

**S.A.ENGINEERING COLLEGE, CHENNAI -600 077**  
**(An Autonomous Institution, Affiliated to Anna University)**  
**B.TECH INFORMATION TECHNOLOGY**  
**REGULATIONS – 2020**  
**CHOICE BASED CREDIT SYSTEM**  
**SEMESTER III**

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
<b>THEORY</b>								
1.	MA1303	Discrete Mathematics	BS	4	3	1	0	4
2.	IT1301	Object Oriented Programming	PC	3	3	0	0	3
3.	CS1301	Data Structures	PC	3	3	0	0	3
4.	EC1306	Digital Principles and System Design	ES	3	3	0	0	3
5.	EC1307	Analog and Digital Communication	ES	3	3	0	0	3
<b>PRACTICALS</b>								
6.	IT1302	Object Oriented Programming Laboratory	PC	4	0	0	4	2
7.	CS1303	Data Structures Laboratory	PC	4	0	0	4	2
8.	HS1301	Interpersonal Skills Laboratory	EEC	2	0	0	2	1
<b>TOTAL</b>				26	15	1	10	21

**SEMESTER IV**

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
<b>THEORY</b>								
1.	MA1403	Probability and Statistics	BS	4	3	1	0	4
2.	CS1401	Computer Architecture	PC	3	3	0	0	3
3.	IT1401	Database Management Systems	PC	3	3	0	0	3
4.	CS1402	Design and Analysis of Algorithms	PC	3	3	0	0	3
5.	EC1408	Microprocessors and Microcontrollers	ES	3	3	0	0	3
6.	HV1401	Universal Human Values 2	MC	2	2	1	0	3
<b>PRACTICALS</b>								
7.	IT1402	Database Management Systems Laboratory	PC	4	0	0	4	2
8.	CS1404	Design and Analysis of Algorithm Laboratory	PC	4	0	0	4	2
9.	HS1401	Employability and Soft Skills Laboratory	EEC	2	0	0	2	1
<b>TOTAL</b>				28	17	2	10	24

**OBJECTIVES:**

- To extend student's logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.

**UNIT I LOGIC AND PROOFS****12**

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.

**UNIT II SET THEORY****12**

Basic concepts – Notations – Subset – Algebra of sets – The power set – Ordered pairs and Cartesian product – Relations on sets – Types of relations and their properties – Relational matrix and the graph of a relation – Partitions – Equivalence relations – Partial ordering – Poset – Hasse diagram – Lattices and their properties – Sub lattices – Boolean algebra – Homomorphism.

**UNIT III COMBINATORICS****12**

Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications

**UNIT IV GRAPHS****12**

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

**UNIT V ALGEBRAIC STRUCTURES****12**

Algebraic systems – Definitions-Examples-Properties-Semi groups and monoids–Homomorphism's- Groups – Subgroups – Normal subgroup and cosets – Lagrange's theorem – Codes and group codes – Basic notions of error correction-Error recovery in group codes.

**TOTAL: 60 PERIODS****OUTCOMES:****At the end of the course, students would:**

- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in identifying structures on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
- Be aware of the counting principles.
- Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

## **TEXTBOOKS:**

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7<sup>th</sup> Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar.R., " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30<sup>th</sup> Reprint, 2011.

## **REFERENCES:**

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4<sup>th</sup> Edition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3<sup>rd</sup> Edition, 2010.
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.

**IT1301**

**OBJECT ORIENTED PROGRAMMING**

**L T P C**

**3 0 0 3**

## **OBJECTIVES:**

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads and generics classes
- To design and build simple Graphical User Interfaces

## **UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 9**

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java –Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays, Packages.

## **UNITII INHERITANCE AND INTERFACES 9**

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, ArrayLists - Strings

## **UNITIII EXCEPTION HANDLING AND I/O 9**

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

## **UNITIV MULTITHREADING AND GENERIC PROGRAMMING 9**

Understanding Threads, Thread Priorities, Synchronizing Threads, Thread life cycle, Inter-thread communication. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations-Introduction to JDBC, JDBC Drivers and Architecture, Accessing Database with JDBC.

## UNITV EVENT DRIVEN PROGRAMMING

9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes -actions - mouse events - Introduction to Swing –Swing GUI Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes. Swing packages-Swing Control classes and Methods.

**TOTAL: 45 PERIODS**

### OUTCOMES:

**Upon completion of the course, students will be able to:**

- Develop Java programs using OOP principles
- Develop Java programs with the concepts of inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Design problems solutions using Generic Collections and Exception Handling
- Create a Database connectivity and manipulate database using JDBC
- Develop interactive Java programs using swings

### TEXT BOOKS:

1. Herbert Schildt, –Java The complete reference, 8<sup>th</sup> Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, –Core Java Volume –I Fundamentals, 9<sup>th</sup> Edition, Prentice Hall, 2013.

### REFERENCES:

1. Paul Deitel, Harvey Deitel, –Java SE 8 for programmers, 3<sup>rd</sup> Edition, Pearson, 2015.
2. Steven Holzner, —Java 2 Black book, Dreamtech press, 2011.
3. Timothy Budd, —Understanding Object-oriented programming with Javall, Updated Edition, Pearson Education, 2000.

**CS1301**

**DATA STRUCTURES**

**L T P C  
3 0 0 3**

### COURSE OBJECTIVES:-

- To Study the concepts of ADTs
- To Acquire linear data structures – lists, stacks, and queues
- To learn non-linear data structures and apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms

### UNIT I LINEAR DATA STRUCTURES – LIST

9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation —singly linked lists-doubly-linked lists – circularly-linked list-applications of lists –Polynomial Manipulation

### UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES

9

Stack ADT – Operations – Evaluating arithmetic expressions- Other Applications- Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Priority Queue-Double Ended Queues – applications of queues.





**Unit I Linear Modulation****9**

Need for Modulation-AM Signal and Spectra-DSB-Product Modulator- Square law and Balanced Modulator- Switching Modulator-DSBSC-SSBSC-VSB-TV signals-Envelope Detector, Coherent Detection-Costas Receiver-Quadrature Carrier Multiplexing- Frequency Translation- Noise in AM.

**Unit II Angle Modulation****9**

Frequency Modulation-Reactance Modulator-Phase Modulation- FM & PM Relation-Bandwidth- Narrow band & Wide band FM transmitters- PLL- Pre-emphasis & De-emphasis- FM Detectors –Phase discriminator- Slope detector- Ratio detector- Noise in FM.

**Unit III Digitization Techniques for Computer Networks****9**

Sampling Theory – PAM – Quantization - Pulse Code Modulation - Noise in PCM – Differential PCM-Delta Modulation – Adaptive Delta Modulation – TDM-Voice band modems.

**Unit IV Digital Modulation****9**

Phase shift keying – BPSK, DPSK, QPSK – Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Pulse shaping – Duo binary encoding — Eye pattern –Correlation Receiver- CDMA- Rake Receiver.

**Unit V Coding Techniques****9**

Measure of information – Entropy – Source coding theorem – Shannon–Fano coding, Huffman Coding, LZ Coding – Channel capacity – Shannon-Hartley law – Shannon's limit – Error control codes – Cyclic codes, Syndrome calculation – Convolution Coding, Sequential and Viterbi decoding.

**TEXT BOOKS:**

1. H Taub, D L Schilling, G Saha, “Principles of Communication Systems” 3/e, TMH 2007
2. Simon Haykin “Digital Communications” John Wiley 2005
3. Simon Haykin, “Communication Systems” 4<sup>th</sup> Edition John Wiley

**REFERENCES:**

1. Bruce A Carlson, “Communication Systems – An Introduction to Signals and Noise in Electrical Communication” 4<sup>th</sup> Edition. McGraw-Hill
2. John G. Proakis, “Digital Communication”, 2014, 5th Edition, McGraw-Hill, India
3. Sklar, Digital Communications: Fundamentals and Applications, 2009, 2nd Edition, Pearson Education

**OBJECTIVES**

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- To develop applications using generic programming and event handling.

**LIST OF EXPERIMENTS**

1. Develop a java application using classes & objects
2. Develop a java application using packages.
3. Develop a java application using Inheritance.
4. Design a Java interface for ADT Stack. Provide necessary exception handling.
5. Write a program to perform string operations using Array List. Write functions for the following
  - a. Append - add at end
  - b. Insert – add at particular index
  - c. Search
  - d. List all string starts with given letter.
- 6 . Write a Java Program to create an abstract class named and demonstrate polymorphism.
7. Write a Java program to implement user defined exception handling.
8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
9. Write a java program that implements multi-threading.
10. Write a java program to create generic function.
11. Design a calculator using event-driven programming paradigm of Java with the following options.
  - a) Decimal manipulations
  - b) Scientific manipulations
12. Develop a simple student database management system using event-driven and concurrent programming paradigms of Java. Use JDBC to connect a back-end database.

**TOTAL : 60 PERIODS****OUTCOMES****Upon completion of the course, the students will be able to**

- Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
- Develop and implement Java Programs with Arraylist.
- Develop and implement Java programs with exception handling and multithreading.
- Design applications using file processing, generic programming and event handling.
- Ability to solve real world problems using features of Object Oriented Programming
- Ability to write, debug and document well-structured Java Applications



**COURSE OBJECTIVES: -**

- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To implement graph algorithms
- To get familiarized to sorting, searching and hashing algorithms

**LIST OF EXPERIMENTS:-**

1. Array implementation of List ADT
2. Implement the following data structures
  - i. Singly Linked List
  - ii. Doubly Linked List
3. Array implementation of Stack and Queue ADTs
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Search Trees
6. Implementation of AVL Trees
7. Programs for implementation of graph traversals
  - (i) BFS and (ii) DFS
8. Programs to find out minimum spanning tree of simple connected undirected graph
  - i. Prim's Algorithm
  - ii. Kruskal's Algorithm
9. Program to implement Dijkstra's algorithm for solving single source shortest path.
10. Implementation of searching algorithms and Selection Sort, Insertion sort algorithms
11. Programs to implement hashing (i) Separate Chaining and (ii) Open Addressing

**COURSE OUTCOMES:-**

- CO1: Implement abstract data types for linear data structures  
CO2: To apply different linear data structures to problem solutions  
CO3: Comprehend and implement the different operations of various Trees.  
CO4: Critically analyze the various algorithms  
CO5: Understand and implement various sorting, searching and hashing algorithms

**OBJECTIVES: The Course will enable learners to:**

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- Improve general and academic listening skills.
- Make effective presentation.

## **UNIT I**

Listening as a key skill- its importance- Speaking- give personal information- ask for personal information- Improving pronunciation- pronunciation basics- Taking lecture notes- preparing to listen to a lecture- articulate a complete idea.

## **UNIT II**

Interpersonal skills- nurturing- empathetic- self-control- patient- sociability- warmth- social skills-Team Work-Work Ethic- willing to work- initiative- self-motivated - Integrity.

## **UNIT III**

Factors influence fluency- deliver a five-minute informal talk- greet- respond to greetings- describe health and symptoms- invite and offer- accept- decline- take leave- listen for and follow the gist- listen for detail.

## **UNIT IV**

Being an active listener: giving verbal and non-verbal feedback- participating in a group discussion- asking and getting clarifications- Summarising academic readings and lectures- Conversational speech- listening to and participating in conversations- persuade.

## **UNIT V**

Formal and informal talk- listen to follow and respond to explanations, directions and instructions in academic and business contexts- Strategies for formal presentations and interactive communication- group/pair presentations.

**TOTAL : 30 PERIODS**

**OUTCOMES: At the end of the course Learners will be able to:**

- Listen and respond appropriately.
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal

### **TEXT BOOKS:**

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

### **REFERENCES:**

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.

**OBJECTIVES:**

- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

**UNIT I                    PROBABILITY AND RANDOM VARIABLES                    12**

Probability – The axioms of probability – Conditional probability – Total probability – Baye’s theorem – Discrete and continuous random variables – Probability mass function – Probability density function– Properties – Mathematical Expectations – Conditional Expectations – Moments – Moment generating functions – characteristic function – Chebyshev’s inequality.

**UNIT II                    STANDARD DISTRIBUTION                    12**

Discrete distribution – Bernoulli’ trial – Binomial distribution – Poisson distribution – Geometric distribution – Negative Binomial distribution – Continuous distribution – Uniform distribution – Exponential distribution – Gamma distribution – Weibull distribution – Normal distribution.

**UNIT III                    TWO – DIMENSIONAL RANDOM VARIABLES                    12**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

**UNIT IV                    TESTING OF HYPOTHESIS                    12**

Sampling distributions – Estimation of parameters – Statistical hypothesis – Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion – Contingency table (test for independent) – Goodness of fit.

**UNIT V DESIGN OF EXPERIMENTS AND STATISTICAL QUALITY CONTROL 12**

One way and Two way classifications – Completely randomized design – Randomized block design – Latin square design –  $2^2$  factorial design – Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits.

**TOTAL : 60 PERIODS**

**OUTCOMES:**

Upon successful completion of the course, students will be able to:

- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.

- Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

### TEXT BOOKS:

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.
3. Kapoor, V.K. and Gupta, S.P. (1978): Fundamentals of applied statistics, Sultan Chand & Sons.

### REFERENCES:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.
6. Grant, E.L. and Laven Worth, R.S.: Statistical Quality Control, McGraw Hill.

**CS1401**

**COMPUTER ARCHITECTURE**

**L T P C  
3 0 0 3**

### **UNIT I FUNDAMENTALS OF COMPUTER ARCHITECTURE**

**9**

Overview- Eight great Ideas in Computer architecture-components of computer system- Instructions – Operations and Operands – Representing Instructions – Arithmetic & Logical operations – control operations – Performance - needs and types of various addressing modes

### **UNIT II ARCHITECTURE OF COMPUTER ARITHMETIC OPERATIONS**

**9**

Data Representation, Architecture of Hardware implementation of arithmetic unit for common arithmetic operations: addition, subtraction, multiplication, division( Fixed point and floating point)

### **UNIT III ORGANIZATION AND ARCHITECTURE OF INSTRUCTION EXECUTION**

**9**

Introduction-Logic Design Convention-Building a datapath – A simple Control Implementation scheme – An Overview of Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards-Exceptions.

### **UNIT IV PARALLELISIM & MEMORY SYSTEM**

**9**

Parallel processing challenges – Flynn's classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory

Multiprocessors. Exploiting Memory Hierarchy: Introduction-Memory Technologies-Basics of caches-Measuring and improving Cache Performance-Virtual Memory-Cache Coherence.

## **UNIT V INPUT/ OUTPUT ORGANIZATION**

**9**

Accessing I/O devices-Interrupts-External Devices-I/O Modules-Programmed I/O-Interrupt Driven I/O-Direct Memory Access-Bus Arbitration-Buses-synchronous Bus-Asynchronous Bus-Interface Circuits-Parallel Port-Serial; Port-Standard I/O Interfaces-Universal serial Bus(USB).

### **TEXT BOOKS:-**

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, Fifth Edition, Tata McGraw Hill, 2012.
3. W. Stallings, Computer organization and architecture, Prentice-Hall, 2012 M. M. Mano, Computer System Architecture, 3rd Edition, 1992, Prentice-Hall

### **REFERENCE BOOKS:-**

1. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
2. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

**IT1401**

**DATABASE MANAGEMENT SYSTEMS**

**L T P C**  
**3 0 0 3**

### **OBJECTIVES:**

- To learn the fundamentals of data models, conceptualize and depict a database system using ER diagram.
- To study the principles to be followed to create an effective relational database and write SQL queries to store/retrieve data to/from database systems.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To learn about the internal storage structures using different file and indexing techniques and the basics of query processing and optimization.
- To study the basics of distributed databases, semi-structured and un-structured data models

## **UNIT I RELATIONAL DATABASES**

**9**

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL .

## **UNIT II DATABASE DESIGN**

**9**

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd’s Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form .

## **UNIT III TRANSACTIONS**

**9**

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

#### **UNIT IV IMPLEMENTATION TECHNIQUES**

**9**

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation .

#### **UNIT V ADVANCED TOPICS**

**9**

Overview of Distributed Databases – Data Fragmentation – Replication — Introduction to Object-based Databases - Enhanced Data bases: Temporal Database –Spatial Database –Multimedia Database - XML Databases: XML schema - NOSQL Database: Characteristics – Schema-less models– Applications – Current Trends.

#### **OUTCOMES:**

**On completion of the course, the student will be able to:**

**CO1:** Model an application’s data requirements using conceptual modeling and design database schemas based on the conceptual model.

**CO2:** Formulate solutions to a broad range of query problems using relational algebra/SQL.

**CO3:** Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

**CO4:** Run transactions and estimate the procedures for controlling the consequences of concurrent data access.

**CO5:** Explain basic database storage structures, access techniques and query processing.

**CO6:** Describe distributed, semi-structured and unstructured database systems.

#### **TEXT BOOKS:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —Database System Concepts, Sixth Edition, Tata McGraw Hill, 2014.
2. Ramez Elmasri, Shamkant B. Navathe, —Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2017.
3. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El Sevier Publishers, 2013.

#### **REFERENCES:**

1. C.J.Date, A.Kannan, S.Swamynathan, —An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.
2. Raghuram Ramakrishnan, —Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.
3. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
3. G. K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
4. Carlos Coronel, Steven Morris, Peter Rob, "Database Systems: Design, Implementation and Management", Ninth Edition, Cengage Learning, 2011.

**COURSE OBJECTIVES:**

- To construct algorithms that is efficient in space and time complexities.
- To understand different design technique like Brute force and Divide and Conquer
- To understand Greedy and Dynamic Programming design techniques
- To understand Backtracking and Branch & Bound design technique
- To understand the limitations of Algorithmic power.

**UNIT I INTRODUCTION****9**

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

**UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER****9**

Brute Force: Closest-Pair - String Matching – Selection Sort – Bubble Sort- Divide and Conquer Methodology: Binary Search – Merge sort – Quick sort – Randomized version of Quick sort- Analysis of Quick sort–Multiplication of Large Integers

**UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE****9**

**Dynamic programming:** Computing a Binomial Coefficient -Warshall's and Floyd's algorithm for All Pairs shortest Path Problem- Multi Stage Graph– 0/1 Knapsack Problem and Memory functions.

**Greedy Technique:** Prim's algorithm and Kruskal's Algorithm - Dijkstra's Algorithm - Bellman ford Problem – Fractional Knapsack problem, Huffman Trees.

**UNIT IV BACKTRACKING AND BRANCH & BOUND****9**

**Backtracking:** n-Queen's problem -Hamiltonian Circuit Problem – Subset Sum Problem- Graph Colouring.**Branch and Bound:** Assignment problem – Knapsack Problem – Travelling Salesman Problem .

**UNIT V TRACTABILITY & SOLVABILITY****9**

Lower – Bound Arguments – P, NP NP- Complete- Dominating Set Problem - NP Hard Problems – Clique Decision Problem – Node Cover Decision Problem – NP Hard Scheduling Problems –Job Shop Scheduling- Approximation Algorithm for NP Hard Problems – Travelling Salesperson Problem – Knapsack Problem.

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

At the end of the course, the students should be able to:

- Apply efficient algorithms to reduce space and time complexity of both recurrent and non-recurrent relations.
- Critically analyze the different algorithms using design techniques like Brute force and Divide and Conquer.
- Construct algorithms using design paradigms like Greedy and Dynamic Programming for a given problem
- Construct algorithms using Backtracking and Branch & Bound design technique.
- Interpret various algorithms and interpret solutions to evaluate NP Hard problems.





## **TEXT BOOKS:**

1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Applications with 8085". Sixth edition, Penram International Publishing 2012.
2. Yu-Cheng Liu, Glenn A.Gibson, —Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2007. 3.
3. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, —The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Second Edition, Pearson education, 2011.

## **REFERENCES:**

1. Krishna Kant, —Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096, PHI, 2007, Seventh Reprint, 2011.
2. Kenneth J. Ayala., —The 8051 Microcontroller, 3rd Edition, Thompson Delmar Learning, 2012.
3. A.K. Ray, K.M. Bhurchandi, —Advanced Microprocessor and Peripherals, Second edition, Tata McGraw-Hill, 2010.
4. Barry B. Brey, —The Intel Microprocessors Architecture, Programming and Interfacing, Pearson Education, 2007. Second impression 2010.

**HV1401**

**UNIVERSAL HUMAN VALUES**

**LT P C  
2 1 0 3**

### **OBJECTIVE:**

The objective of the course is four fold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

### **COURSE TOPICS:**

#### **Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration—what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

#### **Module 2: Understanding Harmony in the Human Being - Harmony in Myself!**

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
8. Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility
9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

### **Module 3: Understanding Harmony in the Family and Society- Harmony in Human Human Relationship**

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

### **Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and selfregulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all pervasive space

21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

### **Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics**

22. Natural acceptance of human values

23. Definitiveness of Ethical Human Conduct

24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c.

Ability to identify and develop appropriate technologies and management patterns for above production systems.

26. Case studies of typical holistic technologies, management models and production systems

27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

#### **READINGS:**

##### **Text Book**

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

##### **Reference Books**

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)13. Gandhi - Romain Rolland (English)

**IT1401**

**DATABASE MANAGEMENT SYSTEMS LABORATORY**

**L T P C**

**0 0 4 2**

**OBJECTIVES:**

- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To be familiar with the use of a front end tool for GUI based application development

**Experiments:**

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins
3. Views, Sequences, Synonyms
4. Database Programming: Implicit and Explicit Cursors
5. Procedures and Functions
6. Triggers
7. Exception Handling
8. Database Design using ER modeling, normalization and Implementation for any application
9. Create Document, column and graph based data using NOSQL database tools.
10. Develop a simple GUI based database application

**OUTCOMES:**

**Upon completion of the course, the students will be able to:**

- Use typical data definitions and manipulation commands.
- Design applications to test Nested and Join Queries
- Implement simple applications that use Views
- Critically analyze the use of Tables, Views, Functions and Procedures
- Implement a GUI application that require a Front-end and Back end Tool
- Create and manipulate data using NOSQL database.

**COURSE OBJECTIVES:**

- To understand and apply algorithm analysis technique
- To acquire and analyze knowledge to solve problems.
- To Design and implement efficient algorithms for a specified application.
- Strengthen the ability to identify and apply the suitable algorithm for the real world problem.
- To understand and analyse the Approximation algorithms

**LIST OF EXPERIMENTS**

1. To find the **factorial** of a given number using recursive algorithm
2. To find the **number of bits in integer**
3. Create **Diamond Pattern Printing**
4. Sort a given set of elements using the **quick sort** method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the 1st to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
5. **Implement merge sort algorithm** to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
6. Implement **0/1 Knapsack problem using Dynamic Programming.**
7. Compute the transitive closure of a given graph using **Warshall's algorithm**
8. Implement All-Pairs Shortest Paths Problem using **Floyd's algorithm.** Parallelize this algorithm, implement it using OpenMP and determine the speed-up achieved.
9. Find Minimum Cost Spanning Tree of a given graph using **Prim's and Kruskal's algorithm**
10. Implement the **Single source Shortest path algorithm**
11. Implement any scheme to find the optimal solution for the **Traveling Sales Person** problem and then solve the same problem instance using any **approximation algorithm** and determine the error in the approximation.
12. Implement N Queen's problem using **Back Tracking.**

**COURSE OUTCOMES:**

At the end of the course, the students should be able to:

- Design algorithms for various computing problems
- Understand different algorithm to solve problems
- Implement efficient algorithms for a specified application
- Identify and apply the suitable algorithm for the given real world problem.
- Understand the approximation algorithms.

## REFERENCES:

1. Levitin A, "Introduction to the Design And Analysis of Algorithms", Pearson Education, 2008.
2. Goodrich M.T., Tomassia, "Algorithm Design foundations Analysis and Internet Examples", John Wiley and Sons, 2006.
3. Base Sara, Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson, 3rd Edition, 1999

HS1401

EMPLOYABILITY AND SOFT SKILLS LAB

L T P C  
0 0 2 1

## OBJECTIVES:

- Strengthen the Employability skills of the students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students' critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.
- Enrich the Soft Skills of the students.

## UNIT I

Soft Skills- Professionalism- Courtesy- manners - etiquette- business etiquette- Flexibility- Positive attitude- Responsibility-Teamwork- Time Management

## UNIT II

**Communication** - oral speaking capability- written- presenting- listening- clear speech & writing- Motivation and **initiative**-Leadership- Reliability/dependability- **Adaptability**- Patience- **Problem solving**- Negotiation and persuasion

## UNIT III

**Writing**- Plan before writing- Use of Graphic organisers- Develop a paragraph: topic sentence, supporting sentences, concluding sentence- Write a descriptive paragraph- opinion paragraph- argumentative- analytical.

## UNIT IV

**Reading**- Genres and Organization of Ideas- **Writing**- Email writing- resumes- Job application- project writing- writing convincing proposals.

## UNIT V

Aptitude- Verbal- Logical Reasoning- Critical reading and thinking- understanding how the text positions the reader- **Writing**- Statement of Purpose- letter of recommendation- Vision statement

**TOTAL: 30 PERIODS**

**OUTCOMES: At the end of the course Learners will be able to:**

- Write different types of paragraphs.
- Write winning job applications.
- Excel in Verbal aptitude, read and evaluate texts logically to solve the puzzles.
- Good in employability and soft skills.
- Display critical thinking in various professional contexts.

**TEXT BOOKS:**

1. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011
2. Debra Daise, Charl Norloff, and Paul Carne Reading and Writing (Level 4) Oxford University Press: Oxford, 2011

**REFERENCES:**

1. Davis, Jason and Rhonda Liss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006
2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012
3. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004
4. Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000
5. Petelin, Roslyn and Marsh Durham. The Professional Writing Guide: Knowing Well and Knowing Why. Business & Professional Publishing: Australia, 2004