## Model Curriculum for Three/Four Year Degree Course (With Multiple Entry /Exit Option) Based on NEP-2020

# **B.Sc. ITM**



## **Odisha State Higher Education Council, Bhubaneswar**

**Government of Odisha** 

Semester	Subjects
Ι	Core I - Data structure Using C
	Core II- Operating Systems
II	Core III- Principle of Management
	Core IV – Java Programming
III	Core V- Digital Logic
	Core VI- Computer Networks
	Core VII- Business Accounting
IV	Core VIII- Database Systems
	Core IX- Organizational Behaviour
	Core X- Foundation of Data Science and Data Analytics
V	Core XI- Web Technology
	Core XII- Software Engineering
	Core XIII- Digital Marketing
VI	Core XIV- Theory of Computation
	Core XV- Python Programming
VII	Core XVI- Advanced Computer Architecture
	Core XVII- Computer Graphics
	Core XVIII- Project Management
	Core XIX- Machine Learning
VIII	Core XX- Data Mining & Data Warehousing
	Core XXI- Design and Analysis of Algorithm
	Core XXII- Cryptography and Network Security
	Core XXIII- Project Work

#### **Program Outcome:**

The Department of Information Technology Management (ITM) is dedicated to promote learning the various subjects and technologies in the field of information technology and management. This program inspires the students who want to shape their career in IT professional world. As the IT industry is the fastest growing industry in India and in the world, this program generates ample opportunities for employment. The program prepares the students for a range of computer applications, techniques of computer networking, software engineering, Web Development, Data Analytics, SQL, Python and Java etc. which helps them to enter into the software industry. Apart from these, the program focuses on principle of management and organization behaviour through which the students gain the knowledge of management which help them to effectively understand and handle managerial requirements in the industry. This program incorporates human values and morality by responsibly accepting the roles to work for the sustainable development of self and society. It also focuses on acquiring the ability to survive in the environment of rapid technological changes through dynamic learning. Students will develop leadership and communication skills, goal setting, time management techniques and to collaborate more effectively in teams in their workplaces.

## Semester-I Data structure Using C

Core I

#### **Course Objectives:**

The course is designed to provide complete knowledge of C language and its use in data structure. Students will be able to develop logics which will help them to write programs C. Also, by learning the basic programming constructs they can easily switch over to any other programming languages in future. It strengthens the ability of the students to identify and apply the suitable data structure for the given real-world problems. It enables them to gain knowledge in practical applications of data structures.

#### **Course Outcome:**

#### On completion of this course, the students will be able to

- Learn various elements of C language including data types, Operators, expressions, decision making implementation in programs.
- Write complex programs using arrays, structure, pointer & functions.
- Know the concept of stack, queue, linked list to represent data in various ways to solve real time applications.
- Search and sort the data using various searching and sorting methods.

## Unit-I:

**Introduction**: Introduction to Programming Language, Character sets, Keywords & Identifiers, Constants, Variables, Input and Output statements (Formatted and Unformatted), Data types and modifiers, Types of Operators, Precedence and associativity of operators.

**Control statements** (Simple IF Statement, IF...ELSE, Nested IF...ELSE, IF...ELSE...IF Ladder), Switch Statement. Looping: Do...WHILE, WHILE and FOR Loop. Array Concept (1D and 2D Array).

**Outcome:** Students will able to understand the basics of C language to write programs and to store the data using array.

#### Unit-II:

**Pointers and its types,** Pointer arithmetic, Array of Pointers, Pointer to pointer. Storage classes. Functions: Types, Function Calls, Recursion, String, Structure, Self-Referential Structure, Array of Structures, Union.

**Outcome:** Students will be able to understand the use of Pointers in data structures, can learn the reusability of codes through functions, can be able to write complex programs in C.

#### Unit-III:

Dynamic Memory allocation (calloc, malloc, realloc &, free). **Stack:** Definition, Representation, Stack operations, Applications (Infix– Prefix– Postfix Conversion & Evaluation). **Queues:** Definition, Representation, queue operations & Applications. **Linked Lists:** Definition, Types (Single and Doubly Linked List), representation, and Linked list insertion and deletion operations.

**Outcome:** Students will be aware of data arrangements and accessing those data for various real-time applications.

#### Unit-IV:

Trees: Tree Terminologies, Binary Tree, Representation, Binary search Tree, Traversing BST, Operations on BST, Heap Tree (max-Heap & Min-Heap). Sorting: Bubble Sort, Insertion Sort, Selection Sort, Quick Sort. Searching: Linear Search, Binary Search.

**Outcome:** Students will be able to search and sort the data and will come to know about the arrangements of data in a hierarchical manner.

#### **Text Books:**

- ✓ E. Balagurusamy, "Programming in ANSIC",4/e, (TMH)
- ✓ Classic Data Structure, P. Samanta, PHI,2/ed

#### **Reference Books:**

- ✓ B. Kernighan & Dennis Ritchie, "The C Programming Language", 2/ePHI
- ✓ Paul Deitel, Harvey Deitel, "C: How to Program",8/prentice Hall.
- ✓ P.C. Sethi, P.K. Behera, "Programming using C", Kalyani Publisher, Ludhiana
- ✓ Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Publications, 2000.
- ✓ Sastry C.V.,Nayak , R,Ch. Rajaramesh, Data Structure & Algorithms, I.K. International Publishing House Pvt .Ltd, New Delhi.

#### Practical

#### Tutorial C & Data Structure Lab Write C'

- Basic programs in C language.
- Programs using conditional statements (if. else, else if ladder, nested if, switch case)
- Programs using various loops
- Programs using 1D, 2D and multidimensional array.
- Program based on pointers.
- Programs using functions, recursion and strings.
- Programs based on structure and union.
- Programs on command line arguments.
- To search an element and print the total time of occurrence in the array.
- To delete all occurrence of an element in an array.
- Array implementation of Stack.
- Array implementation of Linear Queue.
- To implement linear linked list and perform different operations such as node insert and delete, search of an item, reverse the list.
- To implement double linked list and perform different operations such as node insert and delete.
- Linked list implementation of Stack.
- Linked list implementation of Queue.
- To implement a Binary Search Tree.
- To perform binary search operation.
- Bubble sort, Insertion sort, Selection sort, Quicksort.

## **Operating Systems**

## Core-II

## **Course Objectives:**

This course has two components: a theory component to teach you the concepts and principles that underlie modern operating systems, and a practice component to relate theoretical principles with operating system implementation. In the theory component, you will learn about processes and processor management, concurrency and synchronization, memory management schemes, file system and secondary storage management, security and protection, etc.

#### Course Outcome: On completion of this course, students will be able to

- Understand the different services provided by Operating System at different level.
- Learn real life applications of Operating System in every field.
- Understand the use of different process scheduling algorithm and synchronization techniques to avoid deadlock.
- Learn different memory management techniques like paging, segmentation and demand paging etc.

## Unit-I:

Introduction to Operating System, System Structures: Operating system services, system calls, system programs, Operating system design and implementation, Operating system structure.

**Outcome**: Students will be able to know the basic components and services of operating system.

#### Unit-II:

Process Management: Process Concept, Operations on processes, Process scheduling and algorithms, Inter-process Communication, Concepts on Thread and Process, Deadlocks: Deadlock detection, deadlock prevention and deadlock avoidance fundamentals.

**Outcome:** Students will be able to discuss various scheduling algorithms and know the concept of deadlock.

## Unit-III:

Memory Management Strategies: Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory Management: Concepts, implementation (Demand Paging), PageReplacement, Thrashing.

**Outcome:** Students will be able to comprehend how an operating system virtualizes CPU and memory.

#### Unit-IV:

Storage Management: File System concept, Access Methods, File System Mounting, File Sharing and File Protection, Implementing File Systems, Kernel I/O Systems.

**Outcome:** Students will be able to understand the functionality of file systems.

#### **Text Books:**

✓ Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, Eighth Edition, WileyStudentEdition2009.

#### **Reference Books:**

- ✓ Modern Operating System, Tanenbaum, Pearson,4/Ed.2014.
- ✓ Richard F Ashley, Linux with Operating System Concepts, Chapman and Hall/CRC Published, August 26, 2014.
- ✓ Richard Blum, Linux Command Line and Shell Scripting Bible, O' Reilly.

#### **Core II- Operating Systems Lab**

- Write a program (using *fork()* and/or *exec()* commands) where parent and child execute: same program, same code. same program, different code. Before terminating, the parent waits for the child to finish its task.
- Write a program to report behavior of Linux kernel including kernel version, CPU typeand model. (CPU information)
- Write a program to report behavior of Linux kernel including information on configured memory, amount of free and used memory. (memory information)
- Write a program to print file details including owner access permissions, file access time, where file name is given as argument.
- Write a program to copy files using system calls.
- Write a program using C to implement FCFS scheduling algorithm.
- Write a program using C to implement Round Robin scheduling algorithm.
- Write a program using C to implement SJF scheduling algorithm.
- Write a program using C to implement non-preemptive priority-based scheduling algorithm.
- Write a program using C to implement preemptive priority-based scheduling algorithm.
- Write a program using C to implement SRTF scheduling algorithm.
- Write a program using C to implement first-fit, best-fit and worst-fit allocation strategies.

## Semester-II Principle of Management

#### **Course Objectives:**

Core III

The objective of this course is to help the students to get aware towards varied management principles and practices. This course covers the explanations about the fundamentals of management disciplines in organizational context. It details the different functions of management such as planning, organizing, staffing, directing and controlling.

#### Course Outcome: On completion of this course, students will be able to

- Understand the concepts related to Business.
- Demonstrate the roles, skills and functions of management.
- Focus on the theories of management.
- Demonstrate a clear understanding of the concepts, tools & techniques used by executives in developing and executing strategies and will appreciate its integrative and interdisciplinary nature.

Unit-I:

- Nature of Management: Meaning, Definition, importance & Functions, Nature of Management as Art, Science & Profession, levels of management, managerial tasks and skills.
- **Different Schools of Thoughts:** Classical School-contributions of Taylor and Henri Fayol Neo-classical School-Human Relations approach and Behavioural Science Approach; Modern School; System approach and Contingency approach.
- **Outcome:** The students will be able to understand the basic concepts, principles, approaches and practices of management. It inculcates the ability to apply multifunctional approach to organizational objective.

#### Unit-II:

- Planning Meaning Need & Importance, types, advantages & limitations, Forecasting -Need & Techniques, Decision making - Types - Process of rational decision making & techniques of decision making,
- **Organizing-** Concept, importance, principles, different organization models-line and staff; Functional; Depart mentation-need, basis, principles, **Delegation of Authority**-Elements, steps barriers; Centralization and Decentralization of Authority; Span of Management; concept and determining factors.
- **Outcome:** The students will be able to have a conceptual knowledge about the planning and decision making and also able to apply the concept of organizing for the effective functioning of management.

#### Unit-III:

- **Staffing** Meaning & Importance. **Directing**: concepts, importance of directing, Leadership: Concept, importance, types, leadership traits, Tannenbaum& Schmidt's Model and Blake & Mouton's Model.
- **Outcome:** The students will be able to evaluate leadership style to anticipate the consequences of each leadership style, diagnose qualities of efficient leadership, and able to demonstrate elements of directing and its applications.

#### Unit-IV:

- **Motivation:** Concept, importance, importance of need theory, and contributions of McGregor, Maslow, Herzberg. Coordination: concepts, importance, principles and implementation techniques. Control: concepts, importance, process and tools of control.
- **Outcome:** The students will be able to demonstrate clear understanding of the concepts, tools and models of Motivation, coordination and controlling.

#### **Text Books:**

- ✓ Harold Koontz and Iteinz Weibrich, Essential of Management, McGraw Hills International.
- ✓ K. Aswathapa, Essential of Business Administration, Himalaya Publishing House.

#### **Reference Books:**

- ✓ L.M. Prasad Principles & practice of management Sultan Chand & Sons New Delhi.
- ✓ Tripathi, Reddy, Principles of Management, Tata McGraw Hill.

## **Core III- Project Work**

#### **Guidelines for the Project:**

Project is an assignment to strengthen the understanding of fundamentals through effective application of theoretical concept. The objective of the project course is to help the student develop ability to apply multidisciplinary concepts, tools and techniques to solve organizational problems. The project may be from any one of your areas related to the concerned subject.

## **Project report: The Project Report must have the following.**

- Cover Page must have the name and roll no. of the student and the name & designation of theguide along with the title of the Project.
- Acknowledgement, declaration, Certificate of originality signed by the guide with date
- Detailed tables & figures of contents with page nos.
- All pages of the Project Report must be numbered as reflected in Index of Chapters.

## **Index of Chapters:**

- Chapter-I: Introduction & Review of literatures
- Chapter-II: Research Methodology
- Chapter-III: Conceptual & Theoretical Descriptions
- Chapter-IV: Data Analysis & Interpretations
- Chapter-V: Conclusion, Findings, suggestions & Scope for further research.
- References, Annexure, etc.

## Java Programming

## **Course Objectives:**

- To understand the basic concepts and fundamentals of platform independent object-oriented language.
- To demonstrate skills in writing programs using exception handling techniques and multithreading.
- To understand streams and efficient user interface design techniques.
- Use the syntax and semantics of java programming language and basic concepts of OOP.

#### **Course Outcomes**:

## On completion of this course, students will be able to

- Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
- Apply the concepts of Multithreading and Exception handling to develop efficient anderror free codes.
- Design event driven GUI and web related applications which mimic the real wordscenarios

#### Unit-I:

Introduction to Java: Java History, Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords (super, this, final, abstract, static, extends, implements, interface), Data Types, Wrapper class, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods). Input through keyboard using Command line Argument, the Scanner class, Buffered Reader class.

**Outcome:** Students will be able to identify java language components and how they work together in applications.

## Unit-II:

Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining & Using Classes, Class Variables & Methods, Objects, Object reference, Objects as parameters, in all classes, Garbage Collection. Constructor-types of constructor, this keyword, super keyword. Method overloading and Constructor overloading. Aggregation vs Inheritance, Inheritance: extends vs implements, types of Inheritance, Interface, Up-Casting, Down-Casting, Auto-Boxing, Enumerations, Polymorphism, Method Overriding and restrictions. Package: Pre-defined packages and Custom

#### Core IV

packages.

Outcome: Students will be able to solve real world problem using OOP techniques.

#### Unit-III:

Arrays: Creating & Using Arrays (1D, 2D, 3D and Jagged Array), Array of Object, Referencing Arrays Dynamically. Strings and I/O: Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, and Passing Strings to & from Methods, String Buffer Classes and String Builder Classes. IO package: Understanding Streams File class and its methods, Creating, Reading, Writing using

Classes: Byte and Character streams, File Output Stream, File Input Stream, File Writer, File Reader, Input Stream Reader, Print Stream, Print Writer. Compressing and Uncompressing File.

**Outcome:** Students will be able to solve the various problems in array and string, working with file.

#### Unit-IV:

Exception Handling, Threading, Networking and Database Connectivity: Exception types, uncaught exceptions, throw, built-in exceptions, creating your own exceptions; Multi-threading: The Thread class and Run able interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

**Outcome:** Students will be able to develop multithreaded applications with synchronization, working with how to handle exception.

#### **Text Books:**

✓ E. Balagurusamy, "Programming with Java", TMH, 4/Ed.

#### **Reference Books:**

✓ Herbert Schildt, "The Complete Reference to Java", TMH,10/Ed.

#### **Core IV- Java Programming Lab**

#### Write the following programs using Java

- To find the sum of any number of integers entered as command line arguments.
- To find the factorial of a given number.
- To convert a decimal to binary number.
- To check if a number is prime or not, by taking the number as input from the keyboard.
- To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument.
- Write a program that show working of different functions of String and String Buffer classes like set Char At(), set Length(), append(), insert(), concat() and equals().
- Write a program to create a "distance" class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer.
- Modify the- "distance" class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
- Write a program to show that during function overloading, if no matching argument is found, then Java will apply automatic type conversions (from lower to higher datatype).
- Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword.
- Write a program to show the use of static functions and to pass variable length arguments in a function.
- Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.
- Write a program "Divide by Zero" that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
- Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
- Write a program to create your own exception types to handle situation specific to yourapplication (Hint: Define a sub class of Exception which itself is a sub class of Throw able).
- Write a program to demonstrate priorities among multiple threads.

- Write a program to demonstrate different mouse handling event like mouse Clicked (), mouse Entered (), mouse Exited (), mouse Pressed (), mouse Released () & mouse Dragged ().
- Write a program to demonstrate different keyboard handling events.
- Write a program to demonstrate the concept of boxing and unboxing.
- Create a multi-file program where in one file a string message is taken as in put from the user and the function to display the message on the screen is given in another file (makeuse of Scanner package in this program).
- Write a program that creates illustrates different levels of protection in classes/sub classes belonging to same package or different packages

## Semester-III Digital Logic

Core V

#### **Course Objectives:**

Introduce the concept of digital and binary systems. Be able to design and analyze combinational logic circuits. Be able to design and analyze sequential logic circuits. Understand the basic software tools for the design and implementation of digital circuits and systems.

#### Course Outcomes: On completion of this course, students will be able to

- Convert different type of codes and number systems which are used in digital communication and computer systems.
- Compare different types of logic families which are the basic unit of different types of logic gates in the domain of economy, performance and efficiency.
- Analyze different types of digital electronic circuit using various mapping and logical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematical methods.
- Design different types of digital electronic circuits for particular operation.

#### Unit-I:

Character Codes, Decimal System, Binary System, Decimal to Binary Conversion, HexadecimalNotation, Boolean Algebra, Basic Logic Functions: Electronic Logic Gates, Synthesis of Logic Functions, Minimization of Logic Expressions, Minimization using Karnaugh Maps, Synthesis with NAND and NOR Gates, Tri-State Buffers.

**Outcome:** Students will be able to understand the various types of number systems and their conversions and simplify Boolean expression and apply the Boolean theorems through logical gates.

#### Unit-II:

Arithmetic: Addition and Subtraction of Signed Numbers, Addition/ Subtraction Logic Unit, Design of Fast Adders: Carry-Look ahead Addition, Multiplication of Positive Numbers, Signed-Operand Multiplication: Booth Algorithm, Fast Multiplication: Bit-Pair Recoding Multipliers, Carry-Save Addition of Summands, Integer Division, Floating-Point Numbers and Operations: IEEE Standard for Floating-point Numbers, Arithmetic Operations on Floating-Point Numbers, Guard Bits and Truncation, Implementing Floating-Point Operations.

**Outcome:** Students will be able to design and implement variety of logical devices using combinational circuits concept.

## Unit-III:

Flip-Flops, Gated Latches, Master-Slave Flip-Flops, Edge-Triggering, T Flip-Flops, JK Flip Flops. Registers and Shift Registers, Counters, Decoders, Multiplexers, Programmable Logic Devices (PLDs), Programmable Array Logic (PAL), Complex Programmable Logic Devices (CPLDs), Field-Programmable Gate Array (FPGA), Sequential Circuits, UP/DOWN Counters.

**Outcome:** Students will be able to analyze sequential circuits like registers and counters using flip-flops.

#### Unit-IV:

Memory System: Semiconductor RAM Memories, Internal Organization of Memory Chips, Static Memories, Asynchronous DRAMS, Synchronous DRAMS, Structure of Large Memories, Memory System Considerations, RAMBUS Memory. Read-Only Memories: ROM, PROM, EPROM, EEPROM, Flash Memory, Speed, Size, and Cost of Memory. Secondary Storage: Magnetic Hard Disks, Optical Disks, Magnetic Tape Systems. **Outcome:** Students will be able to demonstrate and compare the construction of programmable logic devices and different types of ROM and RAM.

#### **Text Books:**

✓ Carl Hamacher, Z. Vranesic, S. Zaky: Computer Organization, 5/e (TMH).

#### **Refence Books:**

✓ M. Morris Mano: Digital Logic and Computer Design, Pearson.

#### Core V- Practical/Tutorial: Digital Logic Lab

Introduction to Xilinx S/W (VHDL). Write the codes for the following using VHDL.

- Realizing all logic gates.
- Combination Circuit.
- ADDER.
- SUBTRACTOR.
- MUX.
- DE-MUX.
- Encoder.
- Decoder.
- PAL.
- PLA.

Also write the codes using VHDL for the following Sequential Logic Circuits:

- Flip Flops.
- Shift Registers.
- Counters.
- Memory Elements.

## **Computer Networks**

#### **Course Objectives:**

This course is intended to provide an overview of the concepts and fundamentals of data communication and computer networks. It will help the students in understanding of various types of computer networks, different components of computer networks, various protocols, e-mail and communication protocols, network naming and addressing, modern technologies used in networking and their applications.

#### Course Outcome: On completion of this course, the students will be able to

- •Understand network communication using the layered concept, Open System Interconnect (OSI) and the Internet Model.
- •Understand various types of transmission media, network devices.
- •Understand the concept of flow control, error control and LAN protocols.
- •Explain the design of and algorithms used in the physical, data link layers.
- •Understand the working principles of LAN and the concepts behind physical and logical addressing, subnetting and super netting.
- •Analyze the contents in a given Data Link layer packet, based on the layer concept.
- •Determine the various modulation and error detection and correction techniques and their application in communication systems.

#### Unit-I:

Introduction to Data Communications and Network Models: Protocols and Standards, Layers in OSI Models, Analog and Digital Signals, Transmission Modes, Transmission Impairment, Data Rate Limits, Performance, Digital Transmission, Network Devices & Drivers: Router, Modem, Repeater, Hub, Switch, Bridge (fundamental concepts only). **Outcome:** Students will have the basic knowledge about computer network, causes of network errors, layers in networking and network devices & drivers.

#### Unit-II:

Signal Conversion: Digital-to-Digital Conversion, Analog-to-Digital Conversion, Digital-to- analog Conversion, Analog-to-analog Conversion. Transmission Media: Guided Media, Unguided Media, Switching Techniques: Packet Switching, Circuit Switching, Datagram Networks, Virtual- Circuit Networks, and Structure of a Switch.

**Outcome:** Students will have the knowledge about how data transmission takes place through signals and use of switching techniques.

**Core VI** 

#### Unit-III:

Error Detection and Correction: Checksum, CRC, Data Link Control: Framing, Flow and Error Control, Noiseless Channels, Noisy channels, (Stop and Wait ARQ, Sliding Window Protocol, Go Back N, Selective Repeat) HDLC, Point-to-Point Protocol. Access Control: TDM, CSMA/CD, and Channelization (FDMA, TDMA, and CDMA).

**Outcome:** Students will come to know about identifying and correcting errors occurred during data transmission.

#### Unit-IV:

Network Layer: Logical Addressing, IPv4 Addresses, IPv6 Addresses, Virtual-Circuit Networks: Frame Relay and ATM, Transport Layer: Process-Process Delivery: UDP, TCP. Application layers: DNS, SMTP, POP, FTP, HTTP, Basics of WiFi (Fundamental concepts only), Network Security: Authentication, Basics of Public Key and Private Key, Digital Signatures and Certificates (Fundamental concepts only).

**Outcome:** Students will able to understand various protocols used in network to transmit different types of data.

#### **Text Books:**

✓ Data Communications and Networking, Fourth Edition by Behrouza A. Forouzan,T

#### **Reference Books:**

✓ Computer Networks, A.S. Tanenbaum, 4th edition, Pearson Education.

#### Core VI- Computer Network Lab using C/C++/any Simulator

- Simulate Even Parity generator and checker.
- Simulate two-dimensional Parity generator and checker.
- Simulate check sum generator and checker.
- Simulate Hamming code method.
- Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
- Simulate and implement stop and wait protocol for noisy channel.
- Simulate and implement go backsliding window protocol.
- Simulate and implement selective repeat sliding window protocol.
- Simulate and implement distance vector routing algorithm.

## **Business Accounting**

## Core VII

## **Course Objectives:**

The objective of this course is to introduce problems of financial accounting such as measuring and reporting issues related to assets and liabilities and preparing the financial statements. Students are expected to gain the ability of using accounting information as a tool inapplying solutions for managerial problems, evaluating the financial performance, and interpreting the financial structure.

## Course Outcomes: On completion of this course, students will be able to

- Enable the students learn basic accounting principles, concepts, principles and conventions.
- Practice Financial and Management accounting applications.
- Construct the financial statements of company.
- Able to understand the provisions of Companies Act, 1956.
- Exposure on the different accounting software packages.

#### Unit-I:

Introduction: Financial Accounting-definition and Scope, objectives of Financial Accounting, Accounting v/s Book Keeping terms used in accounting, users of accounting information and limitations of Financial Accounting. Conceptual Framework: Accounting Concepts, Principles and Conventions, Accounting Standards concept, objectives, benefits, briefer view of Accounting Standards in India, Accounting Policies, Accounting as a measurement discipline, valuation Principles, accounting estimates.

Outcome: The students will be able to learn basic accounting principles, concepts, principles and conventions which used in business transactions and its applications.

## Unit-II:

Recording of transactions: Voucher system; Accounting Process, Journals, Subsidiary Books, Ledger, Cash Book, Bank Reconciliation Statement, Trial Balance. Depreciation: Meaning, need & importance of depreciation, methods of charging depreciation.

Outcome: The students will be able to prepare trial balance, bank reconciliation statement, identify and rectify the errors in bank reconciliation statement and also understand methods of charging Depreciation.

## Unit-III:

Preparation of final accounts: Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietary business.

Outcome: The students will be able to prepare financial statements in accordance with generally accepted accounting principles, employ critical thinking skills to analyze financial data as well as the effects of differing financial accounting methods on the financial statements.

#### Unit-IV:

Introduction to Company Final Accounts: Important provisions of Companies Act, 1956 inrespect of preparation of final accounts, Understanding of final accounts of a company. an overview of computerized accounting system –Salient features and significance Outcome: The students will be able to understand the provisions of companies act 1956, significance and application of computerized accounting system.

#### **Text Books:**

- ✓ Anil Chowdhry, "Fundamentals of Accounting & Financial Analysis", Pearson Education.
- ✓ Agarwal, R.Srinivasan, "Accounting Made Easy", TMH

## **Reference Books:**

- ✓ Amrish Gupta, "Financial Accounting for Management", Pearson Education
- ✓ S.N.Maheshwari, "Financial Accounting for Management: Vikas Publishing House

#### **Core VII- Business Accounting**

- Introduction to Tally, Features and Versions of Tally.
- Components of Tally Screen, Creation, Alteration & Deletion of Company.
- Primary Group & Subgroup, Creation.
- Alteration & Display of Ledger Accounting.
- Recording of Transactions through vouchers.
- DisplayofFinancialreportsF11andF12configuration.
- Introduction to Inventory system: Advantages of maintaining inventory system in Tally stock group Stock category, stock item units of measure, creation of inventory system.

## Semester-IV Database Systems

#### **Core VIII**

#### **Course Objectives:**

To explain basic database concepts, applications, data models, schemas and instances. To demonstrate the use of constraints and relational algebra operations. Describe the basics of SQL and construct queries using SQL. To emphasize the importance of normalization in databases. To facilitate students in Database design. To familiarize issues of concurrency control and transaction management.

#### Course Outcomes: On completion of this course, students will be able to

- Apply the basic concepts of Database Systems and Applications.
- Use the basics of SQL and construct queries using SQL in database creation and interaction.
- Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.
- Analyze and Select storage and recovery techniques of database system

#### Unit-I:

Introduction to Database and Database Users, Database System Concepts and Architecture: data Models, schema, and instances, Conceptual Modeling and Database Design: Entity Relationship (ER) Model: Entity Types, Entity Sets, Attributes, Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, ER Naming Conventions. Enhanced Entity- Relationship (EER) Model.

**Outcome:** Students will understand the database, its types, uses and applications. They will able to understand various data models.

#### Unit-II:

Database Design Theory and Normalization: Functional Dependencies, Join Dependencies, Normal Forms based on Primary Keys, Second and third Normal Forms, Boyce-Codd Normal Form, Multi valued Dependency and Fourth Normal Form. **Outcome:** Students will understand details of database design and will be able to design the real time data using various normal forms.

#### Unit-III:

Relational data Model and SQL: Relational Model Concepts, Basic SQLs, SQL Data Definition and Data types, Constraints in SQL, Retrieval Queries in SQL, INSERT, DELETE, UPDATE Statements in SQL, Relational Algebra and Relational Calculus:

Unary Relational Operations: SELECT and PROJECT, Binary Relation: JOIN and DIVISION.

Outcome: Students will able to access and manipulate the data using SQL.

#### Unit-IV:

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing, Properties of Transactions, Recoverability, Serializability, Concurrency Control: locking techniques and Time-Stamp Ordering.

**Outcome:** Students will learn about transaction processing in real world, how to handle data when more than one user accessing the same database using various methods.

#### **Text Books:**

✓ Fundamentals of Database Systems, 6th edition, Ramez Elmasri, Shamkant B. Navathe, Pearson Education.

#### **Reference Books:**

✓ An Introduction to Database System, Date C.J.- Pearson Education, New Delhi-2005.

#### **Database Systems**

#### Create and use the following database schemas to answer the given queries.

EMPLOYEE Schema			
Field	Туре	NULLKEY	DEFAULT
Eno	Char (3)	NO	PRI
Ename	Varchar (50)	NO	
Job_type	Varchar (50)	NO	
Manager	Char (3)	Yes	FK
Hire_date	Date	NO	
Dno	Integer	YES	FK
Commission	Decimal (10,2)	YES	

G 1		NO	
Salary	Decimal (7,2)	NO	
	DEPARTMENT	Schema	
Field	Туре	NULLKEY	
Dno	Integer	No	PRI
Dname	Varchar (50)	Yes	
Location	Varchar (50)	Yes	

## **Query List:**

- Query to display Employee Name, Job, Hire Date, Employee Number; for eachemployee with the Employee Number appearing first.
- Query to display unique Jobs from the Employee Table.
- Query to display the Employee Name concatenated by a Job separated by a comma.
- Query to display all the data from the Employee Table. Separate each Column by acomma and name the said column as THE\_OUTPUT.
- Query to display the Employee Name and Salary of all the employees earning more than
- \$2850.
- Query to display Employee Name and Department Number for the Employee No=7900.
- Query to display Employee Name and Salary for all employees whose salary is not in therange of \$1500 and \$2850.
- Query to display Employee Name and Department No. of all the employees in Dept10 and Dept 30 in the alphabetical order by name.
- Query to display Name and Hire Date of every Employee who was hired in 1981.
- Query to display Name and Job of all employees who don't have a current Manager.
- Query to display the Name, Salary and Commission for all the employees who earncommission.
- Sort the data in descending order of Salary and Commission.
- Query to display Name of all the employees where the third letter of their name is 'A'.
- Query to display Name of all employees either have two 'R's or have two 'A's in theirname and are either in Dept No=30 or their Mangers Employee No= 7788.
- Query to display Name, Salary and Commission for all employees whose CommissionAmount is 14 greater than their Salary increased by 5%.
- Query to display the Current Date.

- Query to display Name, Hire Date and Salary Review Date which is the 1<sup>st</sup> Monday aftersix months of employment.
- Query to display Name and calculate the number of months between today and the dateeach employee was hired.
- Query to display the following for each employee <E-Name> earns <Salary> monthlybut wants <3\* Current Salary>. Label the Column as Dream Salary.
- Query to display Name with the 1<sup>st</sup>letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with 'J', 'A' and 'M'.
- Query to display Name, Hire Date and Day of the week on which the employee started.
- Query to display Name, Department Name and Department No for all the employees.
- Query to display Unique Listing of all Jobs that are in Department #30.
- Query to display Name, Department Name of all employees who have an 'A' in theirname.
- Query to display Name, Job, Department No. and Department Name for all the employees working at the Dallas location.
- Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees Name who do not have a Manager.
- Query to display Name, Department No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.
- Query to display Name and Salaries represented by asterisks, where each asterisk (\*) signifies \$100.
- Query to display the Highest, Lowest, Sum and Average Salaries of all the employees.
- Query to display the number of employees performing the same Job type functions.
- Query to display the no. of managers without listing their names.
- Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
- Query to display Name and Hire Date for all employees in the same dept. as Blake.
- Query to display the Employee No. And Name for all employees who earn more than the average salary.
- Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a 'T'.
- Query to display the names and salaries of all employees who report to King.
- Query to display the department no, name and job for all employees in the Salesdepartment.

## **Organizational Behaviour**

#### **Course Objectives:**

The objective of this course is to learn the modern trends, theories and changes in organizational behaviour. This course covers the explanations about the human behavior in the organizational context. It details the impact of individual, group and organizational factors on human behavior. The course also focuses on understanding the behavior of the employees working in the organization. It highlights the significance of Challenges and Opportunities of OB, perception, attribution, learning, organizational change, organizational culture, motivation, leadership and conflict management.

#### Course Outcome: On completion of this course, the students will be able to:

- Understand the behaviour of people in the organization.
- Analyze the complexities associated with management of individual behaviour in theorganization.
- Understand the motivation (why) behind behaviour of people in the organization.
- Cover the explanations about human behavior in the organizational context.
- Impact of individual, group and organizational factors on human behavior.
- Understand the concept of personality, learning and attitude.

#### Unit-I:

**Organizational Behaviour-** Meaning, Definition and importance, Foundations of OB, OB Models, and Challenges to OB.

**Outcome:** The students will be able to understand the conceptual framework of the discipline of OB, OB Models and its practical applications in the organizational set up.

#### Unit-II:

**Individual Behaviour:** Perception: Definition &Concept; Personality: Concept, Determinants and Personality Types (Type A and Type B, Big Five Model, MBTI Model); Learning: Concept and Theories (Classical and Operant Conditioning); Attitude: Components& Formation.

**Outcome:** The students will be able to interpret key concepts and theories of perception, learning with regard to individual differences and apply these appropriately to specific situations.

## Unit-III:

**Group Behaviour:** Group Dynamics: Meaning, Formation and Types of Groups (Formal & Informal Groups), Stages of Group Development, Individual vs. Group decision making.

#### Core IX

Group vs Team. Types of Team. **Group Communication:** Communication Types, Communication Process, Barriers to communication; Effective Communication Methods.

**Outcome:** The students will be able to interpret the key concepts and theories with regard to group behaviour and apply these appropriately to specific situations.

## Unit-IV:

**Motivation**-Meaning, Nature &Importance. Motivational Theories (Maslow's Need Hierarchy Theory, Herzberg's two factor Theory, McClelland's Need Theory, Vroom's Expectancy Theory, Equity Theory); Motivational Challenges. **Leadership** - Leadership: Nature and Importance; Leadership Styles; Leadership Theories (Trait Theory, Behaviour Theory, Contingency Theory).

**Outcome:** The students will be able to understand how the organizational behavior can integrate in understanding the motivation behind behavior of people in the organization. Students also able to identify and develop effective motivational and leadership skills.

## **Text Books:**

- ✓ Organizational Behaviour: L.M. Prasad
- ✓ Organizational Behaviour: Rao &Narayana
- ✓ Organizational Behaviour: Gupta and Joshi (KP)

## **Reference Books:**

✓ Organizational Behaviour: KAswathappa(HPH)

✓ Organizational Behaviour: Stephen Robbins(PHI)

## **Core IX- Project Work Organizational Behavior**

## **Guidelines for Project**

Project is an assignment to strengthen the understanding of fundamentals through effective application of theoretical concept. The objective of the project course is to help the student develop ability to apply multidisciplinary concepts, tools and techniques to solve organisational problems. The project may be from any one of your areas related to the concerned subject.

## **Project report: The Project Report must have the following:**

- Cover Page must have the name and roll no. of the student and the name & designation of theguide along with the title of the Project.
- Acknowledgement, declaration, Certificate of originality signed by the guide

with date

- Detailed tables & figures of contents with page nos.
- All pages of the Project Report must be numbered as reflected in Index of Chapters

## **Index of Chapters:**

- Chapter-I: Introduction & Review of literatures
- Chapter-II: Research Methodology
- Chapter-III: Conceptual & Theoretical Descriptions
- Chapter-IV: Data Analysis & Interpretations
- Chapter-V: Conclusion, Findings, suggestions & Scope for further research.
- Chapter-VI: References, Annexures etc.

## Core X Foundation of Data Science and Data Analytics

#### **Course Objectives:**

This course is intended to understand data management like data collection, processing, analysis, interpretation and visualization by applying quantitative modelling and data analysis techniques for real world business problems. The course also provides the knowledge of statistical data analysis techniques utilized in business decision making.

#### Course Outcome: On completion of this course the students will be able to

- Explain various software tools for data storage, analysis and
- Visualize the data.
- Choose EDA, inference and regression techniques.
- Apply R programming for analyzing statistical data for business decision making.
- Analyze different clustering methods for big data sets.

#### Unit-I:

Definition of Big Data, Big data characteristics & considerations, Data Repositories – analyst perspective, Business drivers for analytics, Typical analytical architecture, Business Intelligence Vs Data Science, Drivers of Big Data analytics, Role of data scientist in Big data ecosystem, Application of Big data analytics.

**Outcome:** The students will have to get Fundamentals of Big Data, Use software tools for data storage, analysis and visualization in big-data analytics.

#### Unit-II:

Need of Data analytic lifecycle, Key roles for successful analytic project, various phases of Data analytic lifecycle: Discovery, Data Preparation, Model Planning, Model Building, Communicating Results, Operationalization.

Outcome: The students can utilize EDA, inference and regression techniques.

#### Unit-III:

Introduction to R: GUI of R, Getting data into & out of R, Data types in R, Basic operations, Descriptive Statistics.

**Outcome:** The students can apply R programming for analyzing statistical data for business decision making.

#### Unit-IV:

Overview of Clustering, K- means, Association Rules, Apriori Algorithm, Linear Regression, Logistic Regression.

Outcome: The students can understand different clustering methods for big data sets.

#### **Text Book:**

✓ David Dietrich, Barry Hiller, "Data Science & Big Data Analytics", EMC

education services, Wiley publications,2012

## **Reference Book:**

✓ Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011.

## Semester-V

#### Core XI

## Web Technology

#### **Course objectives:**

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using web technologies. Students will gain the skills and project- based experience needed for entry into web application and development careers. Students are able to develop a dynamic webpage by the use of java script.

#### Course Outcome: On completion of this course, students will be able to

- Analyze a web page and identify its elements and attributes.
- Create web pages using HTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client side programming).
- Work with PHP application (Server-side Programming) for any database operation.

#### Unit-I:

Web Essentials: Clients, Servers and Communication: The Internet –Basic Internet protocols–The WWW, HTTP request message –response message, web client's webservers –case study. Introduction to HTML: HTML, HTML domains, basic structure of an HTML document–creating an HTML document, mark up tags, heading, paragraphs, line breaks, HTML tags. Elements of HTML, working with text, lists, tables and frames, working with hyperlink, images and multimedia, forms and controls.

## Outcome: Students will be able to explain client and server-side communication and able to design web applications

## Unit-II:

Introduction to cascading style sheets: Concepts of CSS, creating style sheet, CSS properties, CSS styling (background, text format, controlling fonts), working with the block elements and objects. Working who lists and tables, CSS ID and class. Box model (introduction, border properties, padding properties, margin properties), CSS colour, groping, Dimensions, display, positioning, floating, align, pseudo class, Navigation bar, image sprites

## Outcome: Students will be able to design web pages using CSS and BOX model

## Unit-III:

Java scripts: Client-side scripting, what is java script, simple java script, variables, functions, conditions, loops and repetitions. Java scripts and objects, java script own objects, the DOM and web browser environment, forms and validations. DHTML:

Combining HTML, CSS, java scripts, events and buttons, controlling your browser. **Outcome: Students will be able to integrate java script in a web page and check for validation (Client-side programming)** 

## Unit-IV:

PHP: Starting to script on server side, PHP basics, variables, data types, operators, expressions, constants, decisions and loop making decisions. Strings – creating, accessing strings, searching, replacing and formatting strings. Arrays: Creation, accessing array, multidimensional arrays, PHP with Database.

## Outcome: Students will be able to explain server-side scripting and their applicability

## **Text Book:**

- ✓ Web Technologies–Black Book–Dream Tech Press
- ✓ Matt Doyle, BeginningPHP5.3(wrox -Willey publishing)
- ✓ John Duckett, Beginning HTML, XHTML, CSS and Javascript.

## **Reference Book:**

✓ HTML, XHTML and CSS Bible,5ed, Willey India-Steven M. Schafer.

## **Core XI- Project Work**

## Web Technology Lab

- Acquaintance with elements, tags and basic structure of HTML files.
- Practicing basic and advanced text for formatting.
- Practice use of image, video and sound in HTML documents.
- Designing of webpages- Document layout, list, tables.
- Practicing Hyperlink of webpages, working with frames.
- Working with forms and controls.
- Acquaintance with creating style sheet, CSS properties and styling.
- Working with background, text, font, list properties.
- Working with HTML elements box properties in CSS.
- Develop simple calculator for addition, subtraction, multiplication and division operation using java script.
- Create HTML page with java script which takes integer number as a input and tells whether the number is odd or even.
- Create HTML page that contains form with fields name, Email, mobile number, gender, favorite colour and button; now write a java script code to validate each entry. Also write a code to combine and display the information in text box when button is clicked.

- Write a PHP program to check if number is prime or not.
- Write a PHP program to print first ten Fibonacci numbers.
- Create a MySQL database and connect with PHP.
- Write PHP script for storing and retrieving user information from MySQL table.
- Write a HTML page which takes Name, Address, Email and Mobile number from user(register PHP).
- Store this data in MySQL database.
- Next page displays all user in HTML table using PHP (display .PHP).
- Using HTML, CSS, Java script, PHP, MySQL, design an authentication module of awebpage.

## **Software Engineering**

## Core XII

## **Course Objectives:**

Basic knowledge and understanding of the analysis and design of complex systems. To apply software engineering principles and techniques. Ability to develop, maintain and evaluate large-scale software systems. To provide the idea of decomposing the given problem into Analysis, Design, Implementation, Testing and Maintenance phases. To provide an idea of using various process models in the software industry according to given circumstances. To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project. To perform independent research and analysis. Ability to work as an effective member or leader of software engineering teams.

#### Course Outcome: On completion of this course, the students will be able to

- Understand of software process models such as waterfall and evolutionary model is required.
- Understand the problem statement and able to describe the Requirement analysis, creating a data model, use cases, computing function point, effort, architectural design and path testing of a software project.
- Learn about Software requirements and SRS documents.
- Understand project management's responsibilities, which includes planning, scheduling, risk management, and so on.
- Explain the differences between data models, object models, context models, and behavioral models.
- Familiar with implementation difficulties like modularity and coding standards.
- Gain knowledge of verification and validation methods, such as static analysis and reviews.
- Know about different software testing methodologies such as unit and integrated testing etc.
- Describe how to measure software and how to avoid software risks.

## Unit-I:

Introduction: Evolution of Software to an Engineering Discipline, software development projects, Software Lifecycle Models: Waterfall Model and its Extensions, Rapid Application Development (RAD), Agile Development Models, Spiral Model.

**Outcome:** Students will be able to understand fundamental principles of Software engineering discipline & get an idea of various life cycle models used in software development.

#### Unit-II:

Software Project Management: Software Project Management Complexities, Responsibilities of a Software Project Manager, Project Planning, Metrics for Project Size Estimation, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO, Halstead's Software Science, Staffing Level Estimation, Scheduling, Organization and Team Structures, Staffing, Risk Management, Software Configuration Management.

**Outcome:** Students will get a brief idea of various project management activities & will understand various cost estimation techniques, organization team structure and management of staff & risk handling.

#### Unit-III:

Requirement Analysis and Specification: Requirements Gathering and Analysis, Software Requirement Specifications, Formal System Specification Axiomatic Specification, Algebraic Specification, Executable Specification and 4GL.Software Design: Design Process, Characterize a Good Software Design, Cohesion and Coupling, Layered Arrangements of Modules, Approaches to Software Design (Function Oriented & Object-Oriented).

**Outcome:** Students will get knowledge of various requirement analysis techniques and design process during software development work.

#### Unit-IV:

Coding and Testing: Coding: Code Review, Software Documentation, Testing, Unit Testing, Black Box and White Box Testing, Debugging, Program Analysis Tools, Integration Testing, System Testing, Software Maintenance.

**Outcome:** The students will understand of coding and testing process & will able to learn maintenance in software development projects.

Text Book:

✓ Fundamental of Software Engineering, Rajib Mall, Fifth Edition, PHI Publication, India.

#### **Reference Books:**

- ✓ Software Engineering− IanSommerville,10/Ed, Pearson.
- ✓ Software Engineering Concepts and Practice Ugrasen Suman, Cengage Learning IndiaPvt, Ltd.

#### **Core XII- Project Work**

#### **Software Engineering**

#### **Guidelines for Project**

Project is an assignment to strengthen the understanding of fundamentals through effective application of theoretical concept. The objective of the project course is to help the student develop ability to apply multidisciplinary concepts, tools and techniques to implement software engineering. The project may be from any one of your areas related to the concerned subject.

## **Project report:** The Project Report must have the following:

- Cover Page must have the name and roll no. of the student and the name & designation of theguide along with the title of the Project.
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- All pages of the Project Report must be numbered as reflected in Index of Chapters

## Sample Projects:

- Criminal Record Management: Implement a criminal record management system forjailers, police officer sand CBI officers.
- *Route Information: Online information about the bus routes and their frequency and fares*
- Car Pooling: To maintain a web-based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.
- Patient Appointment and Prescription Management System
- Organized Retail Shopping Management Software
- Online Hotel Reservation Service System
- Examination and Result computation system
- Automatic Internal Assessment System
- Parking Allocation System
- Wholesale Management System

## **Digital Marketing**

## **Core XIII**

## **Course Objective:**

The key aim of this course is to understand the concepts of marketing management, to learn about the marketing process for different types of products and services, to understand the tools used by marketing managers in decision situations and to understand the marketing environment.

## Course Outcomes: On completion of this course, the students will be able to

- Demonstrate strong conceptual knowledge in the functional area of marketing management.
- Demonstrate effective understanding of relevant functional areas of marketing management and its application.
- Demonstrate analytical skills in identification and resolution of problems pertaining to marketing management.
- Understand the 'Marketing mix' elements and the strategies and principles underlying the modern marketing practices.
- Explore for themselves the role of a marketing manager and the boundaries of marketing

## Unit-I:

**Marketing**: Objectives of Marketing, Marketing vs Selling, Marketing Environment, Consumer Behaviour, Consumer Buying Process, Factors influencing consumer decision making, **Product:** Product concept, Product classification, New Product Development, Product lifecycle, Product mix.

Outcome: The students will be able to identify core concepts of marketing and the role of marketing in business and society. able to analyse the impact of different environmental factors, factors affecting consumer buying behavior, and different strategies related to product and its application.

#### Unit-II:

**Price:** Objective of pricing, Factors Influencing Product Pricing, Pricing policies. Distribution: Channel of Distribution- Meaning and Importance, Types of Distribution Channel. **Promotion:** Meaning, Importance of Promotion, Types of Promotion, Factors affectingpromotion mix decisions.

**Outcome:** The students will be able to develop marketing strategies based on price, place and promotion objectives. Develop analytical skills in identification and resolution of problems pertaining to price, place and promotion mix.

#### Unit-III:

Fundamentals of Digital marketing & Its Significance, Traditional marketing Vs Digital Marketing, Evolution of Digital Marketing, Digital Marketing Landscape. Fundamentals of Social Media Marketing & its significance, Facebook Marketing-Different types of Ad formats, LinkedIn Marketing- LinkedIn Strategy, Twitter Marketing- Twitter usage, Twitter Ads, Twitter ad campaigns.

**Outcome:** The students will be able to use the digital platform in the optimal way to formulate possible solutions to marketing problems faced by several firms and also able to Identify and utilize various tools through social media.

#### Unit-IV:

Digital Advertising, Different Digital Advertisement, Performance of Digital Advertising: -Process & players, Display Advertising Media, Digital metrics. **YouTube Advertising:** - YouTube Channels, YouTube Ads, Type of Videos, Buying Models, Targeting & optimization, Designing & monitoring Video Campaigns, Display campaigns

**Outcome:** The students will be able to explain the key digital marketing activities needed for competitive success and also Leverage digital strategies to gain competitive advantage for business and career. Able to initiate marketing strategies through the use of Social Media Platform like Face book, Twitter, YouTube & LinkedIn etc.

#### **Text Books:**

- ✓ Marketing Management in Indian Context, Sontakki, KP
- ✓ Marketing Management, Karunakaran,
- ✓ Digital Marketing –Kamat and Kamat-Himalaya
- ✓ Digital Marketing, S.Gupta, McGraw-Hill

#### **Reference Books:**

✓ Marketing Management, Kotler, Keler, Koshi, Jha, Pearson

#### **Core XIII- Project Work**

#### **Digital Management**

#### **Guidelines for the Project:**

Project is an assignment to strengthen the understanding of fundamentals through effective application of theoretical concept. The objective of the project course is to help the student develop ability to apply multidisciplinary concepts, tools and techniques to solve organizational problems. The project may be from any one of your areas related to the concerned subject.

## **Project report: The Project Report must have the following.**

- Cover Page must have the name and roll no. of the student and the name & designation of theguide along with the title of the Project.
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- Chapter-II: Research Methodology
- Chapter-III: Conceptual & Theoretical Descriptions
- Chapter-IV: Data Analysis & Interpretations
- Chapter-V: Conclusion, Findings, suggestions & Scope for further research.
- Chapter-VI: References, Annexures, etc.

## Semester VI Theory of Computation

**Core XIV** 

#### **Course Objectives:**

This course focuses on the basic theory of Computer Science and formal methods of computationlike automata theory, various machines, grammars and Turing Machines. To explore the theoretical foundations of computer science from the perspective of formal languages and classify machines by their power to recognize languages.

Course Outcomes: On completion of this course, the students will be able to

- Understand the basic properties of formal languages and grammars.
- Differentiate among regular, context-free and recursively enumerable languages.
- Make grammars to produce strings from a specific language.
- Minimize the finite automata.
- Acquire concepts relating to the theory of computation and computational models including decidability and intractability.
- Design and deal with Turing machines.
- Get the basic foundation of compiler design.

#### Unit-I:

Alphabet, Languages, Grammars, Finite Automata (DFA, NFA), Regular operations, Regular Languages/Grammars, Regular Expressions, Finite Automaton With  $\dot{\epsilon}$  -Moves, Equivalence of NFA and DFA.

**Outcome:** The students will be able to understand the basic properties of formal languages and grammars, DFA & NFA.

#### Unit-II:

Minimization of Finite Automata, Closure Properties of Regular operations, Pumping Lemma of Regular Languages, Context Free Grammars, Context Free Languages, Derivation Tress, Ambiguity, Properties of Context Free Languages, Left and Right Linear Grammars.

**Outcome:** The students can minimize the finite automata, understand Pumping lemma and Right linear and Left Linear grammar.

#### Unit-III:

Chomsky Normal Form (Elimination of Useless Symbols, Unit Productions, Null Productions), Pushdown Automata, Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Languages.

**Outcome:** The students can be able to Design Push down automata, convert a grammar to CNF'

#### Unit-IV:

Turing Machines, Turing Computability, Type 0 Languages, Techniques for Turing Machine Construction, Multihead And Multitape Turing Machines, Church Turing thesis, Recursive and Recursively Enumerable Set, Chomsky Hierarchy of Languages. **Outcome:** The students will be able to Design and deal with Turing machines. Get the basic foundation of compiler design, Differentiate regular, context-free and recursively enumerable languages.

#### **Text Books:**

- ✓ Introduction to the theory of Computation, Michael Sipser, Cengage Learning.
- ✓ Introduction to Automata Theory, Languages and Computation, J. E. Hopcrpft and J.D. Ullman, Pearson Education, 3rdEdition.

#### **Reference Books:**

- ✓ JFLAP An Interactive Formal Languages and Automata Package Rodger, Finley, ISBN:0763738344
- ✓ JFLAP User Manual and Exercises, Tobias Fransson. Available in the Web.

#### Core XIV- Practical/Tutorial: Theory of Computation Lab Use Java Formal Language and Automata Language (FLAP) software Package (can be downloaded from www.jflap.org) to carry out the following experiments:

- Regular Language-Create: DFA, NFA, Regular Grammar, and Regular Expression.
- Regular Language conversions: NFA to DFA to Minimal DFA, NFA to regular expression& vice versa.
- NFA to regular grammar & vice-versa.
- Context-free language-create: push-down automaton, context-free grammar.
- Context-free language transform: PDA to CFG, CFG to PDA (LL parser), CFG to PDA (SLR Parser), CFG to CNF, CFG to LL parse table and parser, CFG to SLR parse table and parser.
- Recursively Enumerable language: Turing machine (1 tape), Turing machine (multi tape), Turing machine (building blocks), unrestricted grammar.

## Core XV Python Programming

#### **Course Objectives:**

To acquire programming skills in core Python. To acquire Object Oriented Skills in Python. Todevelop the ability to write database applications in Python.

#### **Course Outcome:**

On completion of this course, the students will be able to

- Explain basic principles of Python programming language.
- Implement object-oriented concepts.
- Implement database and GUI applications

#### Unit-I:

**Python:** Features of Python, Installing Python for windows and setting up paths, writing and Executing of a python programs, Python Virtual machine, Frozen binaries, Comparison between C, Java and python, Comments, Doc strings, How python sees variables, Data

typesinPython,builtintypes,sequencesinpython,sets,literalsinPython,userdefineddatatypes, identifiers & reserved words, Naming convention in python.

**Outcome:** Students will be able to understand the syntax and basic concepts of python programming language.

#### Unit-II:

Various Operators in Python, Input & Output, Control statements, if statements, while loop, for loop, infinite loop, nested loop, else suit, break, continue, pass, assert, return statements, command line arguments.

Arrays in python, advantages using arrays, creating arrays, importing the array module, indexing and slicing on arrays, Processing the arrays, Comparing arrays.

Strings in Python, creating strings, Length of a string, indexing in strings, slicing strings, Concatenation and Comparing strings, Finding Sub Strings, Replacing a String.

**Outcome:** Students will be able to build basic programs using fundamental programming constructs

## Unit-III:

Functions in Python, define a function, calling a function, return from function, pass by object Reference, Positional arguments, Default arguments, Recursive functions. Introduction to OOP, features of OOP, creating classes, the self-variable, constructor, types of variables, namespaces, types of methods.

**Outcome:** Students will be able to articulate the OOPs concepts as well as use of functions.

#### Unit-IV:

Inheritance: Define inheritance, types of inheritance, and constructors in inheritance, overriding superclass constructors & methods, the super () method, MRO Polymorphism: Duck typing philosophy of Python, operator overloading, method over riding, interfaces in python.

Exceptions: Errors in a python program, Exceptions, Exception handling, Types of Exceptions, the Exception block, the assert statement, user defined exceptions.

Python Database Connectivity: DBMS, types of databases used with Python, installation of MySQL database, setting path, verifying MySQL, installing MySQL connector, working with MySQL database, Using MySQL from python, retrieving rows, deleting rows, updating rows in a table.

**Outcome:** Students will be able to articulate the OOPs concepts such as inheritance and able to know how to handle exception and python database connectivity.

## **Text Books:**

- ✓ T.Budd, Exploring Python, TMH, 1stEd, 2011.
- ✓ Core Python Programming, Dr.R. Nageswar Rao, Dreamtech Press.
- ✓ Python Programming for Absolute Beginners, Michael Dawson, CENGAGE Learning.

#### **Reference Books:**

 ✓ Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist: Learning with Python, Freely available online.2012.

#### **Online References:**

- ✓ *Python Tutorial/Documentation <u>www.python.or</u> 2015*
- ✓ *http://docs.python.org/3/tutorial/index.html*
- ✓ <u>http://interactivepython.org/courselib/static/pythonds</u>
- ✓ <u>http://www.ibiblio.org/g2swap/byteofpython/read/</u>

## Core XV- Software Lab based on Python Programming

- Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
- Write a Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria: Grade A: Percentage>=80, Grade B:

Percentage>=70 and <80Grade C: Percentage>=60 and <70Grade D: Percentage>=40and <60GradeE: Percentage<40.

- Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
- Write a Program to display the first n terms of Fibonacci series.
- Write a Program to find factorial of the given number.
- Write a Program to find sum of the following series for n terms:  $1 \frac{2}{2!} + \frac{3}{3!} \frac{3}{2!} + \frac{3}{2!} \frac{3}{2!} + \frac{3}{2!} \frac{3}$
- Write a Program to calculate the sum and product of two compatible matrices.
- Install MySQL and connector and write Python programs to retrieve, inserting, delete, update rows in a table.

## Semester-VII

## Core XVI Advanced Computer Architecture

#### **Course Objectives:**

The students will understand the Concept of Parallel Processing and its applications. The students will able to implement the Hardware for Arithmetic Operations and can analyze the performance of different scalar Computers. Also, they can develop the Pipelining Concept for a given set of Instructions.

#### **Course Outcomes:**

On completion of this course, the students will be able to

- Demonstrate concepts of parallelism in hardware/software.
- Discuss memory organization and mapping techniques.
- Describe architectural features of advanced processors.
- Interpret performance of different pipelined processors.
- Explain data flow in arithmetic algorithms
- Development of software to solve computationally intensive problems

#### Unit-I:

Digital Electronics: Boolean algebra, Combinational circuits, Karnaugh map, Flip-flops, Sequential circuits. RISC processors, RISC vs CISC, Classification of Instruction set Architecture, Performance measurement, Basic parallel processing techniques: Instruction level, Thread level and Process level. Classification of parallel architecture. **Outcome:** The students can implement Boolean algebra and be able to understand combinational and sequential circuits, design and implementation of parallel processing techniques.

#### Unit-II:

Pipeline: Arithmetic pipeline, Instruction pipeline. Hazards in a pipeline: Structural, data and control hazard, Overview of hazard resolution techniques. Dynamic instruction scheduling, Branch prediction techniques, Instruction-level parallelism using software approaches, Superscalar techniques.

**Outcome:** The students can interpret the performance of different pipelined processor and significance of superscalar techniques.

#### Unit-III:

Basic concept of hierarchical memory organization, Main memories, Cache memory design and implementation, Cache coherence problem and synchronization mechanisms,

Virtual memory design and implementation, Secondary memory technology, RAID. Bus structures and standards, Synchronous and asynchronous buses. Types and uses of storage devices.

**Outcome:** The students will familiar with fundamentals of memory organization, design and implementation of cache memory, structural representation of bus architecture

## Unit-IV:

Interfacing I/O to the rest of the system, Reliability and availability, I/O system design, Platform architecture. Centralized vs. distributed shared memory, Interconnection topologies, Multiprocessor architecture, Symmetric multiprocessors, Cache coherence problem, Synchronization, Memory consistency, Multicore architecture. Distributed computers, Clusters, Grid, Mainframe computers.

Outcome: Students will know about the importance of multiprocessor and multi computers.

## **Text Books:**

- Computer Organization and Design: The Hardware/Software Interface by David APatterson and John L. Hennessy.5<sup>th</sup> Edition, Morgan Kaufmann, 2013.
- Computer System Architecture by M.Mano, 3<sup>rd</sup>Edition, Pearson Education, 2007.

## **Reference Books:**

- Computer Architecture: A Quantitative Approach by J.Hennessey and D.Patterson, 5<sup>th</sup>Edition, Morgan Kaufman.
- Advanced Computer Architecture: A design Space Approach by D.Sima, Addison-Wesley,1987

## **Computer Graphics**

## Core XVII

## **Course Objectives:**

This course is intended to understand the principles of computer graphics including twodimensional transformation, three-dimensional transformation, clipping algorithms, polygon filling, line drawing algorithms, rendering, projection of objects and demonstrates its application in various fields of computer science.

## Course Outcomes: After completion of this course, students will be able to

- Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
- Use of geometric transformations on graphics objects and their application in composite form.
- Extract scene with different clipping methods and its transformation to graphics displaydevice.
- Explore projections and visible surface detection techniques for display of 3D scene on 2Dscreen.
- Render projected objects to naturalize the scene in 2D view and use of illumination models for this.

## Unit-I:

A survey of computer graphics: Computer Aided Design, Presentation Graphics, Computer Art, Entertainment, Education Training, Visualization, Image Processing, Graphical User Interface. Overview of graphics system: Video Display Devices, Raster Scan Systems, Random Scan Systems, Input Devices, Hard-copy Devices, Graphics Software. Output primitives: Points and lines, DDA and Bresenham's Line Drawing Algorithm, Midpoint circle algorithm, Filled area primitives. Attributes of output primitives: Line attributes, Curve attributes, Colour and grayscale levels, Area-fill attributes, Character attributes, Bundled attributes.

**Outcome:** The students will have the idea of basics of computer graphics and different primitives used to draw different shapes in graphics.

## Unit-II:

**Two dimensional geometric transformations:** Basic Transformation (Translation, Rotation, Scaling), Matrix representation and homogenous coordination, Composite Transformation, Reflection, Shear. **Two-dimensional viewing:** The viewing Pipe-line, Viewing Coordinate Reference frame, Window-to-viewport coordinate transformation. **Clipping:** Line Clipping (Cohen Sutherland Algorithm), Polygon clipping (Sutherland-Hodgeman Algorithm).

**Outcome:** The students will be able to understand how to transform and represent objects in two-dimensional geometry and different clipping methods to fit the objects inside a window.

#### Unit-III:

Three dimensional geometric and modeling transformations: Translation, Rotation, Scaling, Reflections, Shears, Composite Transformation. Three-dimensional viewing: Viewing pipeline, Viewing coordinates, Projections (Parallel and Perspective). Three-dimensional object representation: Polygon Surfaces, Quadratic surfaces, Spline Representations, Bezier Curves and surfaces, B-Spline Curves and surfaces Outcome: The students will be able to understand how to transform and represent objects in three-dimensional geometry.

#### Unit-IV:

**Visible-surface detection methods:** Classification of visible-surface detection algorithms, back-face detection, Depth-Buffer method, A-Buffer method, Scan-line method, Depth- sorting method. **Illumination Models:** Basic illumination models, Displaying light intensities, Halftone Patterns and Dithering Technique, Polygon Rendering Methods (Gouraud and Phong shading)

**Outcome:** The students will come to know about how to detect visible parts of an object and different illumination models to shine the objects.

#### **Text Books:**

✓ Computer Graphics C Version, by D. Hearn and M. P. Baker, 2<sup>nd</sup> Edition, Pearson Education, 2002.

## Core XVII-Computer Graphics Lab

- Background concept of enabling graphics mode in C and usage of various graphic functions available in graphics.h.
- Simple animation programs using graphics library.
- Implementation of DDA and Bresenham's line drawing.
- Midpoint circle algorithms.
- Implementation of translation, rotation, scaling, line clipping, polygon clipping.

## **Project Management**

## **Course Objectives:**

To help the students to understand the various aspects of projects; project Identification, project Appraisal, project planning and scheduling, project implementation, project evaluation of the projects. It touches the practical aspects of project analysis and implementation.

#### Course Outcome: After completion of this course, the students will be

- Able to know the concept of project and project management and types of projects to know all the stages in the project life cycle from concept to completion.
- Know the whole concepts of projects that can be fit into the gamut of finding a gap in terms of customers' needs for goods and filling the gap.
- Know the various aspects of project appraisal like economic, commercial, financial, management appraisal.
- Know the estimation of cost of a project and to identify the gap between conventional financing and project financing.
- Understand the various sources of finance available for meeting the project cost.
- Know the project scheduling techniques in detail.
- Understand the concepts of evaluation of projects during the course of implementation.

#### Unit-I:

Concept of Projects, phases of a project- Pre-investment phase, Investment Phase and operational phase, Types of Projects, Objectives of Project Management, Importance of Project Management, Project Management Life Cycle, Project Identification, Project formulation, Project Selection.

**Outcome:** The students will understand project concepts, various phases and types & objective of project management, life cycle, formulation and selection process.

#### Unit-II:

Project feasibility studies - Opportunity studies, General opportunity studies, specific opportunity studies, pre-feasibility studies, functional studies or support studies, feasibility study- components of project feasibility studies.

**Outcome:** The students will understand various types of feasibility study carried out during project & will learn various components of project feasibility studies.

#### Core XVIII

## Unit-III:

Project planning and project design, Major cost components of project and Estimation of cost of project, Network analysis, PERT and CPM Techniques, Project Implementation practices in India.

**Outcome:** The students will have a clear understanding of project planning and design. Brief understanding of cost estimation techniques.

## Unit-IV:

Project report, Project appraisal, plant location, design and layout, Project financial feasibility- break even analysis, Profitability analysis and social cost benefit analysis. **Outcome:** The students will understand various project reports, appraisal, design layout and cost profit analysis concepts.

## **Text Books:**

✓ Desai Vasant, 'Project Management', Himalaya Publishing House, Mumbai

## **Reference Books:**

- ✓ Singh Narendra, 'Project Management & Control', Himalaya Publishing House, Mumbai.
- ✓ Prasana Chandra, 'Project Preparation, Appraisal and Implementation', Tata McGraw Hill, New Delhi

## Core XVIII- Mini Project: Project Management

## **Guidelines for Project**

Project is an assignment to strengthen the understanding of fundamentals through effective application of theoretical concept. The objective of the project course is to help the student develop ability to apply multidisciplinary concepts, tools and techniques to solve organizational problems. The project may be from any one of your areas related to the concerned subject.

## **Project report: The Project Report must have the following:**

- Cover Page must have the name and roll no. of the student and the name & designation of theguide along with the title of the Project.
- Acknowledgement, declaration, Certificate of originality signed by the guide with date
- Detailed tables & figures of contents with page nos.

• All pages of the Project Report must be numbered as reflected in Index of Chapters

## **Index of Chapters:**

- Chapter-I: Introduction & Review of literatures
- Chapter-II: Research Methodology
- Chapter-III: Conceptual & Theoretical Descriptions
- Chapter-IV: Data Analysis & Interpretations
- Chapter-V: Conclusion, Findings, suggestions & Scope for further research.
- Chapter-VI: References, Annexures, etc.

## **Machine Learning**

## Core XIX

## **Course Objectives:**

To introduce the students to the basic concepts and techniques of Machine Learning. To develop skills of using recent machine learning software for solving practical problems. To gain experience of doing independent study and research.

## Course Outcomes: On completion of this course, the students will be able to

- Explain concept of machine learning, the concept of learning task, various types of learning techniques.
- Describe artificial neural networks, perceptions, learning rules, background propagation algorithms.
- Analyze various supervised learning methods.
- Assess various unsupervised learning –k means, reinforcement learning methods.

## Unit-I:

Introduction – Types of Machine Learning, Designing a Learning System, Issues in Machine Learning; The Concept Learning Task - General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias - Decision Tree Learning - Decision tree learning algorithm, Instance based Learning, Nearest neighbors method.

## Unit-II:

Artificial Neural Networks – Perceptrons, Learning rules, Gradient descent and the Delta rule, Adaline, Madaline Network, Multilayer networks, Derivation of Backpropagation rule-Backpropagation Algorithm- Convergence, Generalization; – Evaluating Hypotheses – Estimating Hypotheses Accuracy, Basics of sampling Theory, Radial basis function networks, Support Vector Machine.

## Unit-III:

Supervised Learning- Linear Regression (Gradient Descent, Normal Equations), Weighted Linear Regression (LWR), Logistic Regression, Generative Models (Gaussian Discriminant Analysis, Naive Bayes), Learning – Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, Tree Ensembles (Decision trees, Random Forests, Boosting and Gradient Boosting).

## Unit-IV:

Unsupervised Learning- K-means, Gaussian Mixture Model (GMM), Expectation Maximization (EM), Variational Auto-encoder (VAE), Factor Analysis, Principal Components Analysis (PCA), Independent Components Analysis (ICA), Linear Discriminant Analysis (LDA), Vector Quantization – Self Organizing Feature Map. Reinforcement learning: Markov decision process (MDP), Hidden Markov Model (HMM), Bellman equations, Value iteration and policy iteration, Linear quadratic regulation, Linear Quadratic Gaussian, Q-learning, Monte Carlo Methods.

#### **Text Books:**

- ✓ T. Mitchell, "Machine Learning" Mcgraw HillPublisher.
- ✓ T. Hastie, R. Tibshirani, J. Friedman "The Element of Statistical Learning" 2e2008

#### **Reference Books:**

- ✓ E. Alpaydin,: Introduction to Machine Learning. Eastern Economy Edition, Prentice Hall of India.
- ✓ C. M. Bishop, Pattern recognition and Machine Learning, Springer Lab Experiments

#### **Core XIX- Machine Learning Practical**

Basic operations in Python implementation.

- Loading data from Training set and testing the Models.
- Learn to predict values with Linear Regression.
- Learn to predict states using Logistic Regression.
- Learn the definition of a Perceptron as a building block for neural networks, and the perceptron algorithm for classification.
- Learn the definition of a Neural Network, learn to train them using Back propagation network.
- Train Decision Trees to predict states and classification.
- Learn the Bayes rule, and how to apply it to predicting data using the Naive Bayes algorithm.
- Learn to train a Support Vector Machine to separate data linearly.
- Use Kernel Methods in order to train SVMs on data that is not linearly separable.
- Learn the basics of clustering Data, Cluster data with the K-means algorithm.
- Cluster data with Gaussian Mixture Models.
- Optimize Gaussian Mixture Models with Expectation Maximization.
- Learn to scale features in your data, learn to select the best features for training data.
- Reduce the dimensionality of the data using Principal Component Analysis and Independent Component Analysis and LDA
- Learn how to define Markov Decision Processes to solve real-world problems.
- Learn about policies and value functions, Derive the Bellman Equations.
- Write your own implementations of iterative policy evaluation, policy improvement, policy Iteration, and value Iteration.
- Implement classic Monte Carlo prediction and control methods.
- Learn how to tune hyper parameters of an estimator.
- Plotting of Validation curve and learning curve to evaluate the model.
- Evaluating Estimator performance, Cross validation

## Semester-VIII

## Core XX Data Mining & Data Warehousing

#### **Course Objectives:**

This course is intended to introduce the concepts of multidimensional schemas suitable for data warehousing, data warehouse architectures, data mining algorithms, functionalities to support critical thinking, business intelligence gathering, problem solving and to derive business rules for decision support system.

#### Course Outcomes: On completion of this course, the students will be able to

- Design a data mart or data warehouse for any organization. Know about data mining tasks and issues.
- Extract knowledge using data mining techniques.
- Understand and implement classical models and algorithms for organization needs. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering of large data sets.

#### Unit-I:

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization. Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture.

**Outcome:** The students will be able to differentiate between data warehousing and data mining. They will understand the steps required for data mining.

#### Unit-II:

Data Cube Technology. Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology. Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

**Outcome:** The students will be able to understand how to represent data in multidimensional way and how are associated and correlated to each other.

#### Unit-III:

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods.

**Outcome:** The students will come to know the importance of classifying data using different classification methods.

#### Unit-IV:

Cluster Analysis Introduction: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid- Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint- Based Cluster Analysis, Outlier Analysis.

Outcome: The students will know how to cluster data using different techniques.

#### **Text Books:**

✓ Data Mining–Concepts and Techniques–J.Hanand M.Kamber, Morgan Kaufmann Publishers, Elsevier, 2<sup>nd</sup> Edition, 2006.

#### **Reference Books:**

✓ Introduction to Data Mining- P.Tan, M.Steinbach and V.Kumar, Pearson Education

## **Design and Analysis of Algorithm**

## Core XXI

## **Course Objective:**

This course will enable to the students to know how to analyze the asymptotic performance of algorithms and demonstrate a familiarity with major algorithms and data structures, to apply important algorithmic design paradigms and methods of analysis, to synthesize efficient algorithms in common engineering design situations and to get idea regarding P, NP class.

## Course Outcomes: On completion of this course, the students will be able to

- Analyze time complexities times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it.
- Derive and solve recurrences describing the performance of divide- and-conquer algorithms.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.
- Explain the major graph algorithms and their analyses.
- Analyze the future studies of algorithm by using N, NP class.

## Unit-I:

Introduction to Algorithm, Space and Time Complexity, Asymptotic notations, worst case, best case and average case, Substitution method, Recursion-tree method, master method.

**Outcome:** The students can argue the correctness of algorithms using inductive proofs and invariants. Also, can analyze worst-case running times of algorithms using asymptotic analysis.

## Unit-II:

Divide and Conquer Technique: Quick sort, Randomized quick sort, Priority Queue, Heap Sort, Rabin-Karp String Matching, Binary Search, Finding Minimum Maximum.

**Outcome:** The students can describe, analyze and synthesize the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it.

## Unit-III:

Greedy Method: Activity selection problem, Huffman Codes, Fractional Knapsack, Job sequence with deadlines, Minimum Cost Spanning Trees-Prim's and Kruskal's algorithm.

**Outcome:** The students can describe, analyze and synthesize the greedy paradigm and explain when an algorithmic design situation calls for it.

#### Unit-IV:

Dynamic programming: Matrix chain multiplication, Longest Common Subsequence, Travelling Salesman Problem, Single Source Shortest Path: The Bellman Ford algorithm, Dijkstra's Algorithm, All pair Shortest path: Floyd Warshall algorithm. P, NP, NP-Hard, NP Completeness and reducibility, P Space, NP Space

**Outcome:** The students can describe, synthesize and analyze the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.

#### **Text Books:**

✓ Introduction to Algorithms by Thomas H. Cormen, 3<sup>rd</sup> Edition, MIT Press.

#### **Reference Books:**

✓ Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sahani, 2<sup>nd</sup> Edition, University Press.

## Core XXI- Design and Analysis of Algorithm Lab

Writing an efficient sorting algorithm (Quick Sort, Heap sort). Designing efficient algorithm for inserting, deleting and searching in a binary tree, Huffman Codes, Minimum cost spanning tree (Prims and Kruskal), Activity selection problem, Longest Common Subsequence, Travelling salesman problem, The Bellman Ford algorithm, Floyd Warshall algorithm.

## **Cryptography and Network Security**

#### **Course Objectives:**

Core XXII

- To understand basics of Cryptography and Network Security.
- To be able to secure a message over insecure channel by various means.
- To make the student learn different encryption techniques along with hash functions, MAC, digital signatures and their use in various protocols for network security and system security.

#### **Course Outcomes:**

On Completion of this course, the students will be able to

- Learn about how to maintain the Confidentiality, Integrity and Availability of a data and analyze, design classical encryption techniques and block ciphers.
- Understand and analyze public-key cryptography, RSA and other public-key cryptosystems. Design message authentication and analyze and design hash and MAC algorithms.
- Understand security protocols for protecting data on networks and analyze and design digital signature.

#### Unit-I:

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, Access Control and availability) and mechanisms, OSI Security Architecture, Cryptography, Cryptanalysis, Symmetric Cipher Model, Substitution Technique: Monoalphabetic Ciphers, Polyalphabetic Ciphers (Playfair, Vigenere, Hill), Transposition Technique. **Outcome:** The students will know about basics of security and different models of cryptography.

## Unit-II:

Data Encryption Standard (DES), Block Cipher Principles, Stream Cipher, Block Cipher, Strength and Weakness of DES, Advanced Encryption Standard (AES). Modular Arithmetic, Euclid's Algorithm.

**Outcome:** The students will be understanding about data encryption standards and types of ciphers.

#### Unit-III:

Finite Fields of the form GF(P), Principle of Public Key Cryptosystems, Applications for Public Key Cryptosystems, The RSA Algorithm, Diffie Hellman Key Exchange. Authentication Requirement, Authentication Functions: Message Encryption, Message Authentication Code, Hash Function, Message Digest Algorithm: MD5. **Outcome:** The students will come to know why authentication is required and use of crypto systems.

## Unit-IV:

Digital Signatures: Direct Digital Signature, Arbitrated Digital Signature, Authentication Protocol: Mutual Authentication, Symmetric Encryption Approach, Public Key Encryption Approach, Digital Signature Standard, Kerberos (Version4). **Outcome:** The students will be able to understand the importance of digital signatures.

#### **Text Books:**

✓ Cryptography and Network Security by Behrouz A. Forouzan

## **Reference Books:**

✓ Cryptography and Network Security Principles and Practices by William Stallings.

## **Project Work**

## Core XXIII-

## Exam/Viva Mark-100 **Project Guidelines:**

Project is an assignment to strengthen the understanding of fundamentals through effective application of theoretical concept. The objective of the project course is to help the student develop ability to apply multidisciplinary concepts, tools and techniques to solve organizational problems. The project may be from any one of your areas related to the concerned subject.

## **Project report: The Project Report must have the following:**

- Cover Page must have the name and roll no. of the student and the name & designation of theguide along with the title of the Project.
- Acknowledgement, declaration, Certificate of originality signed by the guide with date
- Detailed tables & figures of contents with page nos.
- All pages of the Project Report must be numbered as reflected.

## Note: Project Guidelines are mentioned at the end of the syllabus.

## SAMPLE QUESTIONS

## C-1: PAPER-1: Data Structure using C'

1.	What is a literal in C language?	1 Mark
2.	Explain pointer to pointer.	2 Marks
3.	Write algorithms for PUSH and POP operations of stack.	5 Marks
4.	Write a C' program to implement Quick Sort.	8 Marks

## C-2: PAPER-2: OPERATING SYSTEMS

1.	Define multi-threading.	1 Mark
2.	What are the necessary conditions for deadlock?	2 Marks
3.	List out different services of operating systems and explain each service.	5 Marks
4.	Explain Banker's deadlock-avoidance algorithm with an illustration.	8 Marks

## C-3: PAPER-3: PRINCIPLES OF MANAGEMENT

1.	Define the term Management.	1 Mark
2.	Explain the advantages and limitations of forecasting in the planning	process. 2 Marks
3.	Compare and contrast the leadership styles based on Tannenbaum &	Schmidt's Model

and Blake & Mouton's Model. 5 Marks

4. Discuss the concept of coordination in management. Explain its importance, principles,

and techniques of implementation, highlighting its role in achieving organizational harmony and efficiency. 8 Marks

#### C-4: JAVA PROGRAMMING

- 1. What is Object Oriented Programming?1 Mark2. Explain this keyword with an example.2 Marks3. How does Java support inter thread communication?5 Marks
- 4. Explain with an example to handle multiple catch blocks for a nested try block.

8 Marks

## C-5: DIGITAL LOGIC

- 1. Convert  $(67A9)_{16}$  into decimal.1 Mark
- Implement OR gate using NAND gates only.
  Differentiate between Latch and flip flop ad explain JK Flip with truth table.
  Marks
- 4. Write short notes on (Any Two) (4\*2=8 Marks)
  - a. RAMBUS Memory
  - b. Programmable Array Logic (PAL)
  - c. Tri-State Buffers.

## **C-6: COMPUTER NETWORKS**

1.	What is a topology?	1 Mark
2.	Write two benefits of data link layer.	2 Marks
3.	What is CSMA/CD? Explain.	5 Marks
4.	Explain IP V4. How does it differ from IP V6?	8 Marks

## **C-7: BUSINESS ACCOUNTING**

- What is the purpose of preparing Trading and Profit & Loss Account in financial accounting?
  1 Mark
  Explain the difference between Accounting and Bookkeeping.
  2 Marks
- Walk through the steps involved in preparing Trading and Profit & Count and Balance Sheet for a sole proprietary business. Discuss the importance of each statement in financial analysis.
- 4. Compare and contrast manual accounting systems with computerized accounting systems. Discuss the advantages and disadvantages of each system, considering their impact on financial management and decision-making. 8 Marks

## C-8: DATABASE MANAGEMENT SYSTEMS

1. Define entity set.

2.	Explain select operation in Relational algebra.	2 Marks
3.	Explain two-phase locking protocol for concurrency control.	5 Marks
4.	With suitable example describe various normal forms.	8 Marks

#### **C-9: ORGANIZATION BEHAVIOUR**

- 1. Define Perception in the context of individual behaviour. 1 Mark
- 2. Explain the foundations of Organizational behaviour and their significance in understanding workplace dynamics. 2 Marks
- 3. Compare and contrast Formal and Informal groups, and discuss their impact on organizational dynamics. 5 Marks
- 4. Discuss the nature and importance of leadership in organizational settings. Compare and contrast Trait Theory, Behaviour Theory and Contingency Theory of leadership, highlighting their strengths and weaknesses in different situations.

8 Marks

#### C-10: FOUNDATION TO DATA SCIENCE AND ANALYTICS

1.	Define big data.	1 Mark
2.	What is business intelligence?	2 Marks
3.	Explain basic data types in R.	5 Marks
4.	What is the role of data scientist in big data ecosystem?	8 Marks

#### **C-11: WEB TECHNOLOGY**

- Write the characteristics of DHTML.
  Differentiate between the 'BITWISE AND' and the 'LOGICAL AND' operator in PHP.
- Write the differences between GET and POST methods.
  Define CSS. Explain inline, internal, external and embedded style sheets with examples.
  8 Marks

#### **C-12: SOFTWARE ENGINEERING**

1.	What is software engineering?	1	Mark
2.	What is cohesion in software design?	2	Marks
3.	Describe RAD model in software development.	5	Marks
4.	What is software design? Explain various criteria for good software design	۱.	
		8	Marks

#### **C-13: DIGITAL MARKETING**

- State the objective of pricing in marketing.
  Compare Traditional Marketing with Digital Marketing, highlighting their key differences.
  Discuss the Marketing Environment and its impact on marketing strategies. Also,
- explain the factors influencing consumer decision-making. 5 Marks
- 4. Explore YouTube Advertising as a digital marketing strategy. Discuss YouTube channels, ads, types of videos used in advertising, buying models, targeting and

optimization strategies, and how to design and monitor successful video campaigns. 8 Marks

## **C-14: THEORY OF COMPUTATION**

1.	Define Regular Language.	1 Mark
2.	Design a DFA which recognize strings having odd numbers of zeros.	2 Marks
3.	Design PDA for a <sup>n</sup> b <sup>n</sup> .	5 Marks
4.	State and prove Pumping lemma for regular grammar.	8 Marks

## **C-15: PYTHON PROGRAMMING**

1. What is the purpose of global keyword in Python?	1 Mark
2. What are the features of tuple data structure?	2 Marks
3. Explain different data types in Python.	5 Marks
4. Explain the use of join() and split() string methods with examples. Descr	ibe why
strings are immutable with an example.	8 Marks

## **C-16: ADVANCED COMPUTER ARCHITECTURE**

1.	What is control hazard?	1 Mark
2.	Differentiate between RISC and CISC.	2 Marks
3.	Explain Cache coherence problem.	5 Marks
4.	Why does Hazard occur? Define types of Hazard and briefly	discuss hazard
	resolution techniques.	8
	Marks	

## **C-17: COMPUTER GRAPHICS**

1.	What is a frame buffer?	1 Mark
2.	What is the 2-D rotation transformation? Write the matrix formula.	2 Marks
3.	What is Bezier curve? Derive the formula of it.	5 Marks
4.	Explain Z-Buffer. How does it differ from A-Buffer?	8 Marks

## **C-18: PROJECT MANAGEMENT**

1.	Define feasibility study.	1 Mark
2.	What is Project appraisal?	2 Marks
3.	What is project? Explain objective of project management.	5 Marks
4		1

4. What is project management? Explain project management life cycle in details. 8 Marks

## **C-19: MACHINE LEARNING**

- 1. A decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility is called as \_\_\_\_\_. 1 Mark 2 Mark
- 2. Define Machine learning.
- 3. How to choose a target function explain with an example. 5 Marks
- 4. Give three computer applications for which machine learning approaches seem

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appropriate and the		y scolin mappinpinan	. O Mains
1 1 1			

#### C-20: DATA MINING AND DATA WAREHOUSING

1.	Define data mart.	1 Mark
2.	Describe Dataware House architecture.	2 Marks
3.	Explain Bayesian classification method.	5 Marks
4.	Compare and contrast the features of among partition methods.	8 Marks

#### C-21: DESIGN AND ANALYSIS OF ALGORITHMS

1.	Write the complexity of Quick sort?	1 Mark
2.	Define an algorithm.	2 Marks
3.	What is greedy method? How does it differ from divide & conquer method?	5 Marks
4.	Explain different asymptotic notion with example.	8 Marks

#### C-22: COMPUTER NETWORK SECURITY

1.	What is the use of cipher?	1 Mark
2.	Distinguish between cryptography and cryptoanalysis.	2 Marks
3.	Explain Euclid's algorithm.	5 Marks
4.	What is digital signature? What are its types? Briefly describe the standard	ds of it.
		8 Marks

## LIST OF ORGANIZATIONS FOR INTERNSHIP

Odisha Mining Corporation National Aluminum Company OPTCL Mahanadi Coal Fields Ltd. Steel Plants (Govt. & Private) Airport Authority of India IFFCO Paradeep Port Trust DRDO & All Govt and Private owned Organizations