

Course Structure and Syllabus
of
Master in Computer Application
(2 YEAR PROGRAMME)



(From the Session 2020-21)

INDIRA GANDHI INSTITUTE OF TECHNOLOGY, SARANG
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INDIRA GANDHI INSTITUTE OF TECHNOLOGY, SARANG
Course Structure and Syllabus for MCA

FIRST YEAR

First Semester				Second Semester			
Theory				Theory			
Course Code	Course Name	L-T-P (Periods/Week)	Credits	Course Code	Course Name	L-T-P (Periods/Week)	Credits
20CAC101	Problem Solving & Programming Using C	3-0-0	3	20CAC203	OOPs Using C++	3-0-0	3
20CAC102	Computer Organization and Architecture	3-1-0	4	20CAC204	Operating System	3-0-0	3
20CAS101	Mathematical Foundations and Computing	3-0-0	3	20CAC205	Database Management System	3-0-0	3
20CAH101	Communicative English	3-0-0	2	20CAC206	Design of Algorithms with Data Structures	3-1-0	4
20CAH102	Engineering Economics & Accounting	3-0-0	3	20CAC207	Formal Languages and Automata Theory	3-0-0	3
Total (Theory)		16	15	Total (Theory)		16	16
Practical/ Sessional				Practical/ Sessional			
20CAL101	Problem Solving using C Lab	0-0-3	2	20CAL204	OOPs using C++ Lab	0-0-3	2
20CAL102	Communicative English Lab	0-0-3	2	20CAL205	Database Management System Lab	0-0-3	2
20CAL103	Computer Organization Lab	0-0-3	2	20CAL206	Algorithms with Data Structures Lab	0-0-3	2
Total (Practical/ Sessional)		09	06	Total (Practical/ Sessional)		09	06
TOTAL		25	21	TOTAL		25	22
TOTAL SEMESTER CREDITS: 21				TOTAL SEMESTER CREDITS: 22			
TOTAL CUMULATIVE CREDITS: 21				TOTAL CUMULATIVE CREDITS: 43			

INDIRA GANDHI INSTITUTE OF TECHNOLOGY, SARANG

Course Structure and Syllabus for MCA

SECOND YEAR

Third Semester				Fourth Semester			
Theory				Theory			
Course Code	Course Name	L-T-P (Periods/ Week)	Credits	Course Code	Course Name	L-T-P (Periods/ Week)	Credits
20CAC308	Programming with Java	3-0-0	3	20CAC411	Artificial Intelligence	3-0-0	3
20CAC309	Data Communications and Computer Networks	3-0-0	3	20CAC412	Object Oriented Software Engineering	3-0-0	3
20CAC310	Compiler Design	3-0-0	3	20CAC413	Python Programming	3-0-0	2
	Elective-I (Any One)	3-0-0	3				
20CAE301	Wireless Ad Hoc & Sensor Networks						
20CAE302	Cloud Computing						
20CAE303	Internet of Things						
20CAE304	Soft Computing						
20CAE305	Mobile Computing						
20CAE306	Simulation Modeling						
20CAE307	Optimization Techniques						
	Elective-II (Any One)	3-0-0	3				
20CAE308	Data warehousing and Data Mining						
20CAE309	Machine Learning						
20CAE310	Big Data Analytics						
20CAE311	Data Science with Applications						
20CAE312	Natural Language Processing						
20CAE313	Information Retrieval System						
20CAE314	High Performance Computing						
	Total (Theory)	15	15		Total (Theory)	09	08
	Practical / Sessional				Practical/ Sessional		
20CAL307	Java Programming Lab	0-0-3	2	20CAJ403	Project Work	0-0-6	12
20CAL308	Computer Networks Lab	0-0-3	2	20CAJ404	Comprehensive Viva Voce	0-0-3	4
20CAJ301	Seminar & Technical Writing	0-0-3	2				
20CAJ302	Summer Internship Evaluation	0-0-2	2				
	Total (Practical/ Sessional)	11	08		Total (Practical/ Sessional)	09	16
	TOTAL	26	23		TOTAL	18	24
TOTAL SEMESTER CREDITS: 23				TOTAL SEMESTER CREDITS: 24			
TOTAL CUMULATIVE CREDITS: 66				TOTAL CUMULATIVE CREDITS: 90			

CATEGORY: C: CORE; E: ELECTIVE; L: LABORATORY; H: HUMANITIES; S: BASIC SCIENCES
J: PROJECT, SEMINAR, VIVA, INTERNSHIP

Detail Syllabus FIRST SEMESTER

20CAC101 **Problem Solving & Programming Using C** (3-0-0) **Credit 3**

Course Objectives:

The course is designed to provide knowledge of C language and programming concepts. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Module I **(10hours)**

Problem-Solving Through Computers: Problem Solving Strategies, Flow Charts, Algorithms, and Pseudo Codes, Structured Programming Approach, Compiling, Linking and Executing, Syntax and Semantic errors.

C Programming Basics: Character Set, Key Words, Identifiers, Data Types, Variables and Constants, Operators and Expressions, Type Conversions.

Control Structures: Branching - If, Nested if-else and Switch, Looping - While, Do-While and For, Unconditional Jumps - Continue, Break and GOTO.

Arrays and Strings: Concept of Arrays, One Dimensional and Multidimensional Arrays, Applications of Arrays, Concept of Strings, String Handling Functions, Array of Strings.

Module II **(10 hours)**

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 III **(10 hours)**

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

Dynamic Memory Management: Concepts and Implementations.

Advance Structures: Sparse Matrixes, Self-Referential Structures, Linked Lists - Single Linked Lists, Double Linked Lists, Circular Linked Lists.

Module IV **(10 hours)**

Input and Output Models: Console I/O Concepts and Operations, File I/O Concepts, Defining a File, Opening and Closing a File, I/O Operations in Files, Random Access to Files, Error Handling.

Command Line Arguments: What is Command Line and Why Command Line, Implementations, Use of Environment Vector. **Pre-Processing:** Dealing with Important Pre-Processor Directives. **Graphics**

Programming: Drawing Different Shapes, Using Colours, Pens and Brushes, Displaying Bitmaps, Animations.

Course Outcomes:

Learning Outcomes: Upon completion of this course, students will acquire knowledge about: Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems. Demonstrate an understanding of computer programming language concepts. To be able to develop C programs

Textbooks:

1. Herbert Schildt, "C The Complete Reference", McGraw-Hill Publication.
2. Byron Gottfried, "Schaum's Outline of Programming with C", McGraw-Hill.

Reference Books:

1. Pradip Dey, Manas Ghosh, "Programming in C", Second Edition, Oxford University Press, 2011.
2. Brian W. Kernighan, Dennis Ritchie, "The C Programming Language" (2nd Edition), 1988, Prentice Hall.
3. E. Balagurusamy, "Programming in ANSI C", 4th edition, 2007, McGraw-Hill Publication, New Delhi. (Module 1: Chapters 1-4, Module 2: Chapters 5-8, Module 3: Chapters 9, 11, Module 4: Chapters 10, 12-14).
4. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.
5. K.R. Venugopal, S.R. Prasad, "Mastering C", McGraw-Hill Education India.
6. Online Link (Mooc): <https://nptel.ac.in/courses/106/104/106104128/>

20CAC102 Computer Organization and Architecture (3-1-0) Credit 4

Course Objectives:

The course is designed to provide a complete knowledge on Computer Hardware, Processing and designing structure. Students shall be able to develop logic circuits for creating new computer devices using various architectures. They will learn about various Microprocessor and Microcontrollers which will help them for developing new electronic devices. Also, by learning the Assembly language programming leads to improve advanced programming in different ports and fields.

Module I**(10 Hours)**

Number system - Binary, decimal, octal, hexadecimal, Conversion - Binary to decimal, decimal to binary, octal to decimal, decimal to octal, octal to binary, binary to octal, hexadecimal to binary, binary to hexadecimal, hexadecimal to Decimal, decimal to hexadecimal, hexadecimal to octal, octal to hexadecimal, Binary arithmetic – Addition, subtraction (simple method), Logic gates - AND, OR, NOT, NAND, NOR, Exclusive-OR, Exclusive NOR, Combinational circuits - Design of Combinational Circuits – Adder / Subtractor – Encoder – Decoder – MUX / DEMUX, Flip-Flops, Counters, Registers

Module II**(10 Hours)**

Basic Computer Organization and Design: Instruction codes, computer registers, computer instructions, timing & control, instruction cycle, memory reference instructions, input-output and interrupts, design of basic computer, design of accumulator logic. Micro-programmed Control Unit: Control memory, address sequencing. Central Processing Unit: Introduction, general register organization, stack organization, instruction formats, addressing modes.

Module III**(10 Hours)**

Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware. **Multiprocessors:** Characteristics of multiprocessor, Interconnection Structure, Inter-process Communication & Synchronization.

Module IV**(10 Hours)**

Basic Processing Unit: Fundamental Concepts, Execution of Complete Instruction, Multi-bus Organization, Hardwired control, Micro-programmed control. I/O Interface, Isolated vs Memory Mapped I/O, Mode of transfer: Programmed I/O, interrupt I/O, DMA.

Pipelining: Basic Concepts, Parallel Processing, Pipeline Hazards, Data Hazard, Structural Hazard, Control Hazard, Super Scalar Operation.

Course Outcomes:

CO1: Gain knowledge on Logic Gates and Integrated circuits.

CO2: Gain knowledge in Processing units and Memory Management inside computer.

CO3: Gain knowledge to handle memory and interrupt

Textbooks:

1. M. Mano, —Computer System and Architecture, 3rd Edition, PHI Publication
2. W Stallings, —Computer Organization & Architecture, PHI Publication

Reference Books:

1. J. P. Hayes, —Computer Architecture and Organization, McGraw Hill Publication.
2. Carl Hamacher, Zvonko Vranesic, Safawat Zaky, —Computer Organization, Tata McGraw Hill Publication.
3. Link for online reference: <https://nptel.ac.in/courses/106/105/106105163/>

20CAS101**Mathematical Foundations and Computing****(3-0-0) Credit 3****Module-I****(10 hours)**

Computer arithmetic, errors, significant digits, machine computation, numerical solution of algebraic and transcendental equations by simple iteration method, Bisection method, Regula-falsi method, Newton-Raphson method and their rate of convergence.

Module-II**(08 hours)**

Solution of simultaneous linear system of equations by Cramer's Rule, Stability, Gauss-elimination method, Gauss-Jordan method, Matrix inversion by Gauss-Jordan method, LU decomposition, Iterative method for solving linear equations by Gauss-Jacobi and Gauss-Seidel method, Eigen value & Eigen vector problems.

Module-III**(12 hours)**

Graph Theory, Path and Circuits: History of Graph Theory, Introduction to graph Theory, Application of Graph, Finite and Infinite Graph, Incidence and Degree, Isolated Vertex, Pendant Vertex, Null Graph,

Isomorphism, Sub graphs, A Puzzle with Multicolored Cubes, Walkspaths and Circuits, Connected, Disconnected and Component of Graph, Euler Graphs, Operation on Graph, Hamiltonian Path, Travel Salesman Problem.

Module-IV**(12 hours)****Trees and Fundamental Circuits:**

Trees, Properties of trees, Vertices of Trees, Distances and Centre in a tree, Rooted and Binary Tree, Spanning Tree, Fundamental Circuits, Spanning tree in a weighted Graph. **Cut Sets and Cut Vertices:** Cut Sets, Cut Set in a Graph, Fundamental Circuits, Connectivity and Separability, Network Flow, Isomorphism.

Textbooks:

1. M.K. JAIN, S.R.K. IYENGER, R.K. JAIN, Numerical methods for scientific and engineering computation, New Age International Limited
2. Probability & Statistics for Engineers & Scientists “WALPOLE MYERS YE” 7th Editions
3. NARSINGH DEO, Graph Theory with Applications to Engineering and Computer Science, PHI Learning Private Limited. Ch. 1, 2 3,4.

Reference books:

1. T. Veerarajan and T. Ramachandran, Theory and problems in Numerical methods, Tata McGraw-Hill Publications, New Delhi. Chapter-9.
2. J. H. Mathews, “Numerical methods for Mathematics, Science and Engineering”, PHI publication

20CAH101**Communicative English****(3-0-0)****Credit 2****Course Objectives:**

- ❖ To develop communication skills and soft skills of students. To enhance the ability to use targeted grammatical structures meaningfully and appropriately in oral and written production
- ❖ To improve their general English knowledge that can assist them towards achieving their goal of effectively communicating in English.
- ❖ To enhance the ability of students to participate in group discussion and personal interviews.
- ❖ To familiarize the student with the sounds of English in a nutshell, particularly long and short vowels, some consonants, stress and intonation.

Module I**(8 hours)****The Basics of Communication**

Introduction to business communication: Meaning, importance, the process of communication, factors of communication, principles of communication, verbal and nonverbal communication, barriers to communication, channels of communication, cross cultural communication. Difference between Professional and General communication.

Module II**(12 hours)****The Sounds of English:**

Vowels, diphthongs, consonants, Problem sounds. The International Phonetic Alphabet (IPA), consonant clusters. phonemic transcription. Syllabic division and word stress. Sentence rhythm and weak forms. Contrastive stress in sentences. Intonation: falling, rising and fall-rise tones.

Module III**(10 hours)**

Reading Comprehension and Technical Writing **Reading Comprehension:** Reading: Sub-skills of reading- Reading for comprehension, comprehending the text, Skimming, Scanning, Getting the meanings of unfamiliar words, Note making, Summarizing. The following Texts are to be covered in classroom: The Road Not Taken by Robert Frost, Hunger by Jayanta Mahapatra, Lead, Kindly Light by Saint John Henry Newman, On Freedom and Order by Jiddu Krishna murti, The Magic of Team Work by Sam Pitroda. **Technical Writing:** Process writing, Coherence and Cohesion, Business letters, Job Application, Letters, Resume Reports, Proposals. **Functional Grammar:** Verbs, Tense, Concord, Voices, Conditionals, Direct and Indirect Speech, Elimination of common errors.

Module IV**(10 hours)****Presentation Skill**

Oral presentations, Interviews, Group discussion, Soft skills, Business Etiquette.

Recommended Books:

1. Das, B.K. et al. An Introduction to Professional English and Soft Skills: Cambridge University Press
2. Conner, J.D.O. Better English Pronunciations: Cambridge University Press.
3. Leech, G.N. and Jan Svartik. A Communicative Grammar of English: OUP.

Reference Books:

1. Chaturvedi & Chaturvedi. Business Communication- Concepts, Cases & Applications: Pearson.
2. Rai, Urmila. and S M Rai. Communication for Management: HPH.
3. Online Reference: <https://nptel.ac.in/courses/109/106/109106067/>

20CAH102**Engineering Economics & Accounting****(3-0-0)****Credit 3****Course Objective:**

To help the students to acquire conceptual knowledge of Economic Laws, Financial Accounting and application of principles and practices of Financial Management in the decision-making process to justify or reject long term investment proposals.

Module-I**(8 hours)**

Economics- Nature and scope, The theory of demand, demand function, law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Determination of equilibrium price under perfect competition (Simple Numerical problems to be solved).

Module- II**(8 hours)**

Cost Concepts, Elements of cost, Segregation of costs into Fixed and variable costs. Break-even Analysis- Linear Approach. (Simple Numerical problems to be solved). Depreciation Policy, Depreciation of capital assets, Causes of depreciation, Straight line method and declining balance method

Module-III**(10 hours)**

Accounting process and principles, Elements of book keeping, Journal, , Ledger, cash book, Bank reconciliation statement, trial balance, profit and loss accounts, final accounts of proprietary and partnership concern and balance sheet. Cash Flow Analysis.

Module- IV**(10 hours)**

Financial Management – Meaning, scope and role, Time value of money. Long Term Investment Decision- Payback period method, Present worth method, Future worth method, Annual worth method, Internal rate of return method. Ratio Analysis, Types of ratios. Budgeting – budgets, purpose, budgetary control, preparation of budgets master budget, fixed and flexible budgeting.

Course Outcomes

1. Be able to understand the Microeconomic laws.
2. Be able to evaluate the corporate governance structure of a firm and long term investment decisions.
3. Memorize how to calculate Break Even Point and Depreciation by applying various methods.
4. Be able to maintain the financial statements of a business entity

Reference Books:

1. “Bookkeeping and Accountancy” Choudhari, Chopde.
2. “Cost Accounting”: Choudhari, Chopde.
3. “Financial Management” Text and Problems: M.Y.Khan, P.K.Jain.
4. “Financial Management Theory & Practice” Prasanna ChandraTata McGraw Hill.
5. Managerial Economics & Financial Analysis, Siddiqui S.A.Siddiqui A.S. New Age.
6. Online Reference: <https://nptel.ac.in/courses/112/107/112107209/>

20CAL101**Problem Solving Using C Lab****(0-0-3)****Credit 2**

Implementation of solutions to problems that involves the following:

1. Branching, iterations, and jumps.
2. One-dimensional arrays and matrixes.
3. Sparse matrixes.
4. Strings and string-handling.
5. Pointers, address operators and pointer arithmetic, pointers to arrays, pointers to pointers.
6. Modular program development using functions.
7. Recursions.
8. Structures, unions, and enumerations, accessing their members, pointers to structures and unions.
9. Self-Referential Structures and linked lists.
10. Files and file operations, standard streams, Command line arguments.
11. Different pre-processor directives.
12. Graphics programming.

20CAL102**Communicative English Lab****(0-0-3)****Credit 2**

- Communication process and the major types of written, verbal and nonverbal communications, business and professional communication, Cross cultural communication.
- Composing a letter or memo using clear, concise language as required for a defined audience.
- Types of business messages including good news, unfavorable news, persuasive messages, sales messages, or general information.

- Business reports or proposals demonstrating the ability to gather, organize and present information.
- Oral business presentation in a clear, confident, and effective manner, with visual aids (if needed).
- Interpersonal communication skills: cooperation in the business environment, including organizing meetings, working in teams.

Course Outcome:

- Demonstrate preparation and research skills for oral presentations
- Develop proper listening skills
- Articulate and enunciate words and sentences clearly and efficiently
- Show confidence and clarity in public speaking projects
- Demonstrate ability to gather information and apply it to persuade or articulate one's own point of view
- Understand the rules of spelling and grammar
- Read and analyze text and be able to summarize ideas in writing
- Organize thoughts in a manner that emphasizes flow and paragraph development
- Understand different writing techniques

20CAL103

Computer Organization Lab

(0-0-3)

Credit 2

Experiment List

1. a) Identification of different components of a PC.
b) Assembling & disassembling of a PC.
2. Study of different troubleshooting of a dot matrix printer using LX 1050+ Printer/TrainerModule.
3. Study of the functions of SMPS using SMPS Trainer Kit.
 - a) Study of SMPS with Single Output under Line Regulation.
 - b) Study of SMPS with Multi Output under Line Regulation.
 - c) Study of SMPS with Single Output under Load Regulation.
4. Study of different troubleshooting of CPU using CPU Trainer Module.
5. Design of digital circuits (H/A, F/A, Decoder & Encoder) in VHDL using Active VHDL.
6. Design of digital circuits (MUX, DEMUX & ALU) in VHDL using Active VHDL.
7. Write a C program to perform signed bit multiplication using Booth's algorithm.
8. Write a C program for IEEE-754 floating point representation and perform Addition/Subtraction.

Detail Syllabus
SECOND SEMESTER

20CAC203**OOPs Using C++****(3-0-0)****Credit 3**

Course Objectives: The educational Objectives of this Course are: Provide flexible and powerful abstraction • Allow programmers to think in terms of the structure of the problem rather than in terms of the structure of the computer. • Decompose the problem into a set of objects • Objects interact with each other to solve the problem • create new type of objects to model elements from the problem space

Module-I **(10 hours)**

Principles of Objective Oriented Programming Object Oriented Programming Paradigm, Basic Concepts of Object Oriented Programming, Benefits of Object Oriented Programming, Object Oriented Languages, Applications of Object Oriented Programming, Beginning with C++, Token Expressions & Control Structures Tokens, Keywords, Identifiers and Constants, Data Types, Type Compatibility, Variables, Operators in C++, Implicit Conversions, Operator Overloading, Operator Precedence, Control Structures.

Module-II **(10 hours)**

Functions in C++, Classes & Objects. The Main Function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, Function Overloading, Friend and Virtual Functions. Specifying a class, Member Functions, Arrays within a class, Static Member Functions, Arrays of Objects, Friendly Functions.

Module-III **(8 hours)**

Constructors & Destructors, Operator Overloading, Inheritance Constructors, Parameterized Constructors, Copy Constructors, Dynamic Constructors, Destructors, Defining Operator Overloading, Overloading Operators, Rules for Overloading Operators, Type Conversions

Module-IV **(10 hours)**

Pointers, Virtual Functions & Polymorphism, Working with Files, Exception handling Pointers, Pointers to Objects, this pointer, Pointer to Derived Classes, Virtual Functions, Classes for File Stream Operations, Opening and Closing a File, File Modes, File Pointers, Input Output Operations, Updating a File. An Object Oriented Approach in Real Life Problems.

Text Books:

1. Object Oriented Programming with C++, E. Balagurusamy, Sixth Edition-2013, McGraw Hill Education (India) Private Limited, New Delhi.
2. H. Schildt - C++ The Complete Reference, 4th Edition, Tata McGraw-Hill, New Delhi.

Reference Books

- (i) A. N Kanthane, Object Oriented Programming with ANSI & Turbo C++ , Pearson Education, New Delhi.
- (ii) Object Oriented Programming in C Robert Lafore – SAMS Publishing.
- (iii) Object-Oriented Programming With C++, Poornachandra Sarang, 2nd Edition, PHI Learning Private Limited, New Delhi, 2009.
- (iv) Object-Oriented Programming Using C++, Alok Kumar Jagadev, Amiya Kumar Rath and Satchidananda Dehuri, Prentice-Hall of India Private Limited, New Delhi, 2007.
- (v) Online Refrence: <https://nptel.ac.in/courses/106/105/106105151/>

20CAC204**Operating System****(3-0-0)****Credit 3****Course Objectives:**

The objective of the course is to understand fundamental operating system terminologies like processes, threads, files, semaphores, IPC, shared memory regions, etc., to understand how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions. Understand the principles of concurrency and synchronization, resource management techniques

MODULE-I**(10 Hours)**

Introduction to OS: Definition, Evolution and Types of Operating System, user's view & System view of Operating system, Hardware protection: Dual mode operation, I/O protection, Memory Protection, CPU protection. System components of operating system, operating system services, Understanding System calls with examples.

MODULE-II**(10Hours)**

Process Management: Process Identification & its state, PCB, Process Scheduling: scheduling criteria, different types of scheduler: long term, short term, medium term, Types of scheduling: Pre-emptive, Non-pre-emptive, FCFS, SJF, SRTF, Round Robin, Priority scheduling, multilevel queue scheduling, multilevel feedback queue scheduling, Real time scheduling, context switching, Process creation, Inter Process Communication. Process Synchronization: Cooperating process, Critical Section problem and solution for two processes and multiple process. Semaphore. Classic synchronization Problems: Producer-Consumer, Reader-Writer, Dining philosopher. Deadlock: Necessary condition, RAG, methods to handle deadlock: Prevention, detection and avoidance algorithms, Recovery from deadlock. Introduction to Threading.

MODULE-III**(10Hours)**

Memory Management: Address binding, Logical-vs-physical address space, Swapping, Contiguous memory allocation, Fragmentation, Non-contiguous memory allocation: paging, segmentation, H/W support for Paging & Segmentation, Protection and sharing in paging & segmentation. Virtual Memory: demand paging, Page replacement policy: FIFO, LRU, Optimal, Belady's anomaly, allocation of frames, thrashing

MODULE-IV**(8 Hours)**

File Management: File attribute, File operations, file access method, File protection, File system structure, directory implementation, Allocation methods. Disk Management: Disk Structure, Disk scheduling.

Text book:-

1. Operating System Concept by Galvin Silverschatz Gagne, Wiley Publication

Reference Book:

1. *Modern Operating System*, A.S.Tanenbaum ,PHI Publishers
2. Online Reference: <https://nptel.ac.in/courses/106/105/106105214/>

Course Outcomes:

1. To know about the requirement of OS.
2. To know about the process and its Management.
3. To know about the memory management.
4. To know about the creation of file and its management.

20CAC205**Database Management System****(3-0-0)****Credit 3****Course Objective:**

Student should be able to

- Define Database system formally and informally
- Explain elementary and advanced database structures
- Explain the different ER model, mapping and relationship for solving typical problems
- Describe the process of file organizations and index.
- Explain the complexity of algorithms
- Design Normalization and Query optimization technique.
- Explain Database recovery and failure techniques.

Module-I**(10 Hours)**

Introduction to database Systems, advantages of database system over traditional filesystem, Basic concepts & Definitions, Database users, Database Language, Database System Architecture, Schemas, Sub Schemas, & Instances, database constraints, 3-level database architecture, Data Abstraction, Data Independence, Mappings, Structure, Components & functions of DBMS, Data models.

Module-II**(10 Hours)**

Entity relationship model, Components of ER model, Mapping E-R model to Relational Schema. Storage Strategies: Detailed Storage Architecture, Storing Data, Magnetic Disk, RAID, Other Disks, Magnetic Tape, Storage Access, File & Record Organization, File Organizations & Indexes, Order Indices, B+ Tree Index Files, Hashing, Data Dictionary. .

Module-III**(10 Hours)**

Relational Algebra (RA), Tuple Relational Calculus (TRC) and Domain Relational Calculus (DRC), Relational Query Languages: SQL and QBE. Database Design: Database development life cycle (DDL), Automated design tools, Functional dependency and Decomposition, Join strategies, Dependency Preservation & lossless Design, Normalization, Normal forms: 1NF, 2NF, 3NF, and BCNF, Multi-valued Dependencies, 4NF & 5NF. Query processing and optimization: Evaluation of Relational Algebra Expressions, Query optimization, Query cost estimation.

Module-IV**(10 Hours)**

Transaction processing and concurrency control: Transaction concepts, properties of transaction, concurrency control, locking and Timestamp methods for concurrency control schemes. Database Recovery System: Types of Database failure & Types of Database Recovery, Recovery techniques. Fundamental concepts on Object-Oriented Database, Object relational database, distributed database, Parallel Database, Data warehousing & Data Mining, Big Data and NoSQL.

Text Books:

1. Database System Concepts by Sudarshan and Korth ,6th edition, McGraw-Hill Education.
2. Fundamentals of Database System by Elmasari&Navathe, Pearson Education.
3. Fundamentals of Database Management System by Gillenson, Wiley India.

References Books:

1. Database Management Systems by Ramakrishnan, McGraw-Hill Education.
2. Database management system by leon&leon, Vikas publishing House.
3. Database System: Concept, Design & Application by S.K.Singh, Pearson Education.
4. An introduction to Database System – Bipin Desai, Galgotia Publication.
5. Online reference: <https://nptel.ac.in/courses/106/105/106105175/>

Course Outcomes

- CO1- Graduate will be able to evaluate and analyze Database system.
- CO2- Graduate will be able to understand Database Language, System Architecture, Schemas etc.
- CO3- Graduate will be able to understand E-R model to Relational Schema. Storage Strategies etc.
- CO4- Graduate will be able to understand Tuple Relational Calculus, Normalization and Query processing and optimization.
- CO5- Graduate will be able to adopt best techniques to solve recovery and failure of database system.
- CO6-To develop appropriate Databases to a given problem that integrates ethical, social, legal, and economic concerns.

20CAC206 Design of Algorithms with Data Structures (3-1-0) Credit 4

Course Objective

Student should be able to

- Define algorithm formally and informally
- Explain elementary and advanced data structures
- Explain the different algorithms for solving typical problems
- Describe the process of algorithm design and analysis
- Explain the complexity of algorithms
- Design recursive and non-recursive algorithms for, say, computing a Fibonacci number
- Explain P, NP and NP-completeness

Module-I (10 Hours)

Introduction: Role of Algorithms in Computing, Analyzing Algorithms, Designing Algorithms, Asymptotic Notation, Standard Notations and Functions. Advance data structure linear vs non linear data structure. Recurrences, solution of recurrences by substitution, recursion tree and Master methods,

Module-II (10 Hours)

Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, extendible Hashing. Heap Structure: Min-Max heap, Binomial heaps, Search and Tree Structure: Binary Search Tree, AVL Tree, Priority Queue, Lower bounds for sorting.

Module-III (10 Hours)

Divide and Conquer:(Quick sort ,Merge sort, Strassen's algorithm for Matrix) **Dynamic Programming:** (LCS, Floyd-Warshall Algorithm, Matrix Chain Multiplication) **Greedy Algorithm:** (Single Source Shortest Path, Knapsack problem, Minimum Cost Spanning Trees(Kruskal's and Prim's algorithm) The Huffman coding algorithm,) **Geometric Algorithm:** (Convex hulls, Segment Intersections, Closest Pair)

Internet and Network flow Algorithm: (Text pattern matching(Naive and Rabin-Krap algorithm) Flow Network,cut, Ford-Fulkerson method) **Graph Algorithm:**(Breadth First search, Depth First search) **Backtracking:** – n-Queens problem Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound.

Module-IV**(10 Hours)**

Polynomial Time, Polynomial-Time Verification, NP Completeness & reducibility, NP Completeness proofs, Cook's theorem, Approximation algorithm, Vertex cover algorithm, Travel Sales man problem.

Text Book

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition , PHI Learning Private Limited, 2012.

Reference Books

1. Anany Levitin, " Introduction to the Design and Analysis of Algorithms", 3rd Edition, Addison- Wesley Longman, 2011.
2. E. Horowitz, S. Sahani and Dinesh Mehta, "Fundamentals of Data Structures in C++", 2nd Ed,University Press.
3. Mark Allen Weiss, "Data Structures & Algorithm Analysis in C/C++", Pearson Edu. India.
4. Adam Drozdex, "Data Structures and algorithms in C++", Thomason learning.
5. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
6. Online reference: <https://nptel.ac.in/courses/106/102/106102064/>

Course Outcomes

- CO1- Graduate will be able to evaluate and analyze complexity of the algorithm.
- CO2- Graduate will be able to understand divide and conquer technique of the algorithm.
- CO3- Graduate will be able to understand Dynamic and Greedy programming in algorithm design.
- CO4- Graduate will be able to understand Internet and Backtracking can be used in algorithm
- CO5- Graduate will be able to adopt best algorithm design techniques to solve the given problems.

20CAC207**Formal Languages and Automata Theory****(3-0-0)****Credit 3**

Course Objectives: The **objective** of this **course** is to explore the **theoretical** foundations of computer science from the perspective of **formal languages** and classify machines by their power to recognize **languages**.

Module-I**(10 Hours)**

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

Module-II**(10 Hours)**

Context free grammars and pushdown automata. Chomsky and Griebach normal forms. Parse trees, Cook, Younger, Kasami, and Early's parsing algorithms. Ambiguity and properties of context free languages. Pumping lemma, Ogden's lemma, Parikh's theorem. Deterministic pushdown automata, closure properties of deterministic context free languages.

Module-III**(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, μ -recursive functions, recursiveness of Ackermann and Turing computable functions.

Module-IV**(10 Hours)**

Church Turing hypothesis. Recursive and recursively enumerable sets. Universal Turing 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.

Text Books:

1. Introduction to Automata Theory, Languages and Computation: J.E. Hopcroft and J.D Ullman, 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, Wiley India, 2nd Edition.
3. Online reference: <https://nptel.ac.in/courses/106/106/106106049/>

20CAL204**OOPs using C++ Lab****0-0-3****Credit 2****Experiment List:**

1. Programs on concept of classes and objects.
2. Programs using inheritance.
3. Programs using static polymorphism.
4. Programs on dynamic polymorphism.
5. Programs on operator overloading.
6. Programs on dynamic memory management using new, delete operators.
7. Programs on copy constructor and usage of assignment operator.
8. Programs on exception handling.
9. Programs on generic programming using template function & template class.
10. Programs on file handling.

20CAL205**Database Management System Lab****0-0-3****Credit 2**

1. Introduction SQL-SQL*Plus
2. Road way travels E-R Diagrams
3. Various Data Types
4. Tables
5. My SQL Installation
6. DDL and DML Commands with Examples
 - a) Use of SQL syntax: creation, insertion, and SQL queries with where clause.
 - b) (Use of SQL syntax: deletion, updating, and SQL queries using where clause.

c) (Use of SQL syntax: join statements and SQL queries including where clause.

7. Key Constrains-Normalization
8. Aggregate functions
9. Joins
10. Views
11. Index
12. PL/ SQL
13. Exception handling
14. Triggers
15. Cursors
16. Subprograms-procedure PL/ SQL
17. Functions of PL/ SQL
18. Extra-programs
19. Concurrency control problem using lock operations.
20. Programs on ODBC using either VB or VC++.

20CAL206

Algorithms with Data Structures Lab

0-0-3

Credit 2

List of Experiments

1. Using a stack of characters, convert an infix string to postfix string.
2. Implement insertion, deletion, searching of a BST.
3. Implement binary search and linear search in a program
4. (a)Write a program to demonstrate Masters Theorem.

(b) Take different input instances for both the algorithm and show the running time.
5. Implement Hashing function in a program.
6. Implement a heap sort using a Max/Min heap.
7. (a)Implement a heap sort using a Binomial heap.

(b) Write a program on Heap sort based on priority sorting.
8. (a) Write a program on Quick sort algorithm.

(b) Write a program on merge sort algorithm.
9. Implement AVL tree in a program.
10. Implement Strassen's matrix multiplication algorithm.
11. Using dynamic programming implement LCS.
12. (a) Implement DFS/ BFS for a connected graph.

(b) Implement Dijkstra's shortest path algorithm using BFS.
13. (a)Implement MST using Kruskal/Prim algorithm.

(b)Write a program to implement Huffman's algorithm.
14. Write a program to find the shortest path in a given graph using Floyd-Warshall algorithm.
15. Write a program to find the shortest path in a given graph using Bellman -Ford algorithm

16. Write a program to find Optimal solution for a Knap Sack Problem using
17. Greedy Method.
18. Write a program to implement Rabin-Krap algorithm.
19. Write a program to implement Ford-Fulkerson algorithm.
20. Find out the solution to the N-Queen problem.
21. 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.