass mark will be 50% which means students have to score 25 out of 50.

Evaluation Scheme

Daily Performance -10

Lab Record - 10

Lab Quiz - 05

Final Experiments & Viva – 25

Total=50

1st Semester MCA

MCA 101. PROBLEM SOLVING AND PROGRAMMING USING C

Module 1 (10 hours)

Introduction to Computers: Basic Organization of a Computer, Number System, Conversion.
Programming Basics: Algorithm, Flowchart, Structured Programming Approach,Structure of a C Program, Compiling, Linking and Executing Programs.
C Language Fundamentals: Character Set, Key Words, Identifiers, Data Types, Variables and Constants, Operators, Expressions, Type Conversions, Statements, Managing Console Input and Output Operations.
Control Structures: Decision Making and Branching - If and Switch, Loop Structures - While, Do While and For, Unconditional Jumps - Continue, Break and Go To.

Module 2 (10 hours)

Arrays: Concept, Declaration and Manipulation of Arrays, One Dimensional, Multidimensional Array and their Applications.
Strings: Concept of Strings, String Handling Functions, Array of Strings.
Pointers: Pointer Variable and its Importance, Dereferencing, Pointer Arithmetic and Scale Factor, Pointers and Arrays, Pointer and Strings, Array of Pointers, Pointers to Pointers.
Functions: Designing Structured Programs, User Defined and Standard Functions, Formal and Actual Arguments, Function Prototype, Parameter Passing, Functions Returning Multiple Values, Functions Returning Pointers, Pointers to Functions, Nesting of Functions, Recursion, Passing Arrays to Functions.
Scope and Extent: Scope Rules, Storage Classes - Auto, Extern, Register and Static.

Module 3 (10 hours)

Structures, Unions and Enumerations: Declaration and Initialization of Structures, Structure as Function Parameters, Structure Pointers, Unions, Enumerations.

Module 4 (10 Hours)

File Input and Output: Defining, Opening a File and Closing a File, Input/output Operations in Files, Random Access to Files, Error Handling.
Command Line Arguments, Dynamic Memory Management, Pre-Processor Directives.
Graphics using C programming.

Module 5 (6 Hours)(as per choice of faculty) Graphics using C.

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Book:

1. PradipDey, ManasGhosh, “Programming in C”, First Edition,OxfordUniversity Press, 2011.
2. E. Balagurusamy, “Programming in ANSI C”, 4th edition, 2007, McGraw-Hill Publication, New Delhi.
3. Brian W. Kernighan, Dennis Ritchie, “The C Programming Language” (2nd Edition), 1988, Prentice Hall.
4. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.

Reference Books:

1. K.R. Venugopal, S.R. Prasad, “Mastering C”, McGraw-Hill Education India.
2. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Second Edition, Tata McGrawHill,2006.
3. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley(India) Pvt. Ltd., Pearson Education in South Asia, 2011.

MCA 102 COMPUTER ORGANIZATIONS AND ARCHITECTURE

Module 1 (10 Hours)

Introduction: Basic architecture of computer, Functional units, Operational concepts, Bus structures, Von Neumann Concept.

Basic Processing: Instruction code, Instruction set, Instruction sequencing, Instruction Cycle & Execution Cycle, Instruction format, Addressing modes, Micro instruction, Data path and control path design, Micro programmed vs. Hardwired controlled unit, RISC vs. CISC.

Arithmetic: Design of ALU, Binary arithmetic, Addition and Subtraction of signed number, Multiplication of Positive number, Signed operand multiplication, Division, Floating point number representation and arithmetic.

Digital Electronics: Boolean algebra, Digital Logic, Truth Tables, K map, Number system, Flip - Flop

Module 2 (10 Hours)

Memory: Memory Hierarchy, RAM, ROM, Cache memory organization, Mapping techniques, Virtual memory, Memory Interleaving, Secondary Storage, Flash drives.

Module 3(10 Hours)

Input/output: Accessing I/O devices, I/O mapped I/O, Programmed I/O, Memory Mapped I/O, Interrupt Driven I/O, Standard I/O interfaces, Synchronous and Asynchronous Data transfer, DMA data transfer.

Introduction to Parallel processing: Flynn's Classification, Pipelining, Super Scalar processors, Array processing, vector processing.

Module 4 (10 Hours)

8085 Microprocessor and Assembly level Programming using 8085 microprocessor

Module 5 (6 hours)(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:

1. Mano.M. "Computer System and Architecture" (3rd Ed) (PHI).
2. Computer Architecture by Hwang and Briggs. (MGH).
3. Fundamentals of Computer Organisation by M V L N Raja Rao; Scitech publ.
4. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "ComputerOrganization", 5th Edition, McGraw-Hill Education India

Reference Books:

1. William Stalling,"Computer Organization and Architecture", Pearson Education
2. J. P. Hayes, "Computer Architecture and Organization",MGH
3. A.S. Tananbaum, "Structured Computer Organization", Pearson Education

MCA 103 BUSINESS INFORMATION SYSTEM

This course will give a high level understanding of what information is, what business is and how information is key to successful execution of a business. It will help understanding the evolution of information system from a traditional way of dealing with information to a level how information is a business enabler. It also covers the tools and techniques deployed to expedite the information processing and controlled dissemination of information.

Module 1(10 Hours)
Introduction to Business Information System: What is information and what is Business. Why information System, perspectives of information system, contemporary approaches to information system, Learning to use information system- key management issues.

Module 2 (10 Hours)
Information System in the enterprise: Major types of information system, systems from a functional perspective, integrating functions and business processes, Management opportunities, Challenges and Solutions

Module 3 (10 Hours)
Information systems, organizations, management and strategy: Organizations and information systems, how information system impact organizations and business firms, impact of IT on management decision making, management information system and business strategy, management opportunities challenges and solutions

Module 4(10 Hours)
The digital farm: Electronic Business and electronic commerce and digital farm, e-Commerce, e-Business and digital farm, management opportunities, challenges and solutions, ethical and social issues in digital farm, ethics in an information society, moral dimensions of information system.
IT infrastructure and Platforms: IT infrastructure, infrastructure component, contemporary hardware platform trend, contemporary software platform trends, organizing data in a traditional file environment, database approach to data management, Telecommunications, network and the internet, contemporary networking infrastructure, Internet, social media.

Module 5 (6 Hours) (as per choice of faculty)
Portion covered can be tested through Internal evaluation only not to be included in University examination)
MS Suit of products (Excel, Access, Power-point) covering information extraction using Scenarios, Pivot, Macros. Animated presentations, small scale database design and reporting.

References
1. Management Information Systems by Kenneth C Laudon- Prentice Hall.
2. Business Information Systems by Robert C Nickerson, Prentice Hall

MCA 104 COMPUTER ORIENTED NUMERICAL METHODS

Module 1(10 Hours)
Computing Arithmetic, Significant Digits and Numerical Instability, Root finding methods-Bisection, Newton Raphson, Secant and RegulaFalsi, methods for multiple roots.

Module 2 (10 Hours)
System of Linear Algebraic Equations and Eigenvalue problems-Gauss Elimination, LU Decomposition- Jacobi-Gauss-Seidel and SOR methods, Interpolation and Approximation-spline approximation- Linear, quadratic and Cubic,

Module 3 (10 Hours)
Differentiation and Integration-Richardson's extrapolation, Gauss Quadrature methods, ordinary differential equations-Initial and Boundary Value Problems, introduction to numerical solutions of Partial Differential Equations.

Module 4 (10 Hours)
Flowchart and Algorithms and programming in C implementations.

Module 5 (06 Hours)
(as per choice of faculty)
Portion covered can be tested through Internal evaluation only not to be included in University examination)

References:

1. Numerical Methods for Scientific and Engineering Computation by M.K. Jain, SRK Iyengar and R.K.Jain
2. Numerical Methods for Engineers by S.C. Chopra and Raymond P. Canale
3. Introductory Methods of Numerical Analysis by Sastry
4. Numerical Analysis by E.W. Cheney and D.R.Kincaid

MCA 105 ENGINEERING ECONOMICS

Module 1 (8 Hours)
Introduction to Economics: definition, scope and nature of economics, consumption laws, demand & supply analysis, elasticity of demand, indifference curve analysis, consumer surplus and its application.

Module 2 (10 Hours)
Production : factors of production, production function, law of variable proportion, laws of return to scale, elasticity of factor-substitution, optimal combination of factor-inputs, production efficiency, economies of scales,
Cost of Production: types of costs, economic costs: fixed cost and variable costs, Average and Marginal costs, short-run and long-run cost functions.

Module 3 (10 Hours)
Market Structure: pure competition, perfect competition, imperfect market, monopoly and oligopoly. Indian Banking System, Functions and Roles of Commercial Banks and Reserve Bank of India.

Module 4 (12 Hours)
Foundations of Engineering Economics, Time value of money and interest formulae, Nominal and effective rate of interest, Present, Annual and Future worth analysis, Rate of Return Analysis, Cost-Benefit analysis in Public sector projects.
Module 5 (06 Hours)(as per choice of faculty)
Portion covered can be tested through Internal evaluation only not to be included in University examination)

References:

1. Koutsoyiannis, A., 'Modern Microeconomics', English Language Book Society, Macmillan.
2. Pindyck, R S, Rubinfeld, D L &Mehta , 'Microeconomics', 6 th Edition, Pearson Education India.
3. Varian, H R, 'Intermediate Microeconomics', 7th edition, East West Press India.
4. Samuelson, Paul A, 'Economics', 5th edition, McGraw Hill New York.
5. Basics of Engineering Economy; Leland Blank and Anthony Tarquin, TMH
6. Contemporary Engineering Economics, Chan. S Park, Pearson
7. Engineering Economics, Paneerselvam, PHI
8. Engineering Economics; Sasmita Mishra, PHI

MCA 106 BUSINESS COMMUNICATION

Objectives:
To develop communication skills and soft skills of students
To enhance the ability of students to participate in group discussions and personal interviews

Module 1 (10 Hours)
Introduction to Business Communication: Meaning, importance, the process of communication, principles of communication, verbal and non-verbal communication, barriers to communication, channels of communication, cross cultural communication.Difference between Professional and General communication.

Module 2 (10 Hours)
Functional Grammar: Verbs, Tense, Voices, Negation and interrogation, conditionals, concord, phrasal verbs, direct and indirect speech, Elimination of common errors.

Module 3 (10 Hours)
Paragraph Writing, Business Letters, Job Application Letters, Resume
Reports – Types, Format, Choice of Vocabulary, Coherence and Cohesion
Proposals: Purpose, Characteristics, Types, Structure

Module 4 (10 Hours)
Oral Presentations, Interviews, Group discussion, Soft Skills, Business Etiquette
Module 5 (06 Hours)(as per choice of faculty)
Portion covered can be tested through Internal evaluation only not to be included in University examination)

Value-based Text Reading:

A. Study of the following essays from the text book with emphasis on writing skills:
   1. Man and His Environment by Robert Arvill
   2. The Language of Literature and Science by Aldous Huxley
   3. Humanistic and Scientific Approach to Human Activityn by Moody E Prior
   4. Gods in this Godless Universe by Bertrand Russell
   5. Religion- An Inevitable Part of Human Life by J Milton Yinger

B. Readings of selected short stories:
   1. The Renunciation by Rabindranath Tagore
   2. The Lament, by Anton P. Chekhov
   3. The Barber's Trade Union by Mulk Raj Anand
   4. The Eyes Are Not Here by Ruskin Bond

Text Books:

1. Business Communication Today; Bovee et al, Pearson
2. Business Communication, Meenakshi Raman and Prakash Singh, Oxford
3. Improve Your Writing' ed. By V N Arora and Laxmi Chandra, Oxford University Press, New Delhi
4. Technical Communication- Principles and Practices' by M R S Sharma, Oxford University Press, New Delhi.

Practical

MCA 101 PROGRAMMING IN C LABORATORY

1. Find Area, Perimeter of Square & Rectangle.
2. Find max. Among 3 nos.
3. Check leap year
4. Factorial of Number
5. Calculate a b
6. Prime Number.
7. Perfect Number.
8. Armstrong Number.
9. Floyd's Triangle
10. Fibonacci Series
11. Inter conversion of Decimal, Binary & Hexadecimal no.
12. LCM & GCD of numbers
13. Insert & Delete an element at given location in array.
14. Transpose of matrices
15. Multiplication of matrices
16. Display upper & lower diagonal of matrices
17. Array of Structure e.g. student result, Employee pay slip , Phone bill
18. Function with no parameter & no return values
19. Function with parameter & return values
20. Function with parameter & no return values
21. Function with call by reference
22. Recursion function e.g. sum of digit, reverse of digit
23. String manipulation function e.g. string copy, concatenation, compare, stringlength, reverse
24. Pointer Arithmetic
25. File handling e.g. Read / Write file, copy file, merging file
26. Random access of file
27. File handling with command line arguments
28. Drawing line, rectangle, circle, ellipse by using graph
29. Changing foreground/ background color
30. Changing color & font of text
31. Swapping of numbers by using bit wise operator.
32. Macro expansion
33. File Inclusion
34. IO interfacing & Device Driver using C.
35. Graphics using C

MCA 102 COMPUTER ORGANIZATIONS AND ARCHITECTURE (LAB)

I–CYCLE: DigitalLogicDesignExperiments:

1. Multiplexers & Decoders
2. Counters
3. Shift Registers
4 Binary Adders&Subtractors
5 A L U

II–CYCLE: 8085AssemblyLanguageProgramming:

1. 8085AssemblyLanguageProgrammingaccordingtotheorycourse microprocessors-usingthefollowingtrainers:KeyboardMonitorof8085µPTrainer.SerialMonitorof8085µPTrainerwithTerminal
8085LineAssemblerof8085µPTrainerwithPCasTerminal8085CrossAssemblerusingIn-CircuitEmulator(ICE)with8085µPTrainerandPCasTerminalGradedProblemsaretobeusedaccordingtothesyllabusof

2. COMPUTER ORGANIZATION

PentiumclassPCarchitecturefamiliarizationhardware&softwarepartsdemonstration, Troubleshooting of PC,Laptops, Server and Loading of Operating System, Antivirus and other software packages

MCA 106 BUSINESS COMMUNICATION LABORATORY

Describe the communication process and the major types of written, verbal, and nonverbal communications used in business and professional communication.
Demonstrate the ability to compose a letter or memo using clear, concise language as required for a defined audience.
Demonstrate the ability to communicate a variety of types of business messages that may include good news, unfavorable news, persuasive messages, sales messages, or general information.
Compose business reports or proposals that demonstrate the ability to gather, organize, and present information.
Demonstrate the ability to prepare and deliver an oral business presentation in a clear, confident, and effective manner, with visual aids (if needed).
Discuss the interpersonal communication skills needed to build interpersonal cooperation in the business environment including meetings and work teams.
Discuss the communication principles and processes that improve the effectiveness of an organization’s communication climate.
Describe strategies for communicating across cultures.

COURSE/LAB OUTLINE

1. Understanding business communication
2. Work-team communication
3. Communication technology
4. Developing business writing skills
5. Writing basic correspondence (routine, persuasive, and bad-news messages)
6. Report writing
7. Oral and employment communication

MCA 201 Data Structure using C

Module 1 (10 hours)

Fundamentals: Introduction to Data Structures, Classification of Data Structures, Algorithms, Measuring Space and Time Complexities, Asymptotic Notations, Abstract Data Types.
Arrays: Storage Structures for Arrays, Sparse Matrixes, Strings, Pattern Matching.
Linked Lists: Dynamic Memory Management, Single Linked Lists, Double Linked Lists, Circular Linked Lists, Operations on Polynomials.
Stacks and Queues: Representation, Linked Stacks and Queues, Operations on Stacks and Queues, Applications of Stack and Queues.

Module 2 (10 hours)

Trees: Terminology, Representation, Binary Trees, Binary Search Trees, Searching, Insertion and Deletions Operations in a Binary Search Tree, Height Balanced Trees, M-way Search Trees, B-Trees, B+ Trees, General Trees, Representation of General Trees and Binary Trees, Forests, Application of Trees.

Module 3 (10 hours)

Graphs: Terminology, Representation, Path Matrix, Graph Traversal, Shortest Path Problems, Topological Sort.
Searching and Sorting Techniques: Linear and Binary Search, Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Heap and Heap Sort, Radix Sort, Comparison of Sorting Techniques.

Module 4 (10 Hours)

Hashing: Hash Functions and Hashing Techniques. External sorting, Implementation using programming in C.

Module 5 (06 Hours)(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Book

1. Data Structures Using C - Aaron M. Tenenbaum
2. Tremblay, Jean-Paul, and Paul G. Sorenson, "An introduction to data structures with applications", McGraw-Hill, Inc., 1984.

Reference Books

1. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, 2008, Universities Press Pvt. Ltd. Hyderabad.
2. Seymour, Lipchitz. “Data Structures with C.”TMH (2010).

MCA 202 Object Oriented Programming using C++

Module I (12 Hours)

Fundamentals of object oriented programming: Introduction to Object Oriented Paradigm, procedural Paradigm, An overview of classes, objects and Methods, inheritance and polymorphism

Basic OF C++: Structure of c++ program, data types and declaration, Expressions and operator precedence, Program flow control, functions, scope of variables, Inline functions and default arguments, dynamical location new and delete operators.

Module II (12 Hours)

Classes as objects, user defined data types, constructors & destructors, controlling and accessibility, class members, member functions, Friend functions, this pointer, static and const member functions.

inheritance: Derived classes, syntax of derived classes, Types of Inheritance, Virtual Functions and Virtual Base Classes.

Adhoc Poly morphism: Overloading and Function selection, Friend Functions, overloading operators such as assignment subscripting, I/O, pointer to class member, new and delete.

Module III (16 Hours)

Templates: Introduction algorithms, sequence containers, iterators, specialized iterators, associative containers, strong user-defined object, function objects. Generic Classes, Class Templates, Function Templates Parameterizing Vectors, STL, Containers, Iterators, Function Adapters, String Library

Exceptions: Using assert signal. throwing exceptions, Try Blocks, handlers, Exception specification, standard exceptions and uses.

I/O streams: Output and Input class streams, Ostream, Istream, File handling, using strings as streams

Module 4 (10 Hours)

Pointer : Addresses and pointers. The address of operator and pointer and arrays. Pointer and Function pointer and C++ types string. Memory management : New and Delete, pointers to objects, debugging pointers.

Module 5 (6 Hours) (as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

TEXTBOOKS

1.ObjectOrientedProgrammingusingC++,IraPohl,PEARSONEDUCATION

2.ObjectOrientedProgramminginC++,RobertLafore

3.UMLin21Days,Tech Media

MCA 203 Operating Systems

Module 1 (10 Hours)

Operating System Introduction- Functions, Characteristics, Structures - Simple Batch, Multi programmed, timeshared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating-System services, System Calls, Virtual Machines. Process and CPU Scheduling - Process concepts and scheduling, Operation on processes, Cooperating Processes, Threads, and Interposes Communication Scheduling Criteria, Scheduling Algorithm, Multiple -Processor Scheduling, Real-Time Scheduling.

Module 2 (10 Hours)

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging. Demand Paging, Performance of Demanding Paging, Page Replacement, Page Replacement Algorithm, Allocation of Frames, Thrashing.

Module 3 (10 Hours)

File System Interface and Implementation -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management, Directory Management, Directory Implementation, Efficiency and Performance. Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors.

Module 4 (10 Hours)

Deadlocks - System Model, Dead locks Characterization, Methods for Handling Deadlocks Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock. I/O Management – I/O software and its types, Disk Scheduling. Shell Programming: Concept of shell, Types of shell, Editors for shell programming (e.g. vi), basics of Shell programming. Case Study- UNIX, LINUX, and Windows NT.

Module 5 (6 Hours)(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books

1. Silberschatz& Galvin: Operating System Concept, Wiley, Latest Edition.

2. Milan Milenkovic: Operating Systems, Tata McGraw – Hill, Latest Edition.

3. William Stallings: Operating Systems, PHI, Latest Edition.

Reference Books

1. YashawantKanetkar: Unix Shell Programming, BPB.
2. A.S. Tanenbaum: Modern Operating Systems, latest edition Pearson/PHI.
3. Dhamdhere: Operating Systems, Tata McGraw Hill.
4. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

MCA 204 Principles and Practices of Management

Module 1(10 Hours)

Nature and functions of Management: What Managers do? Definition, Management as a Science, Art, Profession, Levels of Managers, Management Process, Skills of Managers, Role of Managers. Scientific Management Theory (Taylo*r)*, Administrative Management Theory (Fayol), BehaviouristicsManagement (Mayo). Systems Theory, Contingency Management theory..

Module 2 (10 Hours)

Planning Nature and Purpose of Planning, The Planning Process, Principles of Planning, Types of Planning, Advantages and Limitations of Planning and Steps to make it effective.

Organizing: Nature and Purpose of Organizing, Key components of organizing, Bases of Departmentation, Span of Management and its determinants, Line and Staff Relationship, Line-Staff Conflict, Bases of Delegation, Kinds of Delegation and Decentralization.

Module 3 (10 Hours)

Staffing: Importance, manpower planning, Recruitment and selection, Training and Development, Performance appraisal

Leadership: Different sources of power, Management and leadership Approaches to leadership and styles.

Module 4 (10 Hours)

Controlling: Concept and Process of Control, Control Techniques, Human Aspects of Control, Control as a Feedback System, Feed Forward Control, Preventive Control, Profit and Loss Control, Control Through Return on Investment, The Use of Computer for Controlling and Decision Making, The Challenges Created by IT as a Control Tool. Decision Making Process, Individual Decision Making Models.

Module 5 (6 Hours) (as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Reference Books:

1. Stephen P. Robbins, David A. Decenzo, Sanghmitra Bhattacharya, Madhushree Nanda Agarwal, Fundamentals of Management, Pearson Education, 2009
2. Kreitner, Management Theory and Applications, CengageLearning,India, 2009
3. Robbins, Management, 9th edition Pearson Education, 2008,
4. Griffin, Management Principles and Applications, CengageLearning,India First Edition
5. Harold Koontz, O'Donnell and Heinz Weihrich, Essentials of Management. New Delhi, Tata McGraw Hill, 2006
6. Stoner, Management, PHI Learning, 2008
7. Richard L. Daft, Principles Of Management, Cengage Learning,India, 2009
8. Principles of Management, Meenakshi Gupta, PHI
9. Principles of Management, RN Gupta, S.Chand

MCA 205 Environmental Studies and Green IT

Module 1 (10 Hours) Environmental studies: Scope and importance of environmental studies, environment and its components, ecosystem, environmental pollution; Air, water, soil, Thermal, nuclear and solid waste management, e-waste management

Module 2 (10 Hours)

Winning with Green IT- Basic Green Concepts, Green and IT, IT Ecosystem, Why Green IT now, Do's and Don't of Green IT, Making business case for Green IT, Policies for change, balancing carbon Foot print, Standards and Metrics, Emerging standards with IT practices, reviewing Established and emerging Standards Assessing organization's current energy and needs, Understanding energy terms and terminology, Building Audit for energy requirement, policy based management, Efficiency factors, Carbon reduction options, putting a master plan for go green

Module 3 (10 Hours)

Greening the data center, foundation for Green data management, formalizing best practices for Green IT, Information life cycle management, Tired storage architecture, Going greener with Hosted Data Center Services, maximizing data center efficiency- proper site selection, consolidating physical infrastructure, usage of green servers, managing servers for energy efficiency, planning data center cooling factors- basics of cooling system, bench marking cooling system's efficiency , managing the storage system from green perspective, managing the network to become green

Module 4 (10 Hours)

Virtualization, understanding virtualization, building virtual infrastructure, enabling virtual, using energy efficient machines, desktop virtualization, usage of thin client, collaboration tools – text, voice, video, Video conference, Tele Presence

Paperless office, changing printing habits, using digital documents, evaluating green gadgetry, powering gadgets intelligently, greening the facility, lighting for less, landscaping in a sustainable way, Improving the indoor environment, recycling throughout the office, usage of renewable energy, safe disposal policy

Module 5 (6 Hours)

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text books and References

1. Green IT For Dummies; Carol Baroudi; Jeffrey Hill; Arnold Reinhold; JhanaSenxian Publisher: For Dummies
2. Green Cloud Computing and Risk Management by BabakAkhgar; Colin Pattinson; Mohammad Dastbaz Publisher : Morgan Kaufmann
3. Green Services engineering, Optimization, and Modeling in the Technological Age by Xiaodong Liu; Yang LiPublisher: IGI Global
4. Environmental Studies, Basak, Pearson

MCA 206 Mathematical Computing

Module 1 BASIC SET THEORY (10 hours)

Basic Definitions - Venn Diagrams and set operations - Laws of set theory - Principle of inclusion and exclusion - partitions- Permutation and Combination - Relations- Properties of relations - Matrices of relations - Closure operations on relations - Recurrence relations- Functions - injective, subjective and objective functions.

Module 2 MATRIX ALGEBRA (10 Hours)

Matrices, Rank of Matrix, Solving System of Equations-Eigen Values and Eigen Vectors-Inverse of a Matrix - Cayley Hamilton Theorem

Module 3 MATHEMATICAL LOGIC (10 Hours)

Propositions and logical operators - Truth table - Propositions generated by a set, Equivalence and implication - Basic laws- Some more connectives - Functionally complete set of connectives- Normal forms - Proofs in Propositional calculus - Predicate calculus.

Module 4 (10 Hours) Topics in Graph Theory:

Basic terminology, Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring. Trees: definition and properties, tree traversals— preorder, inorder, postorder, binary trees, spanning trees, cut sets, Graph traversals — BFS and DFS, Minimum cost spanning trees-Prim's and Kruskal's algorithm, Shortest paths in weighted graphs-Dijkstra's algorithm.

Module 5 (06 Hours) (as per choice of faculty)

Introduction to Maple
(a) Symbolic and numerical computation
(b) Graphing
(c) Maple worksheets
(d) Variables, expressions and functions

Recurrence relations:
(a) Fibonacci numbers.
(b) Solving recurrence relations.
(c) Stability of numerical computations.
(d) Approximation of functions.

Use of MATLAB

Portion covered can be tested through Internal evaluation only not to be included in University examination)

REFERENCES:

1. Kenneth H.Rosen, " Discrete Mathematics and Its Applications", Tata McGraw Hill, Fourth Edition, 2002 (Unit 1,2 & 3).
2. Hopcroft and Ullman, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, Delhi, 2002. (Unit 4,5)
3. A.Tamilarasi&A.M.Natarajan, "Discrete Mathematics and its Application", Khanna Publishers,2nd Edition 2005.
4. M.K.Venkataraman "Engineering Mathematics", Volume II, National Publishing ompany, 2nd Edition,1989.
5. JurajHromkovic, "Theoretical Computer Science", Springer IndianReprint, 2010.
6. David Makinson, "Sets, Logic and Maths for Computing", Springer Indian Reprint, 2011.
7. Maple 14 at the Maple soft web store

Practical

MCA201 Data Structure Lab

LIST OF EXPERIMENTS.

1 ADT Stack implementation and use it for evaluation of post-fix expression.

2 Conversion of prefix expression into post-fix form using recursion.

3 Implementation of circular queue (using array) with menu options like insert, delete, display and exit.

4 Implementation of a priority queue (using pointers) and use it to organize student records prioritized by marks.

5 Implementation of ADT doubly linked circular list to hold strings and use it for organizing a sequence of cities constituting at our program.

6 Implementation of a binary search tree with menu options: Construct a tree, insert anode, delete anode, traverse and display preorder, in order and post order sequence of its nodes.

7 Implementation of di-graphs using adjacency matrix and find the transitive closure using Warshall's algorithm.

8 Implementation of a weighted graph and find minimal cost spanning tree using PRIM's Algorithm.

9 Generate 70 random integers in a given range and sort them using quick sort. Apply both binary search and Interpolation search to locate a given integer and compare the search algorithms based on the number of comparisons / probes required or a successful as well as unsuccessful search..

10 Heap Sort

11 Merge Sort.

12 Implementation of a small Real World Application illustrating DS usage

MCA202 Object Oriented Programming Lab

LIST OF EXPERIMENTS:

1.Illustrate passing by Reference
2.Illustrateuseofstaticinsideaclass
3.Demonstrate–usageofFriendFunction
4.Demonstrate Friend Class
5.Complex No.s adding and multiplying
6.Copyconstructordemo
7.Userdefinedcopyconstructordemo
8.Operator+,*overloading
9.AddingRationalNumbers
10.OverloadingAutoincrementoperator.
11.InteractiveConstructor
12.RealTimeDigitalClock
13.VirtualbaseclassDemo
14.'Is–a','has-a'relationships
15. PolymorphismusingPointertoObject
16. VirtualbaseclassDemo
17. BinaryFileDemo
18. Creating large file
19. Filesplit,Filejoin
20. Templatesorting
21. DemoofClassTemplate
22. Matrix Multiplication
23. Linkedlistimplementation
24. Stacksimulation
25. DemoofusingKeywordCONST
26. Drawinglines
27. StoringimageonDisk
28. Animation
29. UsingMouse
30. VisualBasicformcreation

Reference:

Object Oriented Programming with C++, M.P.Bhaveand S.A.Patekar, Pearson Education

MCA203 Operating System Laboratory

OBJECTIVES:

The student should be made to:

- Learn shell programming and the use of filters in the UNIX environment.
- Be exposed to programming in C using system calls.
- Learn to use the file system related system calls.
- Be exposed to process creation and inter process communication.
- Be familiar with implementation of CPU Scheduling Algorithms, page replacement algorithms and Deadlock avoidance

LIST OF EXPERIMENTS:

1. Basics of UNIX commands.
2. Shell Programming.
3. Implement the following CPU scheduling algorithms
a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
   - Sequential
   - Indexed
   - Linked
5. Implement Semaphores
6. Implement all File Organization Techniques
   - Single level directory
   - Two level
   - Hierarchical
   - DAG
7. Implement Bankers Algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement e all page replacement algorithms
   - FIFO
   - LRU
   - LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique of memory management.
12. Implement Threading & Synchronization Applications

Third Semester MCA

MCA 301 Design and Analysis of Algorithms

Module 1 (10 Hours)

INTRODUCTION

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms.Amortized Analysis.

Module 2(10 Hours)

BRUTE FORCE AND DIVIDE-AND-CONQUER

Brute Force – Closest-Pair and Convex-Hull Problems-Exhaustive Search – Traveling Salesman Problem – Knapsack Problem – Assignment problem. Divide and conquer methodology – Merge sort –Heap Sort- Quick sort – Binary search – Multiplication of LargeIntegers – Strassen's Matrix Multiplication-Closest-Pair and Convex-Hull Problems.

Module 3(10 Hours)

DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE

Computing a Binomial Coefficient – Warshall's and Floyd's algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees.

Module 4 (10 Hours)

ITERATIVE IMPROVEMENT

The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- the Stable marriage Problem.

COPING WITH THE LIMITATIONS OF ALGORITHM POWER

Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems–Coping with the Limitations – Backtracking – n-Queens problem –

Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem- Approximation Algorithms for NP – Hard Problems – Traveling Salesman problem – Knapsack problem.

Module 5 (6 Hours)

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

2. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

REFERENCES:

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
2. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008
3. http://nptel.ac.in/

MCA 302 Theory of Computation

Module 1 (10 Hours)
Alphabet, languages and grammars. Production rules and derivation of languages.Chomsky's hierarchy of languages and Grammars. Regular grammars, regular expressions and finiteautomata (deterministic and nondeterministic). Closure and decision properties ofregular sets. Pumping lemma of regular sets. Minimization of finite automata. Leftand right linear grammars.DFA/NFA to regular expression and vice versa using Arden's Formula.

Module 2 (10 Hours)
Context free grammars and pushdown automata. Chomsky and Griebach normalforms. Parse trees, Cook, Younger, Kasami, and Early's parsing algorithms.Ambiguity and properties of context free languages. Pumping lemma, Ogden'slemma, Parikh's theorem. Deterministic pushdown automata, closure properties of deterministic context free languages.

Module 3 (10 Hours)
Turing machines and variation of Turing machine model, Turing computability, Type 0 languages. Linear bounded automata and context sensitive languages. Primitive recursive functions. Cantor and Gödel numbering. Ackermann's function, murecursive functions, recursiveness of Ackermann and Turing computable functions.

Module 4 (10 Hours)
Church Turing hypothesis. Recursive and recursively enumerable sets.. UniversalTuring machine and undecidable problems. Undecidability of Post correspondence problem. Valid and invalid computations of Turing machines and some undecidable properties of context free language problems.
Time complexity class P, class NP, NP completeness.

Module 5 (6 Hours)
(as per choice of faculty)
Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:
1. Introduction to Automata Theory, Languages and Computation: J.E. Hopcroft and J.DUllman, Pearson Education, 3rd Edition.
2. Introduction to the theory of computation: Michael Sipser, Cengage Learning

Reference Books:
1. Automata Theory: Nasir and Srimani , Cambridge University Press.
2. Introduction to Computer Theory: Daniel I.A. Cohen, Willey India, 2nd Edition.

MCA 303 Computer Networks

Module 1 (10 Hours)
Network architecture – layers – Physical links – Channel access on links – Hybrid multiple accesstechniques - Issues in the data link layer - Framing – Error correction and detection – Link-level FlowControl

Module 2 (10 Hours)
Medium access – CSMA – Ethernet – Token ring – FDDI - Wireless LAN – Bridges andSwitches,Circuit switching vs. packet switching / Packet switched networks – IP – ARP – RARP – DHCP – ICMP –Queueing discipline – Routing algorithms – RIP – OSPF – Subnetting– CIDR – Interdomain routing – BGP – Ipv6 – Multicasting – Congestion avoidance in network layer

Module 3 (10 Hours)
UDP – TCP – Adaptive Flow Control – Adaptive Retransmission -Congestion control – Congestionavoidance – QoS

Module 4 (10 Hours)
Email (SMTP, MIME, IMAP, POP3) – HTTP – DNS- SNMP – Telnet – FTP –Security – PGP - SSH

Module 5 (6 Hours)
(as per choice of faculty)
Portion covered can be tested through Internal evaluation only not to be included in University examination)
Preferably use of NetSim, NS2

TEXT BOOK :
1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Third Edition,Morgan Kauffmann Publishers Inc., 2003.

REFERENCES:
1. JamesF.Kuross,KeithW.Ross,“Computer Networking,ATop DownApproachFeaturingtheInternet”,Third Edition,Addison Wesley, 2004.
2. NaderF.Mir,“Computer andCommunicationNetworks”,PearsonEducation,2007
3. Comer, “ComputerNetworks andInternetswithInternetApplications”,Fourth Edition, PearsonEducation,2003.
4. Andrew S.Tanenbaum,“Computer Networks”,FourthEdition,2003.
5. William Stallings, “Data and Computer Communication”, Sixth Edition, Pearson Education,2000

MCA 304 Database Management Systems

Module1 :(10Hours)
Introductory concepts of DBMS:
Introduction and applications of DBMS, Purpose of data base, Data, Independence, Database System architecture- levels, Mappings, Database, users and DBA

Relational Model:
Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, tuple relational calculus

Module2: (16 Hours)
Entity-Relationship model:
Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features – generalization, specialization, aggregation, reduction to E-R database schema.

Relational Database design:
Functional Dependency – definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization – 1NF, 2NF, 3NF, Decomposition using FD- dependency preservation, BCNF, Multi- valued dependency, 4NF, Join dependency and 5NF.

Module3: (10 Hours)
Query Processing & Query Optimization:
Overview, measures of query cost, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans, materialized views

Transaction Management:
Transaction concepts, properties of transactions, serializability of transactions, testing for serializability, System recovery, Two- Phase Commit protocol, Recovery and Atomicity, Log-based recovery, concurrent executions of transactions and related problems, Locking mechanism, solution to concurrency related problems, deadlock, , two-phase locking protocol, Isolation, Intent locking

Module 4 (10 Hours)
Security:
Introduction, Discretionary access control, Mandatory Access Control, Data Encryption
SQL Concepts:
Basics of SQL, DDL,DML,DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator,Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries,

correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. transaction control commands – Commit, Rollback, Savepoint Distributed Data Base concepts.

PL/SQL Concepts:

Cursors, Stored Procedures, Stored Function, Database Triggers

Module 5 (6 Hours)

(As per choice of faculty)

(Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, “Database Systems Concepts”, McGraw-Hill Education , New Delhi
2. RamezElmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, Pearson Education Inc., New Delhi.

Reference Books:

1. Hector Garcia-Molina, Jeffret D. Ullman, JennifferWidom, “Database Systems: A Complete Book”, Pearson Education Inc., New Delhi.
2. C. J. Date “An introduction to Database System”, Pearson Education Inc., New Delhi.
3. Bipin Desai, “An introduction to Database System”, Galgotia Publications.
4. Peter Rob & Carlos Coronel, “Database Systems: Design, Implementation, and Management”, CENGAGE Learning India Pvt. Ltd., New Delhi.
5. Mark L. Gillenson, “Fundamentals of Database Management Systems”, Wiley India Pvt. Ltd., New delhi.
6. Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, McGraw-Hill Education (India), New Delhi.

MCA 305 Quantitative Techniques (OR(Operations Research)& SM(Simulation & Modeling)

Module 1 (10 Hours)

Introduction to OR

Concepts, genesis, Art of modeling, components of model, Types of OR models, effect of data availability on modeling, Computations in OR, Phases of OR study

Linear Programming (LP)

Concepts, Formulation of model, Graphical solution, Maximization / Minimization – Simplex Algorithm, Use of slack / surplus / artificial variables, BigM and Two phase method – Nature & type of solutions, Interpretation of optimal solution. Dual problem – relation between primal and dual , Dual simplex method – Interpretation of dual variables, Revised Simplex Method, Introduction to Integer programming, Developing software for LP solution methods and exposure to available LP & IP Packages.

Module 2(10 Hours)

Transportation & Assignment problems

Concepts, formulations of models, Solution procedures, Optimality checks, Balanced/Unbalanced, Maximum/Minimum problems, Prohibited case – degeneracy

Network Analysis

Network Definition, Minimal spanning tree problem, shortest route problem, Maximal flow problem concepts and solution algorithm as applied to problems. Project planning and control by PERT/CPM network, Probability assessment in PERT network.

Introduction to resource smoothing and allocation

Development of software for the techniques and exposure to Project Management Packages.

Module 3(10 Hours)

Queuing Models

Concepts relating to Queuing systems, types of queuing system (use of six character code), Basic elements of Queuing Model, Role of Poison & Exponential Distribution, Concepts of Birth and Death process, Steady state measures of performance, M/M/1

model with and without limitation of q-size M/G/1, single channel with Poisson arrival rate and general service time.

Module 4 (10 Hours)

Computer Modeling& Simulation

Use of Computer in modeling real life situations, Distribution functions, Random number generation, Selection of input probability distribution, Design of simulation models Experimental design, output analysis variance reduction techniques. Introduction to simulation languages Programming tools for developing simulation models.

Replacement & Maintenance Models

Replacement of items, subject to deterioration of items subject to random failure Group Vs. Individual replacement policies.

Module 5 (6 Hours)

Stress on Non-Linear Programming & its Applications.

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Books:

1. Operation Research, KantiSwaroop
2. Operation Research,V.K. Kapoor
3. Operation Research,PaneerSelvam,PHI
4. Operations Research, Hillier & Lieberman, TMH

MCA 306 Advanced OS

Module 1 (10 Hours)

Architectures of Distributed Systems - System Architecture types - issues in distributedoperating systems - communication networks – communication primitives. TheoreticalFoundations - inherent limitations of a distributed system – lamp ports logical clocks –vector clocks – casual ordering of messages – global state – cuts of a distributedcomputation – termination detection. Distributed Mutual Exclusion – introduction – theclassification of mutual exclusion and associated algorithms – a comparativeperformance analysis.

Module 2 (10 Hours)

Distributed Deadlock Detection -Introduction - deadlock handling strategies indistributed systems – issues in deadlock detection and resolution – control organizationsfor distributed deadlock detection – centralized and distributed deadlock detectionalgorithms –hierarchical deadlock detection algorithms. Agreement protocols – introduction-the system model, a classification of agreement problems, solutions to theByzantine agreement problem, applications of agreement algorithms. Distributedresource management: introduction-architecture – mechanism for building distributed filesystems – design issues – log structured file systems.

Module 3 (10 Hours)

Distributed shared memory-Architecture– algorithms for implementing DSM – memorycoherence and protocols – design issues. Distributed Scheduling – introduction – issuesin load distributing – components of a load distributing algorithm – stability – loaddistributing algorithm – performance comparison – selecting a suitable load sharingalgorithm – requirements for load distributing -task migration and associated issues.Failure Recovery and Fault tolerance: introduction– basic concepts – classification offailures – backward and forward error recovery, backward error recovery- recovery inconcurrent systems – consistent set of check points – synchronous and asynchronouscheck pointing and recovery – check pointing for distributed database systems- recoveryin replicated distributed databases.

Module 4 (10 Hours)

Protection and security -preliminaries, the access matrix model and its implementations.-safety in matrix model- advanced models of protection. Data security –cryptography:Model of cryptography, conventional cryptography- modern cryptography, privatekey cryptography, data encryption standard- public key cryptography – multiple encryption –authentication in distributed systems.

Multiprocessor operating systems - basic multiprocessor system architectures – interconnection networks for multiprocessor systems – caching – hypercube architecture.Multiprocessor Operating System - structures of multiprocessor operating system, operating system design issues- threads- process synchronization and scheduling.Database Operating systems :Introduction- requirements of a database operatingsystem Concurrency control : theoretical aspects – introduction, database systems – aconcurrency control model of database systems- the problem of concurrency control –serializability theory- distributed database systems, concurrency control algorithms –introduction, basic synchronization primitives, lock based algorithms-timestamp basedalgorithms, optimistic algorithms – concurrency control algorithms, data replication.

Module 5 (6 Hours)

Preferably use of MapReduce.
(as per choice of faculty)
Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Book:

1. Andrew S. Tanenbaum and Maarten van Steen. “Distributed Systems: Principles and Paradigms”, Prentice Hall, 2nd Edition, 2007. (Required)

References:

1. MukeshSinghal, NiranjanG.Shivaratri, "Advanced concepts in operating systems:Distributed, Database and multiprocessor operating systems", TMH, 2001
2. PradeepK.Sinha, "Distributed operating system-Concepts and design", PHI, 2003.

MCA 307 Minor Projects

Small project on MapReduce, Maple, NetSim, NS2

Practical

MCA 301 Design and Analysis of Algorithm Lab

Design, develop and implement the specified algorithms for the following problems using C/C++ Language in LINUX /Windows environment.

1. Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.The elements can be read from a file or can be generated using the random number generator.

2. Using OpenMP, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

3. a. Obtain the Topological ordering of vertices in a given digraph.
b. Compute the transitive closure of a given directed graph using
Warshall's algorithm.

4. Implement 0/1 Knapsack problem using Dynamic Programming.

5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

7. a. Print all the nodes reachable from a given starting node in a digraph using BFS method.
b. Check whether a given graph is connected or not using DFS method.

8. Find a subset of a given set S = {sl, s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S={1, 2, 5, 6, 8} and d = 9 there are two solutions{1,2,6}and{1,8}.A
suitable message is to be displayed if the given problem instance doesn't have a solution.

9. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.

10. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.

11. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm,
implement it using OpenMP and determine the speed-up achieved.

12. Implement N Queen's problem using Back Tracking.

List of Practice Experiments:

1. Write C++ programs to implement the following:
a) Prim's algorithm.
b) Kruskal's algorithm.
2. Write a C++ program to find optimal ordering of matrix multiplication.
(Note: Use Dynamic programming method).
3. Consider the problem of eight queens on an (8x8) chessboard.
Two queens are said to attack each other if they are on the same row, column, or diagonal.
Write a C++ program that implements backtracking algorithm to solve the problem i.e.place eight non-attacking queens on the board.
4. Write a C++ program to find the strongly connected components in a digraph.
5. Write a C++ program to implement file compression (and un-compression) usingHuffman's algorithm.
6. Write a C++ program to implement dynamic programming algorithm to solve all pairsshortest path problem.
7. Write a C++ program to solve 0/1 knapsack problem using the following:
a) Greedy algorithm.
b) Dynamic programming algorithm.

c) Backtracking algorithm.
d) Branch and bound algorithm.
8. Write a C++ program that uses dynamic programming algorithm to solve the optimal binary
search tree problem.
9. Write a C++ program for solving traveling sales persons problem using the following:
a) Dynamic programming algorithm.
b) The back tracking algorithm.
c) Branch and Bound.

REFERENCEBOOKS :

1. Richard F.Gilberg, BehrouzA.Forouzan, Thomson, "Data Structures, A PseudocodeApproach with C++", 1st ed., Business Information Press, 2007.
2. D.S.Malik, Thomson, "Data Structures Using C++", 1st ed., Cengage Learning, 2007.
3. Ellis Horowitz, SatrajSahni and Rajasekharam, "Fundamentals of Computer Algorithms", 2nd ed., Galgotia publications pvt.Ltd, 2006.

MCA 303 Computer Networks Lab

1.1 PC-to-PCCOMMUNICATIONSUNDERWIN98/WIN2000'sDIRECTCABLE CONNECTIONwithNULLMODEM
a)Using Serial PortsandRS-232CCable Connection
b)UsingParallelPortsandDirectParallelCableConnection

1.2.1 PC-to-PC COMMUNICATIONS UNDER WIN98/WIN2000'sDIAL-UP NETWORKING with**MODEM**and4-LINEEXCHANGE

1.3. PC-to-PCCOMMUNICATIONS UNDERWIN98/WIN2000'sHYPERTERMINALwithMODEMand4-LINEEXCHANGE

1.4 LANWITHBUS/STAR(SwitchorHub)TOPOLOGYwithaminimumoftwo systemsi)WindowsPeer-to-PeerNetwork ii)WindowsNTClient-ServerNetwork

1.5LANWITHBUS/STAR(SwitchorHub)TOPOLOGYwithaminimumoftwosystemsusing NOVELL Netware

1.6 TERMINALNETWORKWITHUNIX/LINUXSERVERandoneortwo TerminalsusingSerialPorts

1.7 TERMINALNETWORKWITHUNIX/LINUXSERVER,8–portTerminal Serverandoneortwoterminals

LIST OF EXPERIMENTS:

1. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
2. Study of Socket Programming and Client – Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands
5. Create a socket for HTTP for web page upload and download.
6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting.
8. Applications using TCP Sockets like
a. Echo client and echo server
b. Chat
c. File Transfer
9. Applications using TCP and UDP Sockets like
d. DNS
e. SNMP
f. File Transfer
10. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS/NetSim
11. Perform a case study about the different routing algorithms to select the network path with itsoptimum and economical during data transfer.
i. Link State routing
ii. Flooding
iii. Distance vector

ReferenceBooks:

TheCompleteReferenceSeries:WIN98/WIN2000/UNIX/REDHATX/Networking,TMH Edition

MCA 304 Database Management System Labs

CourseDescription:Thiscourseexploresdatabaseprogrammingusingbothnativeand embeddedANSI-standardStructuredQueryLanguage(SQL).Topicsincludeenterprise databasemanagementsystems,databasemiddleware,datadefinitionlanguage,data manipulationlanguage,datacontrollanguage,databasequeriesreporting,query optimization,anddatabaseviews.Studentassignmentsincludedatabasecreation,query designandprogramming,anddatabasemanipulationviaembeddedSQLcallsfroma programminglanguage.

CourseGoal: Successfulgraduatesofthiscourseshouldbeableto:

1. Understandthefundamentalsofarelationaldatabase
2. Understandthefundamentalsofclient-server and multi-tieredapplications
3. UnderstandtheuseofStructuredQueryLanguage(SQL)asadatadefinitionlanguage,data manipulationlanguage,anddatacontrollanguage
4. Understand and write SQL/PL_SQLqueriestocreate,report,andupdatedatain arelationaldatabase
5. Understandthepurposeofandbeabletocreateviews,scripts,triggers,and transactions
6. Understandandbeabletoimplementthefundamentalsofsecurityand permissionsinSQLServer
7. Designentityrelationshipmodelsforabusinessproblemanddevelopa normalizeddatabasestructure

LIST OF EXPERIMENTS:

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, Save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Study of PL/SQL block.
7. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
8. Write a PL/SQL block that handles all types of exceptions.

9. Creation of Procedures.

10. Creation of database triggers and functions

11. Mini project (Application Development using Oracle/ Mysql)

a) Inventory Control System.

b) Material Requirement Processing.

c) Hospital Management System.

d) Railway Reservation System.

e) Personal Information System.

f) Web Based User Identification System.

g) Timetable Management System.

h) Hotel Management System

12. Using Oracle or DB2 under Windows platform and MySQL under Linux/Unix platform

ReferenceBooks:

1. IntroductiontoRelationalDatabasesandSQLProgramming,ChristopherAllen, SimonChatwin,CatherineA.VrearyTataMcGraw-Hill
2. OracleSQLandPL/SQLHandbook,JohnAdolphPalinski,PearsonEducation
3. Oracle11iPL/SQLProgramming,ScottUrman,TataMcGraw-Hill
4. MySQL:TheCompleteReference,VikramVaswani,TataMcgraw-Hill
5. MySQLBible,SteveSuehring,Wiley

4th Semester detailed Syllabus
MCA 401 Programming with Java

Module 1 (10 Hours)
Features of Java, Data types, operators & expressions, control structures, arrays, Classes, objects & methods, constructors, garbage collection, access qualifiers, string handling – string operations, character extraction, string comparison, searching and modifying strings, String Buffer, packages and interfaces, Wrapper classes.

Module 2 (10 Hours)
Inheritance: single and multilevel inheritance, method overriding, abstract class, use of super and final keywords. Exception Handling: Exception types, uncaught exceptions, multiple catch clauses, nested try statements, built-in exceptions, creating your own exceptions. Multithreading: Java thread model, creating multiple threads, thread priorities, synchronization, interthread communication, suspending, resuming and stopping threads.

Module 3 (10 Hours)
Applets: Local & Remote Applets, Applet Architecture, Passing Parameters to Applets, Applet Graphics, Adapter Class. I/O Streams: Console I/O – reading console input, writing console output, Files I/O – Byte Streams, Character Streams, Collection Interfaces & Classes, Delegation Event Model

Module 4 (10 Hours)
AWT Classes: Window fundamentals, working with graphics, working with color & fonts. AWT controls, layout managers & working with menus, JFrames. Swing Classes, Java Beans, Servlet classes & Life Cycle.

Module 5 (6 Hours)
(as per choice of faculty)
Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:
1. Herbert Schildt, The Complete Reference Java 2, Fourth Edition, Tata McGraw Hill-2001
2. Liang Y.Daniel, Introduction to Java Programming (7th Edition), 2009, Pearson Education.

Reference Books:
1. Steven Holzner, Java 1.2, BPB-1998
2. E. Balaguruswami, Programming with Java - Second Edition, Tata McGraw Hill-1998.
3. Mughal K.A., Rasmussen R.W., A Programmer's Guide to Java Certification, Addison-Wesley, 2000 `

MCA 402 Computer Graphics and Multimedia

Module 1 (10 Hours)

An Introduction Graphics System : Computer Graphics and Its Types, Application of computer graphics, Graphics Systems : Video Display Devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Work Stations, Input Devices, Hard Copy Devices, Graphics Software.

Module 2 (10 Hours)

Output Primitives and Attributes of Output Primitives : Output Primitive Points and Lines, Line Drawing Algorithms, Circle Generating Algorithms, Scan-Line Polygon Fill Algorithm, Inside-Outside tests, Boundary-Fill Algorithm, Flood Fill Algorithm, Cell Array, Character Generation, Attributes of Output Primitives : Line Attributes, Color and Grayscale Levels, Area fill Attributes, Character Attributes, Bundled Attributes, Anti-aliasing.

Module 3 (10 Hours)

Two-dimensional Geometric Transformations : Basic Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing. Two-Dimension Viewing : The viewing Pipeline, Window to view port coordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping, Text Clipping, Exterior Clipping Three-Dimensional Concepts : Three Dimensional Display Methods, 3D Transformations, Parallel Proection and Perspective Projection.

Module 4 (10 Hours)

Multimedia : Introduction to Multimedia : Classification of Multimedia, Multimedia Software, Components of Multimedia – Audio : Analog to Digital conversion, sound card fundamentals, Audio play backing and recording Video, Text : Hypertext, Hyper media and Hyper Graphics, Graphics and Animation : Classification of Animation. Authoring Process and Tools. Case Study: graphics software MatLab, Use of MatLab in graphics application, Features of MatLab, Generalize application by using MatLab.

Module 5 (6 Hours)

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:

1. Donald **Hearn** & M. Pauline **Baker**, "*Computer Graphics with OpenGL*", Third Edition, 2004, Pearson Education, Inc. New Delhi.

2. Ze-Nian**Li** and Mark S. **Drew**, "*Fundamentals of Multimedia*", First Edition, 2004, PHI Learning Pvt. Ltd., New Delhi.

Reference Books:

1. Plastock : Theory & Problem of Computer Gaphics, Schaum Series.
2. Foley & Van Dam : Fundamentals of Interactive Computer Graphics, Addison-Wesley.
3. Newman : Principles of Interactive Computer Graphics, McGraw Hill.
4. Tosijasu, L.K. : Computer Graphics, Springer-Verleg.
5. S. Gokul : Multimedia Magic, BPB Publication.
6. Bufford : Multimedia Systems, Addison Wesley.
7. Jeffcoate : Multimedia in Practice, Prectice-Hall.
8. Any other book(s) covering the contents of the paper in more depth.

Note : Latest and additional good books may be suggested and added from time

MCA 403 Object Oriented Software Engineering

Module 1 (10 Hours)

Software Process Models:

Software Product, Software crisis, Handling complexity through Abstraction and Decomposition, Overview of software development activities, Process Models, Classical waterfall model, iterative waterfall model, prototyping mode, evolutionary model, spiral model, RAD model, Agile models: Extreme Programming.

Module 2 (10 Hours)

Software Requirements Engineering:

Requirement Gathering and Analysis, Functional and Non-functional requirements, Software Requirement Specification (SRS), IEEE 830 guidelines, Decision tables and trees.

Software Project Management:

Responsibilities of a Software project manager, project planning, Metrics for project size estimation, Project estimation techniques, Empirical estimation techniques, COCOMO models, Scheduling, Organization &team structure, Staffing, Risk management, Software configuration management.

Module 3 (10 Hours)

Structured Analysis & Design:

Overview of design process: High-level and detailed design, Cohesion and coupling, Modularity and layering, Function–Oriented software design: Structured Analysis using DFD Structured Design using Structure Chart, Basic concepts of Object Oriented Analysis & Design. User interface design, Command language, menu and iconic interfaces.

Coding and Software Testing Techniques:

Coding, Code Review, documentation. Testing: - Unit testing, Black-box Testing, White-box testing, Cyclomatic complexity measure, coverage analysis, mutation testing, Debugging techniques, Integration testing, System testing, Regression testing.

Module 4 (10 Hours)

Software Reliability and Software Maintenance:

Basic concepts in software reliability, reliability measures, reliability growth modeling, Quality SEI CMM, Characteristics of software maintenance, software reverse engineering, software reengineering, software reuse.

Emerging Topics:

Client-Server Software Engineering, Service-oriented Architecture (SOA), Software as a Service (SaaS).

Module 5 (6 Hours)

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:

1. Fundamentals of Software Engineering, Rajib Mall, PHI, 2014.
2. Software Engineering, A Practitioner's Approach, Roger S. Pressman, TMG Hill.

Reference Books:

1. Software Engineering, I. Somerville, 9th Ed. , Pearson Education.

MCA 404 Compiler Design and Language Processor

Module 1 (10 Hours)

Introduction to Compilers: Compilers and translators, Phases of compiler design, cross compiler, Bootstrapping, Design of Lexical analyser, LEX programming.

Syntax Analysis: Specification of syntax of programming languages using CFG, Top-down parser, design of LL (1) parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR, CLR parsers.YACC programming.

Module 2 (10 Hours)

Syntax directed translation: Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate notations: postfix, syntax tree, TAC, translation of expression, controls structures, declarations, procedure calls, Array reference.

Storage allocation & Error Handling: Run time storage administration, stack allocation, symbol table management, Error detection and recovery: lexical, syntactic, semantic.

Module 3(10 Hours)

Code optimization: Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, Loop invariant computation, Induction variable removal, Elimination of Common sub expression.

Module 4 (10 Hours)

Code generation – Problems in code generation, Simple code generator, Register allocation and assignment, Code generation from DAG, Peephole optimization.

Text Books:

- Compilers: Principles Techniques and Tools 1st edition by A. V. Aho, Sethi, Ullman, Pearson education.
- Principal of Compiler Design – Alfred V. Aho& Jeffery D. Ullman ,Narosa Pub. House.

Module 5 (6 Hours)

(As per choice of faculty)

(Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books

1. Principles of Compiler Design by Alfred V. Aho., Jeffrey D. Ulman.
2. “Compilers: Principles, Techniques and Tools” Aho, Ravi Sethi, Ullman, Pearson Education, VIII Ed. 2002.

Reference Books

1. Lex and Yacc by Johan R. levine, Tonny Mason, et. al. O" Reilly and Assosiates.
2. "Compilers Design in C" Allen I. Holub, PHI eastern economy edition 2003.

MCA 405 Personality and Soft Skill Development (Practical)

LIST OF TASKS:

1. Listening comprehension – Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English, and American English; intelligent listening in situations such as interview in which one is a candidate.
2. Vocabulary building, Creativity, using Advertisements, Case Studies etc.
3. Personality Development: Decision-Making, Problem Solving, Goal Setting, Time Management & Positive Thinking
4. Cross-Cultural Communication: Role-Play/ Non-Verbal Communication.
5. Meetings- making meeting effective, chairing a meeting, decision-making, seeking opinions, interrupting and handling interruptions, clarifications, closure-Agenda, Minute writing.
6. Group Discussion – dynamics of group discussion, Lateral thinking, Brainstorming and Negotiation skills
7. Resume writing – CV – structural differences, structure and presentation, planning, defining the career objective
8. Interview Skills – formal & informal interviews, concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing
9. Writing Skills - Business Communication, Essays for competitive examinations.
10. Technical Report Writing/ Project Proposals – Types of formats and styles, subject matter – organization, clarity, coherence and style, planning, data-collection, tools, analysis.- Feasibility, Progress and Project Reports.
11. Very Similar Test of standard software companies like TCS, WIPRO, InfoSys, Googleetc
12. Brain teasing tests

REFERENCES:

1. Simon Sweeny, "English for Business Communication", CUP, First South Asian Edition, 2010.
2. M. Ashraf Rizvi, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Ltd. 2005.
3. Dr A Ramakrishna Rao, Dr G Natanam& Prof SA Sankaranarayanan, "English Language Communication: A Reader cum Lab Manual", Anuradha Publications, Chennai, 2006.
4. Dr. ShaliniVerma, "Body Language- Your Success Mantra", S. Chand, 2006.

5. Andrea J. Rutherford, “Basic Communication Skills for Technology”, 2nd Edition, Pearson Education, 2007.
6. Sunita Mishra & C. Muralikrishna, “Communication Skills for Engineers”, Pearson Education, 2007.
7. Jolene Gear & Robert Gear, “Cambridge Preparation for the TOEFL Test”, 2010.
8. Meenakshi Raman &Sangeeta Sharma, “Technical Communication”, Oxford University Press, 2011.

MCA 406 Elective 1 (Choose any one)

1. MCA 406A: Embedded System

ExamplesofEmbeddedsystemsandTypicalhardware

HardwareFundamentalsforSoftwareEngineerandAdvancedHardwareFundamentals InterruptsandSurveyofsoftwarearchitectures. Introduction to RTOS and More Operating System Services BasicDesignusingRTOS

EmbeddedSoftwaredevelopmenttoolsandDebuggingTechniques

TextBooks:
1.AnEmbeddedSoftwarePrimer,DavidA.Simon,PearsonEducation,Inc.,1999
2.EmbeddedRealTimeSystemsprogramming,SriramVIyerandPankajGupta,TMH, 2004

ReferenceBooks:
1.EmbeddedSystemsDesign–AUnifiedHardware/SoftwareIntroduction,Frank Vahid/TonyGivargis,JohnWiley&Sons,Inc.,2002
2.EmbeddedSystems,Architecture,ProgrammingandDesign,RajKamal,TMH,2003

2. MCA 406B: Data Mining Techniques

DSS-Uses, definition, Operational Database.Introduction to DATA Warehousing.Data-Mart, Conceptof Data-Warehousing, Multi Dimensional Database Structures.Client/Server Computing Model & DataWarehousing.Parallel Processor & Cluster Systems.Distributed DBMS implementations.DATA Warehousing. Data Warehousing Components, Building a Data Warehouse, Warehouse Database,Mapping the Data Warehouse to a Multiprocessor Architecture, DBMS Schemas for Decision Support,Data Extraction, Cleanup & Transformation Tools, MetadataBusiness Analysis: Reporting & Query Tools & Applications. On Line Analytical Processing (OLAP).Patterns & Models.Statistics, Artificial Intelligence.Knowledge Discovery, Data

Mining, Introduction to Data-Mining, Techniques of Data Mining, DecisionTree, Neural Networks, Nearest Neighbor & Clustering. Genetic Algorithm, Rule Introduction, Selecting& using the right Techniques.Multimedia Data-Mining, Multimedia Databases, Mining Multimedia Data, Data-Mining and the worldWide Web, Web Data Mining, mining, Mining and Meta-Data, Data Visualization & overall Perspective,Data Visualization, Application of Data-MiningIntroduction to Data Mining and knowledge discovery in databases (KDD); Data miningprimitives, concepts, tasks and functionalities - concept learning, classification and prediction,association rule mining, clustering and anomaly detection; Data preparation - cleaning,transformation, reduction, discretization; Techniques, approaches and evaluation: Credibility,evaluation and comparison of data mining models; Association rule mining techniques - Apriori,Partition-based, FP-tree, Pincer-search; Supervised (inductive) learning - Decision table, rule,tree; Model tree, Baye's theorem, k-nearest neighbour, Regression, SVM; Unsupervised learning– Clustering Techniques - Partition, k-d tree, Hierarchical, Density, Grid, Advanced Databases:Text, Sequence, Image, etc.

References:

1. J. Han, M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2007
2. I.H. Witten, E. Frank, Data mining: Practical Tools and Techniques with Java Implementations, Morgan Kaufmann 1999
3. P-N. Tan, V. Kumar and M. Steinbach: Introduction to Data Mining, Pearson, 2007
4. D. Hand, H. Mannila, P. Smyth, Principles of Data Mining, Indian reprint, PHI 2004

3. MCA 406C: Wireless Communication and Mobile Computing

Mobile radio systems-, Paging systems, cordless telephone system, cellular telephone system,Cellular Concept: Frequency reuse, channel assignment, hand off, Interference and cell splitting,sectoring, Improving Coverage and capacity in Cellular systems. Propagation modeling:Outdoor/ Indoor Propagation models, Small scale Multipath propagation- Rayleigh fading,Ricean Fading, Nakagami fading, Shadowing, lognormal shadowing fading model, outageprobability, coverage estimation under shadowing, and multipath fading. Wireless Networks802.11, frequency-hopping, encoding and modulation, MAC Layer Protocol Architecture
Multiple access with collision avoidance protocol, Virtual Carrier-Sensing, DCF Protocol, PCFOperation.

References:

1. Rappaport, Wireless communications: principal and practice , Pearson ed.

2. Matthew s. Gast, 802.11 wireless networks, O'reilly
3. Andrea Goldsmith ,Wireless communication , cambridge university press ed .
4. JochenSchiller , Mobile communications, phi/person edu., 2nd ed.,

4. MCA 406D:ERP and E-Commerce

UNIT-I

Introduction

What is E-Commerce, Forces behind E-Commerce Industry Framework, Brief history of E-Commerce,Inter Organizational E-Commerce Intra Organizational E-Commerce, and Consumerto Business Electronic Commerce, Architectural framework
Network Infrastructure for E-CommerceNetwork Infrastructure for E-Commerce, Market forces behind I Way, Component of I wayAccess Equipment, Global Information Distribution Network, Broad band Telecommunication.

UNIT-II

Mobile Commerce
Introduction to Mobile Commerce, Mobile Computing Application, Wireless Application Protocols, WAP Technology, Mobile Information Devices, Web Security
Introduction to Web security, Firewalls & Transaction Security, Client Server Network, Emerging Client Server Security Threats, firewalls & Network Security.

UNIT-III

Encryption

World Wide Web & Security, Encryption, Transaction security, Secret Key Encryption, Public
Key Encryption, Virtual Private Network (VPM), Implementation Management Issues.

UNIT – IV

Electronic Payments

Overview of Electronics payments, Digital Token based Electronics payment System, SmartCards, Credit Card I Debit Card based EPS, Emerging financial Instruments, Home Banking,Online Banking.

UNIT-V

Net Commerce

EDA, EDI Application in Business, Legal requirement in E -Commerce, Introduction to supplyChain Management, CRM, issues in Customer Relationship Management.

Books:

1. Greenstein and Feinman, “E-Commerce”, TMH
2. Ravi Kalakota, Andrew Whinston, “Frontiers of Electronic Commerce”, Addision Wesley
3. Denieal Amor, “ The E-Business Revolution”, Addision Wesley
4. Diwan, Sharma, “E-Commerce” Excel
5. Bajaj & Nag, “E-Commerce: The Cutting Edge of Business”, TMH

5. MCA 406E: PHP and My SQL

UNIT-1:

Introduction to PHP

Evaluation of PHP, Basic Syntax, Defining variable and constant, Php Data type, Operatorand Expression.

Decisions and loop

Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html.

UNIT-2:

Function

What is a function, Define a function, Call by value and Call by reference, Recursive function, StringCreating and accessing, String Searching & Replacing String, Formatting String, StringRelated Library function

Array

Anatomy of an Array, Creating index based and Associative array Accessing array, ElementLooping with Index based array, Looping with associative array using each () and foreach(),Some useful Library function.

UNIT-3:

Handling Html Form with Php

Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission.

Working with file and Directories

Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting afile, working with directories, Creating and deleting folder, File Uploading & Downloading.

UNIT-4:

Session and Cookie

Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookieswith PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables,Destroying the variables and Session.

UNIT-5:

Database Connectivity with MySql

Introduction to RDBMS, Connection with MySql Database, Performing basic database operation(DML) (Insert, Delete, Update, Select), Setting query parameter, Executing queryJoin(Cross joins, Inner joins, Outer Joins, Self joins.)

Exception Handling

Understanding Exception and error, Try, catch, throw. Error tracking and debugging.

References:

1. Learning PHP, MySQL, books by ' O' riley Press

MCA 401 Java Programming Lab

1. Programs to illustrate constructors.
2. Programs to illustrate Overloading & Overriding methods in Java.
3. Programs Illustrate the Implementation of Various forms of Inheritance. (Ex. Single, Hierarchical, Multilevel inheritance….)
4. Program which illustrates the implementation of multiple Inheritance using interfaces in Java.
5. Program to illustrate the implementation of abstract class.
6. Programs to illustrate Exception handling
7. Programs to create packages in Java.
8. Program to Create Multiple Threads in Java.
9. Program to Implement Producer/Consumer problem using synchronization.
10. Program to Write Applets to draw the various polygons.
11.Create and Manipulate Labels, Lists, Text Fields, Text Areas & Panels

12. Handling Mouse Events & Keyboard Events.
13. Using Layout Managers.
14.Create& Manipulate the Following Text Areas, Canvas, Scroll bars, Frames, Menus, DialogBoxes.
15. Programs, which illustrate the manipulation of strings.
a. Ex. 1. Sorting an array of Strings.
1. Frequency count of words & Characters in a text.
16. Programs, which illustrate the use of Streams.
17. Java Program that reads on file name from the user and displays the contents of file.
18. Write an applet that displays a simple message.
19. Write an applet that computes the payment of a loan based on the amount of the loan, theinterest rate and the number of months. It takes one parameter from the browser: Monthlyrate; if true, the interest rate is per month; Other wise the interest rate is annual.
20. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttonsfor the digits and for the + - X % operations. Add a text field to display the result.
21. Write a Java program for handling mouse events.
22. Write a Java program for creating multiple threads
23. Write a Java program that correctly implements producer consumer problem using the conceptof inter thread communication.
24. Write a Java program that lets users create Pie charts. Design your own user interface (with
AWT)
25. Write a Java program that allows the user to draw lines, rectangles and ovals.
26. Write a Java program that illustrates how run time polymorphism is achieved.

TEXT BOOK

1. THE COMPLETE REFERENCE JAVA J2SE 5TH EDITION BY – HERBERT SCHILDT (TMH)

REFERENCE BOOKS

1. THE COMPLETE REFERENCE JAVA 2 (Fourth Edition) BY - PATRICK NAUGHTON & HERBETSCHILDT (TMH)
2. PROGRAMMING JAVA - DECKER&HIRSH FIELD VIKAS PUBLISKING (2001) (THOMSONLEARNING) (SECOND EDITON)
3. INTRODUCTION TO JAVA PROGRAMMING - Y.DANIEL LIANG PHI(2002)
4. OBJECT ORIENTED PROGRAMMING THROUGH JAVA 2 BY - THAMUS WU (Mc.Graw Hill)
5. JAVA 2 - DIETEL & DIETEL (PEARSON EDUCATION)
6. INTRODUCTION TO JAVA – BALA GURU SWAMY

7. INTRODUCTION TO PROGRAMMIND & OOD USING JAVA – JAINO NINE & FA HOSCH (JOHNWILEY)
8. STARTING OUT WITH JAVA – JONY GADDIS (DREAM TECH PRESS)

MCA 402 Computer Graphics and Multimedia Lab

1. Program using OpenGL library functions, to implement the basic primitives such as POINT, LINES, QUAD, TRIANGLES and POLYGON etc.
2. Program using OpenGL library functions, to implement the line chart as per user input. Input monthly data for period of one year.
3. Program to draw hard wired house by using basic primitives of OpenGL library functions.
4. Program by using OpenGL library functions, to implement the Digital Differential Analyser line drawing algorithm.
5. Program by using OpenGL library functions, to implement the Bresenham's Line drawing, Circle drawing, Mid-point Circle drawing and Mid-point Ellipsedrawing algorithms.
6. Program by using OpenGL library functions, to implement the Cohen-Sutherland Line clipping algorithm.
7. Program by using OpenGL library functions, to implement the Liang-Barsky Line clipping algorithm..
8. Program to demonstrate 2D and 3D transformations.
9. Window to Viewport Transformation
10. Splines Using OpenGL, 2D Animation

MCA 403 Software Engineering Labs

Use of Rational Rose 2.0/Higher

Objectives:

1. To know about Phases in software development project, overview, need, coverage of topics
2. To assign the requirement engineering tasks
3. To perform the system analysis : Requirement analysis, SRS
4. To perform the function oriented diagram : DFD and Structured chart
5. To perform the user's view analysis : Use case diagram
6. To draw the structural view diagram : Class diagram, object diagram
7. To draw the behavioral view diagram : Sequence diagram, Collaboration diagram
8. To draw the behavioral view diagram : State-chart diagram, Activity diagram
9. To draw the implementation view diagram: Component diagram
10. To draw the environmental view diagram : Deployment diagram
11. To perform various testing using the testing tool unit testing, integration testing

EXPERIMENT-1

Aim: Phases in software development project, overview, need, coverage of topics
Tools/ Apparatus: None.
Procedure:
1) Open an appropriate software engineering guide and study the software development life cycle and related topics.
2) Study the need of the software engineering.
3) Study the coverage of topics such as life cycle models and their comparisons.

EXPERIMENT-2

Aim: To assign the requirement engineering tasks.
Tools/ Apparatus: None.
Procedure:
1) Identify the different requirement engineering tasks.
2) Assign these tasks to various students to set the ball rolling.
3) Ask the students to start working on the given tasks.

EXPERIMENT-3

Aim: To perform the system analysis : Requirement analysis, SRS
Tools/ Apparatus: None.
Procedure:
1) Assign the group of the students different tasks of system analysis.
2) Ask students to meet different users and start analysis the requirements.
3) Ask students to give presentations group-wise of their system requirements analysis.

EXPERIMENT-4

Aim: To perform the function oriented diagram : DFD and Structured chart
Tools/Apparatus: Rational Rose Software.
Procedure:
1) Identify various processes, data store, input, output etc. of the system and askstudents to analyse.
2) Use processes at various levels to draw the DFDs.
3) Identify various modules, input, output etc. of the system and ask students to analyse.
4) Use various modules to draw Structured charts.

EXPERIMENT-5

Aim: To perform the user's view analysis : Use case diagram
Tools/Apparatus: Rational Rose Software.

Procedure:
1) Iidentify various processes, use-cases, actors etc. of the system and ask students toanalyse.
2) Use processes at various levels to draw the use-case diagram.

EXPERIMENT-6

Aim: To draw the structural view diagram : Class diagram, object diagram
Tools/Apparatus: Rational Rose Software.
Procedure:
1) Identify various elements such as classes, member variables, member functions etc. of the class diagram
2) Draw the class diagram as per the norms.
3) Identify various elements such as various objects of the object diagram
4) Draw the object diagram as per the norms.

EXPERIMENT-7

Aim: To draw the behavioral view diagram : Sequence diagram, Collaboration diagram
Tools/Apparatus: Rational Rose Software.
Procedure:
1) Identify various elements such as controller class, objects, boundaries, messages etc.
of the sequence diagram
2) Draw the sequence diagram as per the norms.
3) Identify various elements such as for the sequence diagram of the collaboration diagram
4) Draw the collaboration diagram as per the norms.

EXPERIMENT-8

Aim: To draw the behavioral view diagram : State-chart diagram, Activity diagram
Tools/Apparatus: Rational Rose Software.
Procedure:
1) Identify various elements states and their different transition of the state-chart diagram
2) Draw the state-chart diagram as per the norms.
3) Identify various elements such as different activity their boundaries etc. of the activity diagram
4) Draw the activity diagram as per the norms.

EXPERIMENT-9

Aim: To draw the implementation view diagram: Component diagram.

Tools/Apparatus: Rational Rose Software.
Procedure:
1) Identify various elements of the component diagram such as the various components like client, server, network elements etc.
2) Draw the component diagram as per the norms.

EXPERIMENT-10

Aim: To draw the implementation view diagram: deployment diagram
Tools/Apparatus: Rational Rose Software.
Procedure:
1) Identify various elements such as the hardware components of the deployment diagram
2) Draw the deployment diagram as per the norms.

EXPERIMENT-11

Aim: To perform various techniques for testing using the testing tool : unit testing, Integrationtesting
Tools/Apparatus: Winrunner.
Procedure:
1) Identify various modules of the system so that they can be tested stand alone.
2) Identify the groups of the module that can be tested together in integration.
3) Perform the testing of the modules as a unit and in integration by using the testing tool.

EXPERIMENT-12

Aim: To draw UML diagrams using Rational rose software.
Tools/Apparatus: Rational rose software.
Procedure:
1) Identify various elements of the system to be drawn using the IDE.
2) Use the UML options of the rational rose to draw the diagrams from experiment 4 to 10.

EXPERIMENT-13

Aim: To draw UML diagrams using MS Visio software.
Tools/Apparatus: MS Visio software.
Procedure:
1) Identify various elements of the system to be drawn using the IDE.
2) Use the UML options of the MS Visio software to draw the diagram from experiment 4 to 10.

Reference books:

1. Fundamentals of Software engineering,Rajib Mall.
3. Software design – From programming to architecture, Eric Braude
5. Object-oriented software engineering – A use case driven approach,Ivar Jacobson(Computer language productivity award winner)

MCA 404 Compiler Design and Language Processor Lab

Practice of LEX and YACC in windows/Linux OS. Practice of writing of programs either in C/C++/JAVA for implementation.

List of Experiments:

1. Design a lexical analyzer for given language and the lexical analyzer should ignoreredundant spaces, tabs and new lines. It should also ignore comments. Although thesyntax specification states that identifiers can be arbitrarily long, you may restrict thelength to some reasonable value. Simulate the same in C/LEX language.
2. Write a program to identify whether a given line is a comment or not.
3. Write a program to recognize strings under 'a', 'a*b+', 'abb'.
4. Write a program to test whether a given identifier is valid or not.
5. Write a program to simulate lexical analyzer for validating operators.
6. Implement the lexical analyzer using JLex, flex or other lexical analyzer generating Tools.
7. Write a program for implementing the functionalities of predictive parser for the miniLanguageas specified in **Note 1**.
8. Write a program for constructing of LL (1) parsing
9. Write a program for constructing recursive descent parsing.
10. Write a program to implement LALR parsing.
11. Write a program to implement operator precedence parsing
12. Write a program to implement Program semantic rules to calculate theexpression that takes an expression with digits, + and * and computes the value.
13. Convert the BNF rules into Yacc form and write code to generate abstract syntax treefor the mini language
14. Write a program to generate machine code from abstract syntax tree generated by theparser. The instruction set specified in **Note 2** may be considered as the target code.

Note 1:

A simple language written in this language is

{int a[3],t1,t2;

```
T1=2;
A[0]=1;a[1]=2;a[t]=3;
T2=-( a[2]+t1*6)/(a[2]-t1);
If t2>5then
Print(t2)
Else{
Int t3;
T3=99;
T2=25;
Print(-t1+t2*t3);/*this is a comment on 2 lines*/
}endif
}
```

Comments(zero or more characters enclosed between the standard C/JAVA Style comment brackets/*…*/)can beinserted .The language has rudimentary support for1-dimenstional array, the declaration int a[3] declares an array ofthree elements,referenced as a[0],a[1] and a[2].

Note:You should worry about the scoping of names.

Experiment with:

1. Write a program to compute FIRST for the following grammar?

E→ TE'
E' →+TE'/î
T →FT'
T'→*FT'/î
F→ (E)/i

2. Write a program to compute FIRST for the following grammar?

S→iCtSS'
S'→eS/ î

3. Write a program to construct predictive parsing table for the following grammar?

S→iCtSS'
S'→eS/ î

Note 2:

Consider the following mini language, a simple procedural high –level language, only operating on integer data, with asyntax looking vaguely like a simple C crossed with Pascal. The syntax of the language is defined by the followinggrammar.

<program>::=<block>
<block>::={<variable definition><slist>}
|{<slist>}
<variabledefinition>::=int<vardeflist>
<vardec>::=<identifier>|<identifier>[<constant>]
<slist>::=<statement>|<statement>;<slist>
<statement>::=<assignment>|<ifstament>|<whilestatement>
|<block>|<printstament>|<empty>
<assignment>::=<identifier>=<expression>
|<identifier>[<expression>]=<expression>
<if statement>::=if<bexpression>then<slist>else<slist>endif
|if<bexpression>then<slisi>endif
<whilestatement>::=while<bexpreession>do<slisi>enddo
<printstatement>:;=print(<expression>)
<expression>::=<expression>::=<expression><addingop><term>|<term>|<addingop>
<term>
<bexprssion>::=<expression><relop><expression>
<relop>::=<|<=|==|>=|>|!=
<addingop>::=+|-
<term>::=<term><multop><factor>|<factor>
<Multop>::=*|/
<factor>::=<constant>|<identifier>|<identifier>[<expression>]
|(<expression>)
<constant>::=<digit>|<digit><constant>
<identifier>::=<identifier><letter or digit>|<letter>
<letter or digit>::=<letter>|<digit>
<letter>:;=a|b|c|d|e|f|g|h|I|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z
<digit>::=0|1|2|3|4|5|^|7|8|9
<empty>::=has the obvious meaning

Experiment with:

1. Write a program to generate the code for the following three address code statements?
   A=B+C
   W=X-Y
2 Write a program to generate the code for the following three address code statements?
   W=(A+B)*C

MCA 409 Group Discussion/Seminar

Tasks:

Reading of newspapers, writing of articles, how to prepare seminars and reports, technical paper writing skills, GD on current topics, invited guest for spoken English, HR personnel from IT industries.

Note:10 things to succeed in Group Discussion

Read voraciously

Make a habit of reading voraciously on every subject. This will keep you ready for any topic for a discussion in GD Your knowledge is your most important weapon in a discussion.

Initiate the discussion

Most of us have a misconception that initiating the discussion would give you an advantage over others. It does give you an advantage but only if you know the subject well and have something relevant to start the discussion otherwise it is a disadvantage.

For e.g. when a group was given a subject “Is Capital punishment right?” some members of the group heard the word punishment and jumped at starting the discussion without understanding the meaning of Capital Punishment. The evaluators kept hearing for 2 minutes after which they intervened and asked the group if they knew the meaning of Capital Punishment. Not to say, the members who initiated were quite looking at each other’s faces. That is when a quite member of the group got up and explained the meaning of the topic. From this incidence, you can easily tell who must have succeeded in the GD, the ones who initiated the discussion or the one who explained the topic and gave it a right direction.

They say, “Speaking just for the sake of speaking is noise”. So, don’t create noise in the GD rather make some useful and resourceful contributions to get noticed in the discussion.

Speak politely and pleasantly

As you speak make sure that you do not speak at the top of your voice. You should be audible and clear. Remember that you are participating in a discussion which is different from a speech given out by the leaders in their rallies. Even if you disagree with the other’s point of view, disagree politely. Use phrases like, I would like to disagree a bit here, I am sorry but I think I have a slightly different point of view here.

Be précised

Abstain from using irrelevant information and data from your talks during a GD Speak precisely so that others also get a chance to put across their point of view.

Acquire and apply knowledge

Stay attentive to the ideas put forward by other group members and keep writing the important points discussed during the GD As you get a chance to speak, put forward your views about the topic. You can also agree or disagree with other's ideas, based on your knowledge about the subject.

Agree with the right

Don't take a stand on either extreme when the discussion begins. It might happen that you get convinced by other's argument and want to change your stand. Respect other's opinion as well and agree with what is right, even if you initially had a different opinion.

Speak confidently

Maintain your confidence as you speak. Establish eye contact with other members of the group and do not let your voice tremble.

Moderate

Try to moderate the discussion if any arguments arise. This is necessary to ensure that the group doesn't wander from the goal of the GD

Use positive body language

Your body language should not demonstrate dominance or low self-confidence. Show your interest in the discussion through your gestures like bending forward a bit, nodding your head.

Be a team player

Last but not the least; be a team player as this is a group activity. Be comfortable with the group members and vice versa.

Sample GD topics

- Reservation system should be stopped
- Donald Trump's presidency – Impact on India bad or good

- Divorce and remarriage should be encouraged
- Reservation for women would help the society
- Hindi movies are harming our society
- Live-in relationships should be encouraged
- India should be reorganized into smaller states
- IT boom and the growing pressure
- Smaller businesses and start-ups have more scope
- Developing countries need trade, not aid
- China is a threat to Indian IT industry
- Should agricultural subsidies be stopped?
- Multinational corporations: Are they devils in disguise?
- Business and Ethics do not go together
- Indian culture doesn't breed leaders
- India - really the NexGen superpower
- Fate of Apple after Steve Jobs
- FDI in Retail - Will really affect the farmers of India?
- EU Zone Crisis - reason for rising value of dollar
- US Debt Crisis - really has an impact on world market
- Should central government provide West Bengal a moratorium on loan repayments?
- Sanctions against Iran - right or wrong?
- FDI in Indian retail should be welcomed
- China market - a threat to Indian market
- Black money in tax heavens - declared national property
- Rising petrol prices - Govt. can control?
- Government should give up the control on CBI
- US war on Iraq-justified or not?
- Depreciation of Indian Rupee has only negative impact on the economy
- Nokia and Microsoft are a planned alliance or desperate move?
- RBI cannot control inflation with its temporary monetary policies
- Ditching the Kyoto Protocol - Is India's objection on EU justified?

Important:

Each student has to arrange summer training/internship in Industry or Educational Institute for 2 to three months duration or research work followed by depositing a project report and presentation in fifth semester. The internship shall be evaluated in fifth semester.