VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN
(An Autonomous Institution)
[Sponsored by Lavu Educational Society, Affiliated to JNTUH & Approved by AICTE, New Delhi]
Kondapur (V), Ghatkesar (M), Medchal - Malkajgiri (D) - 501 301. Phone: 96529 10002/3

## COMPUTER SCIENCE &ENGINEERING (DATA SCIENCE)

## COURSE STRUCTURE-VR24

I B.Tech.-I Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | MA101BS | Matrices and Calculus | 3 | 1 | 0 | 4 |
| 2 | CH102BS | Engineering Chemistry | 3 | 1 | 0 | 4 |
| 3 | CS103ES | Programming for Problem Solving | 3 | 0 | 0 | 3 |
| 4 | EE104ES | Basic Electrical Engineering | 2 | 0 | 0 | 2 |
| 5 | ME105ES | Computer Aided Engineering Graphics | 1 | 0 | 4 | 3 |
| 6 | CS106ES | Elements of Computer Science & Engineering | 0 | 0 | 2 | 1 |
| 7 | CH107BS | Engineering Chemistry Laboratory | 0 | 0 | 2 | 1 |
| 8 | CS108ES | Programming for Problem Solving Laboratory | 0 | 0 | 2 | 1 |
| 9 | EE109ES | Basic Electrical Engineering Laboratory | 0 | 0 | 2 | 1 |
| | | **Total** | **12** | **2** | **12** | **20** |

**I** B.Tech.-II Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | MA201BS | Ordinary Differential Equations and Vector Calculus | 3 | 1 | 0 | 4 |
| 2 | PH202BS | Applied Physics | 3 | 1 | 0 | 4 |
| 3 | ME203ES | Engineering Workshop | 0 | 1 | 3 | 2.5 |
| 4 | EN204HS | English for Skill Enhancement | 2 | 0 | 0 | 2 |
| 5 | EC205ES | Electronic Devices and Circuits | 2 | 0 | 0 | 2 |
| 6 | ML206ES | Python Programming Laboratory | 0 | 1 | 2 | 2 |
| 7 | PH207BS | Applied Physics Laboratory | 0 | 0 | 3 | 1.5 |
| 8 | EN208HS | English Language and Communication Skills Laboratory | 0 | 0 | 2 | 1 |
| 9 | IT209ES | IT Workshop | 0 | 0 | 2 | 1 |
| 10 | *MC210 | Environmental Science | 3 | 0 | 0 | 0 |
| | | **Total** | **13** | **4** | **12** | **20** |

**Note: L-Theory T-Tutorial P-Practical C-Credits**

## COMPUTER SCIENCE &ENGINEERING (DATA SCIENCE)

## COURSE STRUCTURE-VR24

### II B.Tech.-I Semester

| S. No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | EC301ES | Digital Electronics | 3 | 0 | 0 | 3 |
| 2 | DS302PC | Data Structures | 3 | 0 | 0 | 3 |
| 3 | MA303BS | Computer Oriented Statistical Methods | 3 | 1 | 0 | 4 |
| 4 | DS304PC | Computer Organization and Architecture | 3 | 0 | 0 | 3 |
| 5 | DS305PC | Object Oriented Programming through Java | 3 | 0 | 0 | 3 |
| 6 | DS306PC | Data Structures Lab | 0 | 0 | 3 | 1.5 |
| 7 | DS307PC | Object Oriented Programming through Java Lab | 0 | 0 | 3 | 1.5 |
| 8 | DS308PC | Data visualization-R Programming/Power BI | 0 | 0 | 2 | 1 |
| 9 | *MC309 | Gender Sensitization Lab | 0 | 0 | 2 | 0 |
| | | **Total** | **15** | **1** | **10** | **20** |

### II B.Tech.-II Semester

| S. No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS401PC | Discrete Mathematics | 3 | 0 | 0 | 3 |
| 2 | SM402MS | Business Economics & Financial Analysis | 3 | 0 | 0 | 3 |
| 3 | DS403PC | Operating Systems | 3 | 0 | 0 | 3 |
| 4 | DS404PC | Database Management Systems | 3 | 0 | 0 | 3 |
| 5 | DS405PC | Software Engineering | 3 | 0 | 0 | 3 |
| 6 | DS406PC | Operating Systems Lab | 0 | 0 | 2 | 1 |
| 7 | DS407PC | Database Management Systems Lab | 0 | 0 | 2 | 1 |
| 8 | DS408PC | Real-time Research Project/ Societal Related Project | 0 | 0 | 4 | 2 |
| 9 | DS409PC | Node JS /React JS / Django | 0 | 0 | 2 | 1 |
| 10 | *MC410 | Constitution of India | 3 | 0 | 0 | 0 |
| | | **Total** | **18** | **0** | **10** | **20** |

**Note: L-Theory T-Tutorial P-Practical C-Credits**

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## COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

## COURSE STRUCTURE-VR24

### III B.Tech.-I Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS501PC | Algorithms Design and Analysis | 3 | 0 | 0 | 3 |
| 2 | CS502PC | Computer Networks | 3 | 0 | 0 | 3 |
| 3 | DS503PC | Introduction to Data Science | 3 | 1 | 0 | 4 |
| 4 | | Professional Elective - I | 3 | 0 | 0 | 3 |
| 5 | | Professional Elective - II | 3 | 0 | 0 | 3 |
| 6 | DS504PC | R Programming Lab | 0 | 0 | 2 | 1 |
| 7 | CS505PC | Computer Networks Lab | 0 | 0 | 2 | 1 |
| 8 | EN506BS | Advanced English Communication Skills Lab | 0 | 0 | 2 | 1 |
| 9 | DS507PC | ETL-Kafka/Talend | 0 | 0 | 2 | 1 |
| 10 | MC508BS | Intellectual Property Rights | 3 | 0 | 0 | 0 |
| | | **Total** | **18** | **1** | **08** | **20** |

### III B.Tech.-II Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | ML601PC | Machine Learning | 3 | 0 | 0 | 3 |
| 2 | IT602PC | Automata Theory and Compiler Design | 3 | 0 | 0 | 3 |
| 3 | DS603PC | Big Data Analytics | 3 | 0 | 0 | 3 |
| 4 | | Professional Elective – III | 3 | 0 | 0 | 3 |
| 5 | | Open Elective - I | 3 | 0 | 0 | 3 |
| 6 | ML604PC | Machine Learning Lab | 0 | 0 | 2 | 1 |
| 7 | DS605PC | Big Data Analytics Lab | 0 | 0 | 2 | 1 |
| 8 | | Professional Elective - III Lab | 0 | 0 | 2 | 1 |
| 9 | DS606PC | Industrial Oriented Mini Project/ Summer Internship/ Skill Development Course (UI design- Flutter) | 0 | 0 | 4 | 2 |
| 10 | MC607BS | Environmental Science | 3 | 0 | 0 | 0 |
| | | **Total** | **18** | **0** | **10** | **20** |

**Note: L-Theory T-Tutorial P-Practical C-Credits**

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## COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

### Professional Elective-I

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS511PE | Data Warehousing and Business Intelligence | 3 | 0 | 0 | 3 |
| 2 | DS512PE | Artificial Intelligence | 3 | 0 | 0 | 3 |
| 3 | DS513PE | Web Programming | 3 | 0 | 0 | 3 |
| 4 | EC514PE | Image Processing | 3 | 0 | 0 | 3 |
| 5 | DS515PE | Computer Graphics | 3 | 0 | 0 | 3 |

### Professional Elective-II

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS521PE | Spatial and Multimedia Databases | 3 | 0 | 0 | 3 |
| 2 | DS522PE | Information Retrieval Systems | 3 | 0 | 0 | 3 |
| 3 | DS523PE | Software Project Management | 3 | 0 | 0 | 3 |
| 4 | DS524PE | DevOps | 3 | 0 | 0 | 3 |
| 5 | DS525PE | Computer Vision and Robotics | 3 | 0 | 0 | 3 |

### Professional Elective-III

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS631PE | Software Testing Methodologies | 3 | 0 | 0 | 3 |
| 2 | DS632PE | Data Visualization Techniques | 3 | 0 | 0 | 3 |
| 3 | DS633PE | Scripting Languages | 3 | 0 | 0 | 3 |
| 4 | DS634PE | Mobile Application Development | 3 | 0 | 0 | 3 |
| 5 | DS635PE | Cryptography and Network Security | 3 | 0 | 0 | 3 |

### Professional Elective-III Lab

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS611PE | Software Testing Methodologies Lab | 0 | 0 | 2 | 1 |
| 2 | DS612PE | Data Visualization Techniques Lab | 0 | 0 | 2 | 1 |
| 3 | DS613PE | Scripting Languages Lab | 0 | 0 | 2 | 1 |
| 4 | DS614PE | Mobile Application Development Lab | 0 | 0 | 2 | 1 |
| 5 | DS615PE | Cryptography and Network Security Lab | 0 | 0 | 2 | 1 |

**#Courses in PE - III and PE - III Lab must be in 1-1 correspondence.**

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## COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

### Open Elective-I

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS641OE | Fundamentals of Data Science | 3 | 0 | 0 | 3 |
| 2 | DS642OE | R Programming | 3 | 0 | 0 | 3 |

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## COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

## COURSE STRUCTURE-VR24

### IV B.Tech.-I Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS701PC | Predictive Analytics | 3 | 0 | 0 | 3 |
| 2 | DS702PC | Web and Social Media Analytics | 3 | 0 | 0 | 3 |
| 3 | | Professional Elective – IV | 3 | 0 | 0 | 3 |
| 4 | | Professional Elective – V | 3 | 0 | 0 | 3 |
| 5 | | Open Elective – II | 3 | 0 | 0 | 3 |
| 6 | DS703PC | Predictive Analytics Lab | 0 | 0 | 2 | 1 |
| 7 | DS704PC | Web and Social Media Analytics Lab | 0 | 0 | 2 | 1 |
| 8 | DS705PC | Project Stage – I | 0 | 0 | 6 | 3 |
| | | **Total** | **15** | **0** | **10** | **20** |

### IV B.Tech.-II Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | MS801BS | Organizational Behavior | 3 | 0 | 0 | 3 |
| 2 | | Professional Elective – VI | 3 | 0 | 0 | 3 |
| 3 | | Open Elective – III | 3 | 0 | 0 | 3 |
| 4 | DS802PC | Project Stage – II including Seminar | 0 | 0 | 22 | 11 |
| | | **Total** | **9** | **0** | **22** | **20** |

**Note: L-Theory T-Tutorial P-Practical C-Credits**

## COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

### Professional Elective -IV

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS741PE | Quantum Computing | 3 | 0 | 0 | 3 |
| 2 | DS742PE | Database Security | 3 | 0 | 0 | 3 |
| 3 | DS743PE | Natural Language Processing | 3 | 0 | 0 | 3 |
| 4 | DS744PE | Information Storage Management | 3 | 0 | 0 | 3 |
| 5 | DS745PE | Internet of Things | 3 | 0 | 0 | 3 |

### Professional Elective -V

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS751PE | Privacy Preserving Data Publishing | 3 | 0 | 0 | 3 |
| 2 | DS752PE | Cloud Computing | 3 | 0 | 0 | 3 |
| 3 | DS753PE | Data Science Applications | 3 | 0 | 0 | 3 |
| 4 | DS754PE | Mining Massive Datasets | 3 | 0 | 0 | 3 |
| 5 | DS755PE | Exploratory Data Analysis | 3 | 0 | 0 | 3 |

### Professional Elective -VI

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS861PE | Data Stream Mining | 3 | 0 | 0 | 3 |
| 2 | DS862PE | Web Security | 3 | 0 | 0 | 3 |
| 3 | DS863PE | Video Analytics | 3 | 0 | 0 | 3 |
| 4 | DS864PE | Blockchain Technology | 3 | 0 | 0 | 3 |
| 5 | DS865PE | Parallel and Distributed Computing | 3 | 0 | 0 | 3 |

### Open Elective-II

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS721OE | Data Mining | 3 | 0 | 0 | 3 |
| 2 | DS722OE | Data Analytics | 3 | 0 | 0 | 3 |

### Open Elective-III

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | DS831OE | Introduction to social media mining | 3 | 0 | 0 | 3 |
| 2 | DS832OE | Data Visualization using Python | 3 | 0 | 0 | 3 |

| B.Tech. | L | T | P | C |
|---|---|---|---|---|
| I Year - I Semester | 3 | 1 | 0 | 4 |

## MATRICES AND CALCULUS

(Common for CSE, CSE(AI&ML), ECE, IT, CSE(DS) **)**

**Course Objectives:** To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Conceptofeigenvaluesandeigenvectorsandtoreducethequadraticformtocanonicalform
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

**Course Outcomes:** After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Findtheextremevaluesoffunctionsoftwovariableswith/withoutconstraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes

### UNIT-I: Matrices

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss- Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

### UNIT-II: Eigen values and Eigen vectors

Linear Transformation and Orthogonal Transformation: Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

### UNIT-III: Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series. Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta

and Gamma functions and their applications.

**UNIT-IV: Multivariable Calculus (Partial Differentiation and applications)**

Definitions of Limit and continuity. Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

**UNIT-V: Multivariable Calculus (Integration)**

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

**Text Books:**


1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers,36$^{th}$ Edition,2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5$^{th}$ Edition, 2016.


**Reference Books:**


1. Erwin Kreyszig, Advanced Engineering Mathematics, 9$^{th}$ Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9$^{th}$Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

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| B Tech | L | T | P | C |
|---|---|---|---|---|
| I Year - I Semester | 3 | 1 | 0 | 4 |

## ENGINEERINGCHEMISTRY
**(Common to CSE, IT & CSE(DS))**

**Course Objectives**:

- To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
- To imbibe the basic concepts of petroleum and its products.
- To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

**Course Outcomes**:

- Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
- The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
- They can learn the fundamentals and general properties of polymers and other engineering materials.
- They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

**UNIT - I: Water and its treatment:**

Introduction to hardness of water – Estimation of hardness of water by complex metric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation - Determination of F- ion by ion- selective electrode method.

**Boiler troubles**: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Desalination of water – Reverse osmosis

**UNIT – II Battery Chemistry & Corrosion**

**Introduction** - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

**Corrosion**: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods-Cathodic protection – Sacrificial anode and impressed current methods.

**UNIT - III: Polymeric materials:**

**Definition** – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP). Rubbers: Natural rubber and its vulcanization.

**Elastomers**: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans-poly acetylene and applications of conducting polymers.

**Biodegradable polymers**: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

**UNIT - IV: Energy Sources:**

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

**UNIT - V: Engineering Materials:**

**Cement:** Portland cement, its composition, setting and hardening. Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermo response materials- Polyacryl amides, Poly vinyl amides

**Lubricants**: Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point

**Text Books:**


1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications


**Reference Books:**


1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

**B.Tech. CSE** **L T P C**

**I Year - I Semester** **3 0 0 3**

## PROGRAMMING FOR PROBLEM SOLVING

(Common for CSE,IT,CSE(AI&ML)CSE(DS), ECE)

**Course Objectives:**

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of the C programming language.
- To learn the usage of structured programming approaches in solving problems.

**Course Outcomes:** The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in the C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.
- Searching and sorting problems.

**UNIT - I**: **Introduction to Programming**

Compilers, compiling and executing a program.

Representation of Algorithm - Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number Flowchart/Pseudocode with examples, Program design and structured programming

**Introduction to C Programming Language**: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators

**Conditional Branching and Loops**: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

**UNIT - II: Arrays, Strings, Structures and Pointers**:

**Arrays:** one and two dimensional arrays, creating, accessing and manipulating elements of arrays Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

**Structures:** Defining structures, initializing structures, unions, Array of structures

**Pointers:** Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self- referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type

**UNIT - III**: **Preprocessor and File handling in C**:

**Preprocessor**: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions

**UNIT - IV**: **Function and Dynamic Memory Allocation**:

**Functions**: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

**Recursion**: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

**UNIT - V**: **Searching and Sorting**:

Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

**Text Books:**


1. **Jeri R. Hanly and Elliot B.Koffman**, Problem solving and Program Design in C 7th Edition, Pearson
2. **B.A. Forouzan and R.F. Gilberg**, C Programming and Data Structures, Cengage Learning, (3rd Edition)


**Reference Books:**


1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

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| **B.Tech.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **I Year - I Semester** | **2** | **0** | **0** | **2** |

## BASIC ELECTRICAL ENGINEERING

(Common for CSE, IT & CSE(DS))

**Course Objectives:**

- To understand DC and Single & Three phase AC circuits.
- To study and understand the different types of DC, AC machines and Transformers.
- To import the knowledge of various electrical installations and the concept of power, powerfactor and its improvement.

**Course Outcomes:** After learning the contents of this paper the student must be able to

- Understand and analyze basic Electrical circuits.
- Study the working principles of Electrical Machines and Transformers.
- Introduce components of Low Voltage Electrical Installations.

**UNIT-I:**

**D.C. Circuits:** Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

**UNIT-II:**

**A.C. Circuits:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT-III:**

**Transformers:** Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

**UNIT-IV:**

**Electrical Machines:** Construction and working principle of dc machine, performance characteristics of dc shunt machine. Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Single-phase induction motor, Construction and working. Construction and working of synchronous generator.

**UNIT-V:**

**Electrical Installations:** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**Text Books:**


1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition,2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2008.


**Reference Books:**


1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, "Basic Electrical Engineering", S. Chand,2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1stEdition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

| B.Tech. | L | T | P | C |
|---|---|---|---|---|
| I Year - I Semester | 1 | 0 | 4 | 3 |

## COMPUTER AIDED ENGINEERING GRAPHICS

(Common for CSE, CSE(DS) & IT)

**Course Objectives:**

- To develop the ability of visualization of different objects through technical drawings.
- To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products.

**Course Outcomes:** At the end of the course, the student will be able to:

- Apply computer aided drafting tools to create 2D and 3D objects.
- Sketch conics and different types of solids .
- Appreciate the need of Sectional views of solids and Development of surfaces of solids.
- Read and interpret engineering drawings .
- Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting.

**UNIT-I**: **Introduction to Engineering Graphics:**

Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics.

**UNIT-II: Orthographic Projections:**

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes.

**UNIT–III Projections of Regular Solids**:

Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views.

**UNIT-IV**: **Development of Surfaces of Right Regular Solids:**

Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting.

**UNIT-V**: **Isometric Projections:**

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

**Text Books:**

1. Engineering Drawing N.D. Bhatt / Charotar Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.

**Reference Books:**

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

**B.Tech. CSE** **L T P C**

**I Year - I Semester** **0 0 2 1**

# ELEMENTS OF COMPUTER SCIENCE AND ENGINEERING
## (Common to CSE,IT&CSD)

**Course Objective:**

To provide an overview of the subjects of computer science and engineering.

**Course Outcomes:** The student will learn

1. Know the working principles of functional units of a basic Computer
2. Understand program development, the use of data structures and algorithms in problem solving.
3. Know the need and types of operating system, database systems.
4. Understand the significance of networks, internet, WWW and cyber security.
5. Understand Autonomous systems, the application of artificial intelligence.

**UNIT - I**:

Basics of a Computer–Hardware, Software, Generations of computers. Hardware-functional units, Components of CPU, Memory – hierarchy, types of memory, Input and output devices. Software–systems software, application software, packages, frame works, IDEs.

**UNIT - II:**

Software development–water fall model, Agile, Types of computer languages–Programming, markup, scripting Program Development–steps in program development, flowcharts, algorithms, data structures–definition, types of data structures

**UNIT - III**:

Operating systems: Functions of operating systems, types of operating systems, Device & Resource management

Database Management Systems: Data models, RDBMS, SQL, Database Transactions, data centers, cloud services

**UNIT - IV**:

Computer Networks: Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, sensor networks, vehicular networks,5G communication.

World Wide Web–Basics, role of HTML, CSS, XML, Tools for web designing, Social media, Online social networks.

Security–information security, cyber security, cyber laws

**UNIT - V**:

Autonomous Systems: IoT, Robotics, Drones, Artificial Intelligence – Learning, Game Development, natural language processing, image and video processing.

**Text Books:**

1. Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. Gersting University of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield.

**Reference Books:**


1. Fundamentals of Computers, Reema Thareja, Oxford Higher Education, Oxford University Press.
2. Introduction to computers, PeterNorton, 8thEdition, TataMcGrawHill.
3. Computer Fundamentals, Anita Goel, Pearson Education India,2010.
4. Elements of computer science,Cengage.

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| **B Tech** | **L** | **T** | **P** | **C** |
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## ENGINEERING CHEMISTRY LABORATORY

(Common for **CSE,IT & CSE(DS) )**

**Course Objectives:** The course consists of experiments related to the principles of Chemistry required for engineering student. The student will learn:

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry,
- Potentiometry and pH metry methods. Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

**Course Outcomes**: The experiments will make the student gain skills on:

- Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
- Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and nylon-6.
- Estimations saponification value, surface tension and viscosity of lubricant oils.

**List of Experiments:**

1. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.
2. **Conductometry:** Estimation of the concentration of an acid by Conductometry.
3. **Potentiometry:** Estimation of the amount of $Fe^{+2}$ by Potentiomentry.
4. **PH Metry:** Determination of an acid concentration using pH meter.
5. **Preparations:**
    a. Preparation of Bakelite.
    b. Preparation of Nylon–6.
6. **Lubricants:**
    a. Estimation of acid value of given lubricant oil.
    b. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.
7. **Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
8. **Virtual lab experiments**
    a. Construction of Fuel cell and it's working.
    b. Smart materials for Biomedical applications
    c. Batteries for electrical vehicles.
    d. Functioning of solar cell and its applications.

## Reference Books:


1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S. Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5$^{th}$Edition
3. Inorganic Quantitative analysis by A. I. Vogel, ELBS Publications.
4. College Practical Chemistry byV. K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

**B.Tech. CSE** **L T P C**

**I Year - I Semester** **0 0 2 1**

# PROGRAMMING FOR PROBLEM SOLVING LABORATORY

(Common for CSE,IT,CSE(AI&ML),CSE(DS) **)**

**Course Objectives:**

- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C likeoperators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions,arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files.

**Course Outcomes:** The student will learn

- Formulate The Algorithms For Simple Problems
- Translate Given Algorithms To A Working And Correct Program
- Correct Syntax Errors As Reported By The Compilers
- Identify And Correct Logical Errors Encountered During Execution
- Represent And Manipulate Data With Arrays, Strings And Structures
- Use Pointers Of Different Types
- Create, Read And Write To And From Simple Text And Binary Files
- Modularize The Code With Functions So That They Can Be Reused

.

**Practice sessions:**

a. Write a simple program that prints the results of all the operators available in C (including pre/post increment , bitwise and/or/not , etc.). Read required operand values from standard input.

b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.

**Simple numeric problems:**

a. Write a program for finding the max and min from the three numbers.

b. Write the program for the simple, compound interest.

c. Write a program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction.Read percentage from standard input.

d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

e. 5 x 1 = 5

f. 5 x 2 = 10

g. 5 x 3 = 15
h. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

**Expression Evaluation:**

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
c. Write a program that finds if a given number is a prime number
d. Write a C program to find the sum of individual digits of a positive integer and test given numberis palindrome.
e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
g. Write a C program to find the roots of a Quadratic equation.
h. Write a C program to calculate the following, where x is a fractional value.i. 1-x/2 +x^2/4-x^3/6
j. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+……. +x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

**Arrays, Pointers and Functions:**

a. Write a C program to find the minimum, maximum and average in an array of integers.
b. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in asingle dimension array.
c. Write a C program that uses functions to perform the following:
d. Addition of Two Matrices
e. Multiplication of Two Matrices
f. Transpose of a matrix with memory dynamically allocated for the new matrix as row and columncounts may not be the same.
g. Write C programs that use both recursive and non-recursive functions
h. To find the factorial of a given integer.
i. To find the GCD (greatest common divisor) of two given integers.
j. To find x^n

k. Write a program for reading elements using a pointer into an array and display the values usingthe array.
l. Write a program for display values reverse order from an array using a pointer.
m. Write a program through a pointer variable to sum of n elements from an array

**Files:**

a. Write a C program to display the contents of a file to standard output device.
b. Write a C program which copies one file to another, replacing all lowercase characters withtheir uppercase equivalents.
c. Write a C program to count the number of times a character occurs in a text file. The file nameand the character are supplied as command line arguments.
d. Write a C program that does the following:
It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function)
Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function)
The program should then read all 10 values and print them back.
e. Write a C program to merge two files into a third file (i.e., the contents of the first file followedby those of the second are put in the third file).

**Strings:**

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
c. Write a C program that uses functions to perform the following operations:
d. To insert a sub-string into a given main string from a given position.
e. To delete n Characters from a given position in a given string.
f. Write a C program to determine if the given string is a palindrome or not (Spelled same in bothdirections with or without a meaning like madam, civic, noon, abcba, etc.)
g. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn‘tcontain ch.
h. Write a C program to count the lines, words and characters in a given text.

**Miscellaneous:**

a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action

to take. Display an error message if an invalidchoice is entered.

b. Write a C program to construct a pyramid of numbers as follows:

```
1          *          1          1          *
1 2        * *        2 3        2 2        * *
1 2 3      * * *      4 5 6      3 3 3      * * *
                                 4 4 4 4    * *
                                            *
```

**Sorting and Searching:**

a. Write a C program that uses non recursive function to search for a Key value in a given
b. list of integers using linear search method.
c. Write a C program that uses non recursive function to search for a Key value in a given
d. sorted list of integers using binary search method.
e. Write a C program that implements the Bubble sort method to sort a given list of
f. integers in ascending order.
g. Write a C program that sorts the given array of integers using selection sort in descending order
h. Write a C program that sorts the given array of integers using insertion sort in ascending order
i. Write a C program that sorts a given array of names

**TEXT BOOKS:**


1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)


**REFERENCE BOOKS:**


1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

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| **B.Tech** | **L** | **T** | **P** | **C** |
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## BASIC ELECTRICAL ENGINEERING LABORATORY

(Common for CSE, IT & CSE(DS))

**Course Objectives:**

- To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.
- To study the transient response of various R, L and C circuits using different excitations.
- To determine the performance of different types of DC, AC machines and Transformers.

**Course Outcomes:** After learning the contents of this paper, the student must be able to

- Verify the basic Electrical circuits through different experiments.
- Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
- Analyze the transient responses of R, L and C circuits for different input conditions.

**List of experiments/demonstrations:**

**PART- A (compulsory)**

1. Verification of KVL and KCL
2. Verification of Thevenin's and Norton's theorem
3. Transient Response of Series RL and RC circuits for DC excitation
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RL, RC and RLC Series circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Torque-Speed Characteristics of a Three-phase Induction Motor.

**PART-B (any two experiments from the given list)**

1. Verification of Superposition theorem.
2. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
4. Measurement of Active and Reactive Power in a balanced Three-phase circuit
5. No-Load Characteristics of a Three-phase Alternator

**Text Books:**


1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition,2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2008.


**Reference Books:**


1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, "Basic Electrical Engineering", S. Chand,2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1stEdition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

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| **B.Tech.** | **L** | **T** | **P** | **C** |
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| **I Year - II Semester** | **3** | **1** | **0** | **4** |

**ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**

(Common for CSE, CSE(AI&ML), ECE, IT, CSE(DS))

**Course Objectives:** To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms.
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions.
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.

**Course outcomes:** After learning the contents of this paper the student must be able to

- Identify whether the given differential equation of first order is exact or not.
- Solve higher differential equation and apply the concept of differential equation to real world problems.
- Use the Laplace transforms techniques for solving ODE's.
- Evaluate the line, surface and volume integrals and converting them from one to another.

**UNIT-I: First Order ODE**

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

**UNIT-II: Ordinary Differential Equations of Higher Order**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type $e^{ax}$, $\sin ax$, $\cos ax$, polynomials in $x$, $e^{ax}V(x)$ and $x\,V(x)$, method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits.

**UNIT-III: Laplace transforms**

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

**UNIT-IV: Vector Differentiation**

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

**UNIT-V: Vector Integration**

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

**Text Books:**


1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36$^{th}$Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications,
   5$^{th}$ Edition, 2016.


**Reference Books:**


1. Erwin Kreyszig, Advanced Engineering Mathematics, 9$^{th}$ Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9$^{th}$ Edition, Pearson, Reprint, 2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi
4. N.P.Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

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| **B.Tech.** | **L** | **T** | **P** | **C** |
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| **I Year - II Semester** | **3** | **1** | **0** | **4** |

## APPLIED PHYSICS
**(Common to CSE , CSE(DS) & IT)**

**Course Objectives:** The objectives of this course for the student are to:

- Understand the basic principles of quantum physics and band theory of solids.
- Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
- Study the fundamental concepts related to the dielectric, magnetic and energy materials.
- Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
- Study the characteristics of lasers and optical fibers.

**Course Outcomes:** At the end of the course the student will be able to:

- Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
- Identify the role of semiconductor devices in science and engineering Applications.
- Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
- Appreciate the features and applications of Nanomaterials.
- Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

### UNIT - I: Quantum Physics and Solids

Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram-effective mass of electron-origin of energy bands- classification of solids.

### UNIT - II: Semiconductors and Devices

Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

### UNIT - III: Dielectric, Magnetic and Energy Materials

Dielectric Materials**:** Basic definitions- types of polarizations (qualitative)-ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials**:** Hysteresis - soft and hard magnetic materials - magnetostriction,

magnetoresistance - applications – bubble memory devices, magnetic field sensors and multiferroics.

Energy Materials**:** Conductivity of liquid and solid electrolytes- superionic conductors – materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

**UNIT - IV: Nanotechnology**

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterials.

**UNIT - V: Laser and Fiber Optics**

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations- lasing action - pumping methods- ruby laser, He-Ne laser , CO2 laser, Argon ion Laser, Nd:YAG laser- semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection- construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers- losses in optical fiber - optical fiber for communication system - applications.

**Text Books:**


1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4thEdition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.


**Reference Books:**


1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons, 11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

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| I Year - II Semester | 0 | 1 | 3 | 2.5 |

## ENGINEERING WORKSHOP

(Common for CSE , CSE(DS) & IT)

**Course Objectives:**

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
- To develop a |right attitude, team working, precision and safety at workplace.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have a practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

**Course Outcomes:** At the end of the course, the student will be able to:

- Study and practice on machine tools and their operations.
- Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, and foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

**I. TRADES FOR EXERCISES:**

**At least two exercises from each trade:**

1. Carpentry–(T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
2. Fitting–(V-Fit, Dovetail Fit & Semi-circular fit)
3. Tin-Smithy– (Square Tin, Rectangular Tray & Conical Funnel)
4. Foundry–(PreparationofGreenSandMouldusingSinglePieceandSplitPattern)
5. Welding Practice–(Arc Welding & Gas Welding)
6. House-wiring–(Parallel & Series, Two-way Switch and Tube Light)
7. Black Smithy–(Round to Square, Fan Hook and S-Hook)

**II. TRADES FOR DEMONSTRATION & EXPOSURE:**

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

**Text Books:**

1. Workshop Practice/B. L. Juneja / Cengage
2. Workshop Manual/K. Venugopal / Anuradha.

**Reference Books:**

1. Workshop Manual-P. Kannaiah /K.L. Narayana /Scitech
2. Workshop Manual/ VenkatReddy /BSP

EN204HS **Vignan's Institute of Management and Technology for Women** VR24
**An Autonomous Institution**

| **B.Tech.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **I Year - II Semester** | **2** | **0** | **0** | **2** |

## ENGLISH FOR SKILL ENHANCEMENT

(Common for CSE, CSE(DS) & IT)

**Course Objectives:**

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Develop study skills and communication skills in various professional situations.
- Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

**Course Outcomes:** The student will learn

- Understand the importance of vocabulary and sentence structures.
- Choose appropriate vocabulary and sentence structures for their oral and written communication.
- Demonstrate their understanding of the rules of functional grammar.
- Develop comprehension skills from the known and unknown passages.
- Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
- Acquire basic proficiency in reading and writing modules of English.

**UNIT - I**:

Chapter entitled 'Toasted English' by R.K.Narayan from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

**Vocabulary**: The Concept of Word Formation -The Use of Prefixes and Suffixes – Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives Synonyms and Antonyms

**Grammar**: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

**Reading**: Reading and Its Importance- Techniques for Effective Reading.

**Writing**: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

**UNIT - II:**

Chapter entitled 'Appro JRD' by Sudha Murthy from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

**Vocabulary**: Words Often Misspelt - Homophones, Homonyms and Homographs

**Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

**Reading**: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Chapter entitled 'Appro JRD' by Sudha Murthy from "English: Language, Context and Culture" published by Orient BlackSwan, Hyderabad.

**Vocabulary**:Words Often Misspelt - Homophones, Homonyms and Homographs

**Grammar:** Identifying Common Errors in Writing with Reference to Noun- pronoun Agreement and Subject-verb Agreement.

**Reading**: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

**UNIT - III**:

Chapter entitled 'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

**Vocabulary**: Words Often Confused - Words from Foreign Languages and their Use in English.

**Grammar**: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

**Reading:** Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

**Writing**: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume

**UNIT - IV**:

Chapter entitled 'Art and Literature' by Abdul Kalam from "English: Language, Context and Culture" published by Orient BlackSwan, Hyderabad.

**Vocabulary**: Standard Abbreviations in English

**Grammar**: Redundancies and Clichés in Oral and Written Communication.

**Reading**: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

**Writing**: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

**UNIT - V**:

Chapter entitled 'Go, Kiss the World' by Subroto Bagchi from "English: Language, Context and Culture" published by Orient BlackSwan, Hyderabad.

**Vocabulary**: Technical Vocabulary and their Usage

**Grammar**: Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

**Reading**: Reading Comprehension-Exercises for Practice

**Writing:** Technical Reports- Introduction – Characteristics of a Report – Categories of Reports **Formats** - Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

**Text Books:**


1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.


**Reference Books:**


1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

EC205ES **Vignan's Institute of Management and Technology for Women** VR24
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| **B.Tech.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **I Year - II Semester** | **2** | **0** | **0** | **2** |

## ELECTRONIC DEVICES AND CIRCUITS

(Common for CSE, CSE(AI&ML), CSE(DS), IT & ECE)

**Course Objectives:**

- To introduce components such as diodes, BJTs and FETs.
- To know the applications of devices.
- To know the switching characteristics of devices

**Course Outcomes:** The student will learn

- Acquire the knowledge of various electronic devices and their use on real life.
- Know the applications of various devices.
- Acquire the knowledge about the role of special purpose devices and their applications.

**UNIT - I**: **Diodes**

Diode - Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics, Diode as a switch- switching times.

**UNIT - II: Diode Applications:**

Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

**UNIT - III**: **Bipolar Junction Transistor (BJT):**

Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times.

**UNIT - IV**: **Junction Field Effect Transistor (FET):**

Construction, Principle of Operation, Pinch-Off Voltage, Volt- Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSTET as a capacitor.

**UNIT - V**: **Special Purpose Devices:**

Zener Diode - Characteristics, Zener diode as Voltage Regulator, Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode, Photo diode, Solar cell, LED, Schottky diode.

**Text Books:**


1. Jacob Millman - Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, Louis Nashelsky- Electronic Devices and Circuits theory, 11th Edition, 2009, Pearson**.**


**Reference Books:**


1. Horowitz -Electronic Devices and Circuits, David A. Bell – 5thEdition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly - Basic Electronics-Principles and Applications, Cambridge, 2018.

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| **B.Tech.** | **L** | **T** | **P** | **C** |
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| **I Year - II Semester** | **0** | **1** | **2** | **2** |

## PYTHON PROGRAMMING LABORATORY

(Common for CSE(AI&ML), CSE, CSE(DS), IT)

**Course Objectives:**

- To install and run the Python interpreter.
- To learn control structures.
- To Understand Lists, Dictionaries in Python
- To Oversee Strings and Files in Python
- To create GUI Environment

**Course Outcomes:** The student will learn.

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Verify programs using modular approach, file I/O, Python standard library.
- Implement Digital Systems using Python.
- Able to create GUI using Python

**Week -1:**

1. i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.

   ii) Start the Python interpreter and type help () to start the online help utility.

2. Start a Python interpreter and use it as a Calculator.

3. i) Write a program to calculate compound interest when principal, rate and number of periods are given.

   ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points

4. Read name, address, email and phone number of a person through keyboard and print the details.

**Week - 2:**

1. Print the triangle below using for loop.

```
5
4 4
3 3 3
2 2 2 2
1 1 1 1 1
```

2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop

4. Python program to print all prime numbers in each interval (use break)

**Week - 3:**

1. i) Write a program to convert a list and tuple into arrays.
   ii) Write a program to find common values between two arrays.
2. Write a function called GCD that takes parameters a and b and returns their greatest common divisor.
3. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

**Week - 4:**

1. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
2. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
   i). Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
   ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
   iii). Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.
3. i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
   ii) Remove the given word in all the places in a string?
   iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
4. Writes a recursive function that generates all binary strings of n-bit length

**Week - 5:**

1. i) Write a python program that defines a matrix and prints
   ii) Write a python program to perform addition of two square matrices
   iii) Write a python program to perform multiplication of two square matrices
2. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
3. Use the structure of exception handling all general-purpose exceptions.

**Week-6:**

1. a. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
   b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.
   c. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.

2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritances.
3. Write a python code to read a phone number and email-id from the user and validate it for correctness.

**Week- 7:**

1. Write a Python code to merge two given file contents into a third file.
2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
3. Write a Python code to Read text from a text file, find the word with most number of occurrences
4. Write a function that reads a file file1 and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.

**Week - 8:**

1. Import numpy, Plotpy and Scipy and explore their functionalities.
   a) Install NumPy package with pip and explore it.
2. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
3. Write a program to implement Half Adder, Full Adder, and Parallel Adder
4. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

**TEXT BOOKS:**


1**. Supercharged Python:** Take your code to the next level, Overland

2**. Learning Python, Mark Lutz, O'reilly**


**REFERENCE BOOKS:**


1. Python for Data Science, Dr. Mohd. Abdul Hameed, Wiley Publications - 1st Ed. 2021
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Think Python, Allen Downey, Green Tea Press
6. Core Python Programming, W. Chun, Pearson
7. Introduction to Python, Kenneth A. Lambert, Cengage

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| **B.Tech.** | **L** | **T** | **P** | **C** |
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| **I Year - II Semester** | **0** | **0** | **3** | **1.5** |

## APPLIED PHYSICS LABORATORY
## (Common to CSE, CSE(DS),IT)

**Course Objectives:** The objectives of this course for the student to

- Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
- Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
- Able to measure the characteristics of dielectric constant of a given material.
- Study the behavior of B-H curve of ferromagnetic materials.
- Understanding the method of least squares fitting

**Course Outcomes:** The students will be able to:

- Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
- Appreciate quantum physics in semiconductor devices and optoelectronics.
- Gain the knowledge of applications of dielectric constant.
- Understand the variation of magnetic field and behavior of hysteresis curve.
- Carried out data analysis.

**List Of Experiments:**

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)
   b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a)Determination of the beam divergence of the given LASER beam
    b)Determination of Acceptance Angle and Numerical Apertureof an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.

**Reference Book:**

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

| B.Tech. | L | T | P | C |
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| I Year - II Semester | 0 | 0 | 2 | 1 |

## ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

(Common for CSE, CSE(DS) & IT)

**Course Objectives:**

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking.
- To improve the fluency of students in spoken English and neutralize the impact of dialects.
- To train students to use language appropriately for public speaking, group discussions and interviews.

**Course Outcomes:** The student will learn

- Understand the nuances of English language through audio- visual experience and group activities.
- Neutralize their accent for intelligibility.
- Speak with clarity and confidence which in turn enhances their employability skills

**Syllabus**: English Language and Communication Skills Lab (ELCS) shall have two parts:

a) Computer Assisted Language Learning (CALL) Lab
b) Interactive Communication Skills (ICS) Lab

**Exercise – I**

**CALL Lab:**

***Understand:*** Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.

***Practice:*** Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

**ICS Lab:**

***Understand:*** Spoken vs. Written language- Formal and Informal English.

***Practice:*** Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

**Exercise- II**

**CALL Lab:**

***Understand:*** Structure of Syllables – Word Stress– Weak Forms and Strong Forms Stress pattern in sentences – Intonation.

***Practice:*** Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*

**ICS Lab:**

***Understand****:* Features of Good Conversation – Strategies for Effective Communication.

***Practice:*** Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette

**Exercise - III**

**CALL Lab:**

***Understand:*** Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).

***Practice:*** Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -Testing Exercises

**ICS Lab:**

***Understand:*** Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing

***Practice:*** Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

**Exercise – IV**

**CALL Lab:**

***Understand:*** Listening for General Details.

***Practice:*** Listening Comprehension Tests - Testing Exercises

**ICS Lab:**

***Understand:*** Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.

***Practice:*** Making a Short Speech – Extempore- Making a Presentation.

**Exercise – V**

**CALL Lab:**

***Understand:*** Listening for Specific Details.

***Practice:*** Listening Comprehension Tests -Testing Exercises

**ICS Lab:**

***Understand:*** Group Discussion

***Practice:*** Group Discussion

**Computer Assisted Language Learning (CALL) Lab:**

1. The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.
   System Requirement (Hardware component):
   Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:
   Computers with Suitable Configuration
   High Fidelity Headphones
2. Interactive Communication Skills (ICS) Lab :
   The Interactive Communication **Skills Lab:** A Spacious room with movable chairs and audio- visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

**Source of Material (Master Copy):**

- *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford University Press

**Note:** Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

**Suggested Software:**

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, $10^{th}$ Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

**Reference Books:**


1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.*
   Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press.

**B.Tech.** **L T P C**

**I Year - II Semester** **0 0 2 1**

## IT WORKSHOP

(Common for IT, CSE, CSE(AI&ML), CSE(DS))

**Course Objectives:** The IT Workshop for engineers is a training lab course spread over 60 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, PowerPoint and Publisher.

**Course Outcomes:**

- Perform Hardware troubleshooting
- Understand Hardware components and inter dependencies
- Safeguard computer systems from viruses/worms
- Document/ Presentation preparation
- Perform calculations using spreadsheets.

### PC Hardware

**Task 1:** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Task 2:** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Task 3:** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.

### Internet & World Wide Web

**Task1: Orientation & Connectivity Boot Camp:** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Task 2: Web Browsers, Surfing the Web:** Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Task 3: Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by type the student.

**Task 4: Cyber Hygiene:** Students would be exposed to the various threats on the

internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

**LaTeX and WORD**

**Task 1** – **Word Orientation:** The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

**Task 2: Using LaTeX and Word** to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

**Task 3: Creating project** abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

**Task 4: Creating a Newsletter:** Features to be covered: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

**Excel**

**Excel Orientation:** The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

**Task 1: Creating a Scheduler** - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Task 2 : Calculating GPA** - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

**Task 3:** Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

**Powerpoint**

**Task 1:** Students will be working on basic power point utilities and tools which help them create basic powerpoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

**Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

**Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

**Reference Books:**


1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, WILEY Dreamtech
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. PC Hardware - A Handbook – Kate J. Chase PHI (Microsoft)
5. LaTeX Companion – Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press, Pearson Education.

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| I Year - II Semester | 3 | 0 | 0 | 0 |

## ENVIRONMENTAL SCIENCE
## (Common for CSE, CSE(DS) & IT)

**Course Objectives**:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations.

**Course Outcomes:**

- Based on this course, the Engineering graduate will understand /evaluate develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.

**UNIT-I**

**Ecosystems:** Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT-II**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, flood sand droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

**UNIT-III**

**Biodiversity and Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In- Situ and Ex-situ conservation. National Biodiversity act.

**UNIT-IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Waste water Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation.

**Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions/ Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

**UNIT-V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

**Text Books:**


1 Textbook of Environmental Studies fo Undergraduate Courses by Erach Bharucha for University Grants Commission.
2 Environmental Studies by R.Rajagopalan, Oxford University Press.


**Reference Books:**


1. Environmental Science: towards as ustainable future by RichardT.Wright.2008PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Danie lB.Botkin&Ed ward A.Keller,Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4$^{th}$Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

EC301ES **Vignan's Institute of Management and Technology for Women** VR24
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| **B.Tech.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - I Semester** | **3** | **0** | **0** | **3** |

## DIGITAL ELECTRONICS
## (Common to CSE, CSE(DS) & IT)

**Course Objectives:**

- To provide a thorough understanding of the binary number system, Boolean algebra, and logic gates.
- To introduce gate-level minimization techniques using Karnaugh maps for circuit simplification.
- To analyze and design combinational logic circuits such as adders, multiplexers, and encoders.
- To explore sequential logic circuits, including flip-flops, counters, and shift registers.
- To understand memory devices, asynchronous sequential circuits, and programmable logic devices.

**Course Outcomes:** The student will learn

- Know the characteristics of various components. Know about the logic families and realization of logic Gates.
- Understand the utilization of components.
- Design and analyze small signal amplifier circuits.
- Learn Postulates of Boolean algebra and to minimize Combinational functions.
- Design and analyze combinational and sequential circuits.

**UNIT - I**: **BOOLEAN ALGEBRA AND LOGIC GATES:**

Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary logic. Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, Digital logic gates.

**UNIT - II: GATE – LEVEL MINIMIZATION:**

The map method, Four-variable map, Five-Variable map, product of sums simplification Don't-care conditions, NAND and NOR implementation other Two-level implementations, Exclusive – Or function.

**UNIT - III**: **COMBINATIONAL LOGIC:**

Combinational Circuits, Analysis procedure Design procedure, Binary Adder-Subtractor Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits.

**UNIT - IV**: **SEQUENTIAL LOGIC:**

Sequential circuits, latches, Flip-Flops Analysis of clocked sequential circuits, state Reduction and Assignment, Design Procedure. Registers, shift Registers, Ripple counters, synchronous counters, other counters.

**UNIT - V**: **MEMORIES AND ASYNCHRONOUS SEQUENTIAL LOGIC:** Introduction, Random-Access Memory, Memory Decoding, Error Detection and correction Read-only memory, Programmable logic Array programmable Array logic, Sequential Programmable Devices. Introduction, Analysis Procedure, Circuits with Latches, Design Procedure, Reduction of state and Flow Tables, Race-Free state Assignment Hazards, Design Example.

**Text Books:**


1. Digital Design – Third Edition, M. Morris Mano, Pearson Education/PHI.
2. Digital Principles and Applications Albert Paul Malvino Donald P. Leach TATA McGraw Hill Edition.
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson.


**Reference Books:**


1. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.
2. Switching and Logic Design, C.V.S. Rao, Pearson Education
3. Digital Principles and Design – Donald D.Givone, Tata McGraw Hill, Edition.
4. Fundamentals of Digital Logic and Microcomputer Design, 5TH Edition, M. Rafiquzzaman John Wiley.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - I Semester** | **3** | **0** | **0** | **3** |

## DATA STRUCTURES

**Course Objectives:**

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms.

**Course Outcomes:** The student will learn

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, heaps, graphs, and AVL-trees.
- Ability to assess about the application of pattern matching and Different types of Tries.

**UNIT - I**:

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

**UNIT - II:**

Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching.

Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing linear probing, quadratic probing, double hashing, rehashing, extendible hashing

**UNIT - III**:

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, B- Trees, B+ Trees, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

**UNIT - IV**:

Graphs: Graph Implementation Methods. Graph Traversal Methods.

Sorting: Quick Sort, Heap Sort, External Sorting- Model for external sorting, Merge Sort.

**UNIT - V**: **Searching and Sorting**:

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

**Text Books:**


1. **Fundamentals of Data Structures in C,** 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. **Data Structures using C –** A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.


**Reference Books:**


1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.

MA303BS **Vignan's Institute of Management and Technology for Women** VR24
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| **B.Tech.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - I Semester** | **3** | **1** | **0** | **4** |

## COMPUTER ORIENTED STATISTICAL METHODS

(Common for CSE, IT & CSE[DS])

**Pre-requisites:** Mathematics courses in first year of study.

**Course Objectives:** To learn

- The theory of Probability, Probability distributions of single and multiple random variables
- The sampling theory, testing of hypothesis and making statistical inferences
- Stochastic process and Markov chains.

**Course outcomes:** After learning the contents of this paper the student must be able to

- Apply the concepts of probability and distributions to case studies.
- Formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.
- Apply concept of estimation and testing of hypothesis to case studies.
- Correlate the concepts of one unit to the concepts in other units.

### UNIT - I: Probability

Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Baye's Rule.

Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions.

### UNIT - II: Expectation and discrete distributions

Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem. **Discrete Probability Distributions**: Binomial Distribution, Poisson distribution.

### UNIT - III: Continuous and Sampling Distributions

Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions. **Fundamental Sampling Distributions:** Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, t - Distribution, F-Distribution.

### UNIT - IV: Sample Estimation & Tests of Hypotheses

Introduction, Statistical Inference, Classical Methods of Estimation, Single Sample: Estimating the mean, standard error of a point estimate, prediction interval. Two sample: Estimating the difference between two means, Single sample: Estimating a proportion, Two samples: Estimating the difference between two proportions, Two samples: Estimating the ratio of two variances.

**Statistical Hypotheses:** General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning a single mean, Two samples: tests on two means, One sample: test on a single proportion. Two samples: tests on two proportions, Two- sample tests concerning variances.

**UNIT-V: Stochastic Processes and Markov Chains**

Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.

**TEXTBOOKS:**


1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.
3. S.D.Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi.


**Reference Books:**


1. T.T. Soong, Fundamentals of Probability and Statistics For Engineers, John Wiley & Sons, Ltd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, academic press.
3. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - I Semester** | **3** | **0** | **0** | **3** |

# COMPUTER ORGANIZATION AND ARCHITECTURE

**Course Objectives:**

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

**Course Outcomes:**

- Understand the basics of instruction sets and their impact on processor design.
- Demonstrate an understanding of the design of the functional units of a digital computer system.
- Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
- Design a pipeline for consistent execution of instructions with minimum hazards.
- Recognize and manipulate representations of numbers stored in digital computers

**UNIT - I**

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture. Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

**UNIT - II**

Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit. Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

**UNIT - III**

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation. Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations

**UNIT - IV**

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access. Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

**UNIT - V**

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics. Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor. Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor arbitration, Inter-processor communication and synchronization, Cache Coherence.

**TEXTBOOK:**

1. Computer System Architecture– M. Morris Mano, Third Edition, Pearson/PHI.

**REFERENCE BOOKS:**

1. Computer Organization–Carl Hamacher, Zvonks Vranesic, SafeaZaky, VthEdition, McGraw Hill.
2. Computer Organization and Architecture– William Stallings Sixth Edition, Pearson/PHI. Structured Computer Organization– Andrew S. Tanen

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - I Semester** | **3** | **0** | **0** | **3** |

## OBJECT ORIENTED PROGRAMMING THROUGH JAVA

**Course Objectives:**

- To Understand the basic object-oriented programming concepts and apply them in problem solving.
- To Illustrate inheritance concepts for reusing the program.
- To Demonstrate multitasking by using multiple threads and event handling
- To Develop data-centric applications using JDBC.
- To Understand the basics of java console and GUI based programming

**Course Outcomes:** The student will learn

- Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
- Use multithreading concepts to develop inter process communication.
- Understand the process of graphical user interface design and implementation using AWT or swings.
- Develop applets that interact abundantly with the client environment and deploy on the server

**UNIT - I**:

Object oriented thinking and Java Basics- Need for OOP paradigm, summary of OOP concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

**UNIT - II:**

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

**UNIT - III:**

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. String handling, exploring java.util. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

**UNIT – IV:**

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

**UNIT - V**:

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing-JApplet, JFrame and JComponent, Icons and Labels, text fields,

buttons – The JButton class, check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

## Text Books:


1. **Java the complete reference,** 7th edition, Herbert schildt, TMH.
2. **Understanding OOP with Java,** updated edition, T. Budd, Pearson education


## Reference Books:


1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John wiley & sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R. Buyya, S.T. Selvi, X. Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer. 9. Maurach's Beginning Java2 JDK 5, SPD.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - I Semester** | **0** | **0** | **3** | **1.5** |

## DATA STRUCTURES LAB

**Course Objectives:**

- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

**Course Outcomes:** The student will learn

- Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
- Ability to develop C programs for calculating and real-time applications using basic elements like Strings, and Data Structures like Stacks, Queues and Linked Lists.
- Ability to Implement searching and sorting algorithms
- Ability to Implement the tree traversal methods (Recursive & Non-Recursive).
- Ability to Implement a Pattern matching algorithms

**List of Experiments:**

1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using
   i) Arrays ii) Pointers
5. Write a program that implement Queue (its operations) using
   i) Arrays ii) Pointers
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Quick sort ii) Heap sort iii) Merge sort
7. Write a program to implement the tree traversal methods (Recursive & Non-Recursive).
8. Write a program to implement
   i) Binary Search tree ii) B Trees iii) B+ Trees iv) AVL trees
   v) Red - Black trees
9. Write a program to implement the graph traversal methods.
10. Implement a Pattern matching algorithms using Boyer- Moore, Knuth-Morris-Pratt

**Text Books:**

1. **Fundamentals of Data Structures in C,** 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. **Data Structures using C –** A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

**Reference Books:**

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - I Semester** | **0** | **0** | **3** | **1.5** |

## OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

**Course Objectives:**

- To write programs using abstract classes.
- To write programs for solving real world problems using the java collection framework.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform.
- To impart hands-on experience with java programming.

**Course Outcomes:** The student will learn

- Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
- Use multithreading concepts to develop inter process communication.
- Understand the process of graphical user interface design and implementation using AWT or swings.
- Develop applets that interact abundantly with the client environment and deploy on the server

**List of Experiments:**

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. A) Develop an applet in Java that displays a simple message.
   B) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.
4. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.
5. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

6. Write a Java program for the following:
   Create a doubly linked list of elements.
   Delete a given element from the above list.
   Display the contents of the list after deletion.
7. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in the selected color. Initially, there is no message shown.
8. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.
10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
11. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
12. Write a Java program that correctly implements the producer – consumer problem using the concept of inter thread communication.
13. Write a Java program to list all the files in a directory including the files present in all its subdirectories.

## Reference Books:


1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

DS308PC **Vignan's Institute of Management and Technology for Women** VR24

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| **II Year - I Semester** | 0 | 0 | 2 | 1 |

## DATA VISUALIZATION - R PROGRAMMING/ POWER BI

**Course Objectives:** Students will be able to:

- Effective use of Business Intelligence (BI) technology (Tableau) to apply data visualization
- To discern patterns and relationships in the data.
- To build Dashboard applications.
- To communicate the results clearly and concisely.
- To be able to work with different formats of data sets.

**Course Outcomes:** At the end of the course a student should be able to

- Understand How to import data into Tableau.
- Understand Tableau concepts of Dimensions and Measures.
- Develop Programs and understand how to map Visual Layouts and Graphical Properties.
- Create a Dashboard that links multiple visualizations.
- Use graphical user interfaces to create Frames for providing solutions to real world problems.

**LAB PROBLEMS:**

1. Understanding Data, what is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?
2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau, creating basic charts (line, bar charts, Tree maps), Using the Show me panel.
3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.
6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colors.
8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.

9. Tableau file types, publishing to Tableau Online, sharing your visualizations, printing, and exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

**REFERENCE BOOKS:**


1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References).
3. The Art of R Programming by Norman Matloff Cengage Learning India.

| B.Tech. | L | T | P | C |
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| II Year - I Semester | 3 | 0 | 0 | 0 |

## GENDER SENSITIZATION LAB
## (Common to CSE,CSE(AIML),CSE(DS),IT & ECE)

**Course Objectives:**

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

**Course Outcomes:** The student will learn

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labor and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

**UNIT-I:**

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Cas

**UNIT – II:**

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

**UNIT – III:**

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

**UNIT – IV:**

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu". Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

**UNIT– V:**

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks The Brave Heart.

**TEXTBOOK:**

1. ESSENTIAL READING: The Textbook, "Towards a World of Equals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

**B. Tech. CSE(DS)** **L T P C**

**II Year - II Semester** **3 0 0 3**

# DISCRETE MATHEMATICS

**Course Objectives:**

- Introduces elementary discrete mathematics for computer science and engineering.
- Topics include formal logic notation, methods of proof, induction, sets, relations, algebraic structures, elementary graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

**Course Outcomes:** The student will learn

- Ability to understand and construct precise mathematical proofs and construct precise mathematical proofs
- Ability to analyze and solve counting problems on finite and discrete structures
- Ability to describe and manipulate sequences
- Describe and manipulate sequences
- Ability to apply graph theory in solving computing problems

**UNIT - I Mathematical logic:**

Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

**Unit – II: Set theory**

Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

**Unit – III: Algebraic Structures**

Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

**Unit – IV: Elementary Combinatorics:**

Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

**Unit – V: Graph Theory:**

Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

**Text Books:**

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

**Reference Books:**

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

SM402MS **Vignan's Institute of Management and Technology for Women** VR24
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| **B.Tech.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - II Semester** | **3** | **0** | **0** | **3** |

**Business Economics and Financial Analysis**
**(Common for CSE, IT& CSE(DS))**

**Course Objectives:**

- To learn the basic business types, impact of the economy on Business and Firms specifically.
- To understand the fundamental concepts of demand and supply in economics.
- To understand the relationship among production, cost, market structures, and pricing strategies for business decision-making.
- To understand the fundamental accounting principles.
- To analyze the Business from the Financial Perspective.

**Course Outcomes:** The student will learn

- Various Forms of Business and the impact of economic variables on the Business.
- Problem-solving skills by applying demand and supply theories to real-world situations.
- How production, costs and market structures influence pricing decisions and business profitability.
- To prepare, analyze, and interpret financial statements.
- To analyse financial position by analysing the Financial Statements of a Company.

**Unit–I: Introduction to Business and Economics**

**Business:** Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

**Economics:** Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

**UNIT-II: Demand and Supply Analysis**

**Elasticity of Demand:** Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

**Supply Analysis:** Determinants of Supply, Supply Function and Law of Supply.

**UNIT-III: Production, Cost, Market Structures & Pricing**

**Production Analysis:** Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

**Cost analysis:** Types of Costs, Short run and Long run Cost Functions.

**Market Structures:** Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

**UNIT - IV: Financial Accounting**

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts (Simple Problems).

**UNIT - V: Financial Ratios Analysis**

Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios– Analysis and Interpretation (simple problems).

**Text Books:**


1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.


**Reference Books:**


1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - II Semester** | **3** | **0** | **0** | **3** |

## OPERATING SYSTEMS

**Course Objectives:**

- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

**Course Outcomes:** The student will learn

- Will be able to control access to a computer and the files that may be shared
- Demonstrate the knowledge of the components of computers and their respective roles in computing.
- Ability to recognize and resolve user problems with standard operating environments.
- Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.
- Will be able to control access to File System Interface and Operations

**UNIT - I**: **Operating System - Introduction**

**Structures** - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

**Process:** Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

**UNIT - II: CPU Scheduling**:

Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec

**Deadlocks:** System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

**UNIT - III**: **Process Management and Synchronization**

The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors

**Interprocess Communication Mechanisms:** IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

**UNIT - IV**: **Memory Management and Virtual Memory:**

Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

**UNIT - V**: **File System Interface and Operations**:

Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

**Text Books:**


1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the **UNIX** environment, W.R. Stevens, Pearson education


**Reference Books:**


1. Operating Systems- Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education

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|---|---|---|---|---|
| **II Year – II Semester** | **3** | **0** | **0** | **3** |

## DATABASE MANAGEMENT SYSTEMS

**Course Objectives:**

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

**Course Outcomes:**

- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques
- Analyze and implement transaction processing concurrency control and database recovery protocols in database

**UNIT - I**

**Database System Applications**: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model

**UNIT - II**

**Introduction to the Relational Model**: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

**UNIT - III**

**SQL**: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases. Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

**UNIT – IV**

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation-Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

**UNIT - V**

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

**TEXT BOOKS**:


1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill.


**REFERENCE BOOKS**:


1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year – II Semester** | **3** | **0** | **0** | **3** |

## SOFTWARE ENGINEERING

**Course Objectives:**

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

**Course Outcomes:**

- Ability to translate end-user requirements into system and software requirements, using e.g., UML, and structure the requirements in a Software Requirements Document (SRD)
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report.
- Ability to recognize and understand the adopt the design models such as waterfall model, Spiral model.
- Will able to understand the concepts such as quality management with Industrial Standards.

**UNIT - I**

**Introduction to Software Engineering:** The evolving role of software, changing nature of software, software myths. A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). Process models: The waterfall model, Spiral model and Agile methodology

**UNIT - II**

**Software Requirements:** Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

**UNIT - III**

**Design Engineering**: Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

**UNIT - IV**

**Testing Strategies**: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. Metrics for Process and Products: Software measurement, metrics for software quality.

**UNIT - V Risk management**: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

**TEXT BOOKS**:


1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.


**REFERENCE BOOKS**:


1. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

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| **B.Tech.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - II Semester** | **0** | **0** | **2** | **1** |

## OPERATING SYSTEMS LAB

**Course Objectives:**

- To provide an understanding of the design aspects of operating system concepts through simulation
- Introduce basic Unix commands, system call interface for process management Interprocess Communication and I/O in Unix

**Course Outcomes:** The student will learn

- Simulate and implement operating system concepts such as scheduling, deadlock management.
- Simulate the memory management techniques.
- Able to implement C programs using Unix system calls
- Able to Implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls
- Ability to Simulate and Implement OS Concept for Page Replacement Policies Such as FCFS, LRU & Optimal

**List of Experiments:**

1. Write C programs to simulate the following CPU Scheduling algorithms
   a) FCFS b) SJF c) Round Robin d) Priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, opendir, readdir)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms
   a) Pipes b) FIFOs c) Message Queues d) Shared Memory
6. Write C programs to simulate the following memory management techniques
   a) Paging b) Segmentation
7. Write C programs to simulate Page replacement policies
   a) FCFS b) LRU c) Optimal

**Text Books:**


1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R. Stevens, Pearson education.

**Reference Books:**


1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System - A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

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**An Autonomous Institution**

| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - II Semester** | **0** | **0** | **2** | **1** |

## DATABASE MANAGEMENT SYSTEMS LAB

**Course Objectives:**

- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

**Course Outcomes:** The student will learn

- Design database schema for a given application and apply normalization.
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers.
- Develop query using various operators in sdifferent clauses
- Implement data integrity constraints.

**List of Experiments:**

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A. Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)
   B. Nested, Correlated subqueries
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

**Text Books:**


1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3 rd Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.


**Reference Books:**


1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

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**An Autonomous Institution**

| **B.Tech. CSE (DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - II Semester** | **0** | **0** | **2** | **1** |

## NODE JS/ REACT JS/ DJANGO

**Course Objectives:**

- To implement the static web pages using HTML and do client-side validation using JavaScript.
- To design and work with databases using Java
- To develop an end-to-end application using java full stack.
- To introduce Node JS implementation for server-side programming.
- To experiment with single page application development using React.

**Course Outcomes:** The student will learn

- Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.
- Demonstrate Advanced features of JavaScript and learn about JDBC
- Develop Server – side implementation using Java technologies like
- Develop the server – side implementation using Node JS.
- Design a Single Page Application using React.

**List of Experiments:**

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed in experiment 1 and the database created in experiment 5.
8. Maintaining the transactional history of any user is very important. Explore the various session tracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
10. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)
11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.

13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
14. Create a TODO application in react with necessary components and deploy it into GitHub.

**Reference Books:**


1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, A Press.

MC410 **Vignan's Institute of Management and Technology for Women** VR24
**An Autonomous Institution**

| **B.Tech.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year - II Semester** | 3 | 0 | 0 | 0 |

## CONSTITUTION OF INDIA
**(COMMON TO CSE,CS(DS),CSE(AIML),IT & ECE)**

**Course Objectives:** Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

**Course Outcomes:** Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956.

**UNIT-I:**

History of Making of the Indian Constitution- History of Drafting Committee.

**UNIT-II:**

Philosophy of the Indian Constitution- Preamble Salient Features

**UNIT-III:**

Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Right
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

**UNIT-IV:**

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

**UNIT-V:**

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO ZilaPanchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

**UNIT-VI:**

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

**Suggested Reading:**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **III Year - I Semester** | **3** | **0** | **0** | **3** |

## ALGORITHMS DESIGN AND ANALYSIS

(Common for CSE, IT, CSE(AI&ML), CSE(DS))

**Course Objectives:**

- Introduces the notations for analysis of the performance of algorithms.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst, average, and best- case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

**Course Outcomes:**

- Analyze the performance of algorithms
- Choose appropriate data structures and algorithm design methods for a specified application
- Understand the choice of data structures and the algorithm design methods.
- Implement tree and graph traversal techniques and identify graph components.
- Classify problems as NP-Hard or NP-Complete and explain computational complexity concepts.

**UNIT - I**

**Introduction**: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.

**Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

**UNIT - II**

**Disjoint Sets**: Disjoint set operations, union and find algorithms, Priority Queue- Heaps, Heapsort **Backtracking:** General method, applications, n-queen's problem, sum of subsets problem, graph Coloring, Hamiltonian cycles.

**UNIT - III**

**Dynamic Programming:** General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

**UNIT - IV**

**Greedy method**: General method, applications- Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

**Basic Traversal and Search Techniques:** Techniques for Binary Trees,

Techniques for Graphs, Connected components, Biconnected components.

**UNIT - V**

**Branch and Bound**: General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

**NP-Hard and NP-Complete problems**: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

**TEXT BOOK:**


1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekhara, University Press.


**REFERENCE BOOKS:**


1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R.Tamassia, John Wiley and sons.

CS502PC **Vignan's Institute of Management and Technology for Women** VR24

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
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| **III Year - I Semester** | **3** | **0** | **0** | **3** |

## COMPUTER NETWORKS

(Common for CSE, CSE(AI&ML), CSE(DS))

### Course Objectives

- The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

### Course Outcomes

- Understand basic computer network concepts and architectures.
- Explain the functions of OSI and TCP/IP layers.
- Apply sub netting, routing, and congestion control techniques.
- Use essential network protocols in design and implementation.
- Analyze application-layer services like DNS, HTTP, and email.

### UNIT - I

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless Transmission.

Data link layer: Design issues, framing, Error detection and correction.

### UNIT - II

Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols.

Medium Access sublayer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

### UNIT - III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

### UNIT - IV

Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

### UNIT - V

Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB,

HTTP, Streaming audio and video.

**TEXT BOOK:**

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

**REFERENCE BOOKS:**

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

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| **III Year - I Semester** | **3** | **1** | **0** | **4** |

## INTRODUCTION TO DATA SCIENCE

**Course Objectives:**

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

**Course Outcomes:**

- Understand statistical modeling, data types, and data science concepts.
- Implement R programming basics, vectors, matrices, lists, and data frames.
- Apply conditionals, loops, and functions for data manipulation in R.
- Visualize data using charts, graphs, and exploratory techniques.
- Perform predictive analysis using linear and multiple regression models.

**UNIT- I**

**Introduction**

Definition of Data Science- Big Data and Data Science hype – and getting past the hype- Datafication- Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting.

**Basics of R:** Introduction, R-Environment Setup, Programming with R, Basic Data Types.

**UNIT- II**

**Data Types & Statistical Description**

**Types of Data:** Attributes and Measurement, Attribute, The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes.

Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data

**UNIT- III**

**Vectors:** Creating and Naming Vectors, Vector Arithmetic, Vector sub setting.

**Matrices:** Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.

**Factors and Data Frames:** Introduction to Factors: Factor Levels, summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, sub setting of Data Frames, Extending Data Frames, Sorting Data Frames.

**Lists:** Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors.

**UNIT- IV**

**Conditionals and Control Flow:** Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

**Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List.

**Functions in R:** Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

**UNIT- V**

**Charts and Graphs:** Introduction, Pie Chart: Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

**Regression:** Linear Regression Analysis, Multiple Linear regression

**TEXT BOOKS:**


1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt,O'Reilly, 2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.


**REFERENCE BOOKS:**


1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.

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| **III Year - I Semester** | **3** | **0** | **0** | **3** |

**DATA WAREHOUSING AND BUSINESS INTELLIGENCE**

**(Professional Elective – I)**

**Course Objectives:**

- This course is concerned with extracting data from the information systems that deal with the day-to-day operations and transforming it into data that can be used by businesses to drive high-level decision making
- Students will learn how to design and create a data warehouse, and how to utilize the process of extracting, transforming, and loading (ETL) data into data warehouses.

**Course Outcomes:**

- Understand architecture of data warehouse and OLAP operations.
- Understand Fundamental concepts of BI
- Application of BI Key Performance indicators
- Understand Utilization of Advanced BI Tools and their Implementation.
- Implementation of BI Techniques and BI Ethics.

**UNIT- I**

Data Warehouse, Data Warehouse Modelling, OLAP operations, Data Qube Computation methods

**UNIT- II:**

Business Intelligence Introduction – Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

**UNIT- III**

BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business Intelligence-Value driven and Information use

**UNIT- IV**

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME).

**UNIT- V**

Business Intelligence and integration implementation-connecting in BI systems- Issues of legality Privacy and ethics- Social networking and BI.

**TEXT BOOK:**

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER,Elsevier, 4th Edition.

2. Rajiv Sabherwal “Business Intelligence” Wiley Publications, 2012.

**REFERENCE BOOKS:**

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.
2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence. Solutions with SQL Server, 2008 R2 & Office 2010, TMH, 2011.
4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis] [Publication: (Wiley)]
5. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGrawHill Edition, Tenth reprint 2007
6. Building the Data Warehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd.
7. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

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| **III Year - I Semester** | **3** | **0** | **0** | **3** |

## ARTIFICIAL INTELLIGENCE
## (Professional Elective – I)

**Course Objectives:**

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Course Outcomes:**

- Understand AI concepts, intelligent agents, and search strategies.
- Apply heuristic and local search techniques for problem solving
- Analyze adversarial search and constraint satisfaction problems.
- Represent knowledge using propositional and first-order logic with inference.
- Apply probabilistic reasoning and Bayesian methods to handle uncertainty.

**UNIT - I**

Introduction to AI, Intelligent Agents, problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

**UNIT - II**

**Problem Solving by Search-II and Propositional Logic**

**Adversarial Search:** Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems. Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

**UNIT - III**

**Logic and Knowledge Representation**

**First-Order Logic:** Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

**Inference in First-Order Logic:** Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

**UNIT – IV**

**Knowledge Representation**: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

**Classical Planning:** Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

**UNIT – V**

**Uncertain knowledge and Learning Uncertainty:** Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use

**Probabilistic Reasoning**: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

**TEXT BOOK:**

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education

**REFERENCE BOOKS:**

1. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education

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| **III Year - I Semester** | **3** | **0** | **0** | **3** |

# WEB PROGRAMMING
## (Professional Elective – I)

**Course Objectives:**

- Understand the technologies used in Web Programming.
- Know the importance of object-oriented aspects of Scripting.
- Understand creating database connectivity using JDBC.
- Learn the concepts of web-based application using sockets

**Course Outcomes:**

- Design web pages.
- Use technologies of Web Programming.
- Apply object-oriented aspects to Scripting.
- Create databases with connectivity using JDBC.
- Build web-based application using sockets.

**UNIT- I**

**Client-side Programming** HTML- Basic Tags- List, Tables, Images, Forms, Frames, CSS JAVA Script - Web page Designing using HTML, Scripting basics- Client side and server-side scripting. Java ScriptObject, names, literals, operators and expressions-statements and features- events - windows - documents - frames - data types - built-in functions- Browser object model - Verifying forms.-HTML5- CSS3- HTML 5 canvas - Web site creation using tools.

**UNIT- II: JAVA**

**Introduction to object-oriented programming**-Features of Java – Data types, variables and arrays – Operators – Control statements – Classes and Methods – Inheritance. Packages and Interfaces – Exception Handling – Multithreaded Programming – Input/Output – Files – Utility Classes – String Handling.

**UNIT- III**

**JDBC:** JDBC Overview – JDBC implementation – Connection class – Statements - Catching Database Results, handling database Queries. Networking– InetAddress class – URL class- TCP sockets – UDP sockets, Java Beans –RMI

**UNIT- IV**

**APPLETS** Java applets- Life cycle of an applet – Adding images to an applet – Adding sound to an applet. Passing parameters to an applet. Event Handling. Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers and Menus. Servlet – life cycle of a servlet. The Servlet API, Handling HTTP Request and Response, using Cookies, Session Tracking. Introduction to JSP.

**UNIT- V**

**XML AND WEB SERVICES** Xml – Introduction-Form Navigation-XML Documents-XSL – XSLT- Web services-UDDI-WSDL-Java web services – Web resources.

**TEXT BOOK:**


1. Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How To Program 5th Edition.
2. Herbert Schildt, Java - The Complete Reference, 7th Edition. Tata McGraw-Hill Edition.
3. Michael Morrison XML Unleashed Tech media SAMS.


**REFERENCE BOOKS:**


1. John Pollock, Javascript - A Beginners Guide, 3rd Edition –- Tata McGraw-Hill Edition.
2. Keyur Shah, Gateway to Java Programmer Sun Certification, Tata McGraw Hill, 2002.

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| **III Year - I Semester** | **3** | **0** | **0** | **3** |

**IMAGE PROCESSING (Professional Elective – I)**

(Common for CSE, CSE(AI&ML), CSE(DS))

**Course Objectives:**

- Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
- The topics include image acquisition; sampling and quantization; preprocessing; enhancement; restoration; segmentation; and compression.

**Course Outcomes:**

- Understand digital image acquisition, sampling, quantization, and pixel relationships.
- Apply 2D transformation techniques for image processing.
- Apply image enhancement and filtering techniques.
- Apply image restoration and segmentation techniques.
- Understand image compression techniques and models.

**UNIT- I**

Digital Image Fundamentals: Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

**UNIT- II:**

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

**UNIT- III**

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

**UNIT- IV**

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

**UNIT- V**

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

**TEXT BOOK:**

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2nd Ed, 2004

**REFERENCE BOOKS:**


1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MAT LAB: Rafael C. Gonzalez, Richard E. Woods, Steven L.
3. Eddins: Pearson Education India, 2004.
4. Digital Image Processing: William K. Pratt, John Wiley, 3rd Edition, 2004.

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| **III Year - I Semester** | **3** | **0** | **0** | **3** |

**COMPUTER GRAPHICS (Professional Elective – I)**

**Course Objectives:**

- Provide the basics of graphics systems including Points and lines, line drawing algorithms, 2D, 3D objective transformations

**Course Outcomes:**

- Understand applications and basic components of computer graphics systems.
- Apply 2D transformations and clipping techniques.
- Understand 3D object representations, rendering methods, and color models.
- Apply 3D transformations and viewing techniques.
- Analyze animation techniques and visible surface detection methods.

**UNIT- I**

**Introduction:** Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random-scan systems, graphics monitors and work stations and input devices

**Output primitives:** Points and lines, line drawing algorithms (DDA and Bresenham's Algorithm) circle generating algorithms and ellipse - generating algorithms

**Polygon Filling:** Scan-line algorithm, boundary-fill and flood-fill algorithms

**UNIT- II:**

**2-D geometric** transformations: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

**2-D viewing:** The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, clipping operations, point clipping, Line clipping-Cohen Sutherland algorithms, Polygon clipping-Sutherland Hodgeman polygon clipping algorithm.

**UNIT- III**

**3-D object representation:** Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces, Polygon rendering methods, color models and color applications.

**UNIT- IV**

**3-D Geometric transformations**: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

**3-D viewing:** Viewing pipeline, viewing coordinates, projections, view volume and general projection transforms and clipping.

**UNIT- V**

**Computer animation:** Design of animation sequence, general computer animation functions, raster animations, computer animation languages, key frame systems, motion specifications.

**Visible surface detection methods:** Classification, back-face detection, depth-buffer method, BSPtree method, area sub-division method and octree method.

**TEXT BOOK:**


1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson Education


**REFERENCE BOOKS:**


1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
4. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and
5. Hughes, Pearson Education.
6. Computer Graphics, Steven Harrington, TMH.

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| **III Year - I Semester** | **3** | **0** | **0** | **3** |

## SPATIAL AND MULTIMEDIA DATABASES (Professional Elective - II)

**Course Objectives:**

- Provide the basics of graphics systems including Points and lines, line drawing algorithms, 2D, 3D objective transformations

**Course Outcomes:**

- Understand spatial data models and spatial database design.
- Analyze spatial indexing and multidimensional data structures.
- Represent and retrieve image databases using R-trees.
- Store and retrieve text, audio, video, and multimedia data.
- Understand distributed multimedia presentations and media servers.

**UNIT- I**

**Introduction to Spatial Databases:** Overview, beneficiaries, GIA and SDBMS, users, Space taxonomy, query language, query processing, query optimization. Spatial Concepts and Data Models: Models of Spatial information, three step database design, Extending the ER model with spatial concept, object-oriented data modeling, Spatial Query Languages.

**UNIT- II:**

**Spatial Storage and Indexing**: Storage-disks and files, spatial indexing, TR*, spatial join index. Query processing and optimization – Evaluation of Spatial operations, query optimization, Analysis of Spatial index structures, distributed and parallel spatial database system. **Multidimensional Data Structures:** k-d Trees, Point Quadtrees, The MX-Quadtree, R-Trees, comparison of Different Data Structures.

**UNIT- III**

**Image Databases**: Raw Images, Compressed Image Representations, Image Processing: Segmentation, Similarity-Based Retrieval, Alternative Image DB Paradigms, Representing Image DBs with Relations, Representing Image DBs with R-Trees, Retrieving Images By Spatial Layout, Implementations.

**Text/Document Databases**: Precision and Recall, Stop Lists, Word Stems, and Frequency Tables, Latent Semantic Indexing, TV-Trees, Other Retrieval Techniques

**UNIT- IV**

**Video Databases:** Organizing Content of a Single Video, Querying Content of Video Libraries, Video Segmentation, video Standards

**Audio Databases:** A General Model of Audio Data, Capturing Audio Content through Discrete Transformation, Indexing Audio Data

**Multimedia Databases:** Design and Architecture of a Multimedia Database, Organizing Multimedia Data Based on The Principle of Uniformity, Media Abstractions, Query Languages for Retrieving Multimedia Data, Indexing SMDSs with Enhanced Inverted

Indices, Query Relaxation/Expansion.

**UNIT- V**

**Creating Distributed Multimedia Presentations**: Objects in Multimedia Presentations, Specifying Multimedia Documents with Temporal Constraints, Efficient Solution of Temporal Presentation Constraints, Spatial Constraints.

**Distributed Media Servers:** Distributed multimedia server architecture, distributed retrieval plans, optimal distributed retrieval plans.

**TEXT BOOK:**


1. Shashi Shekhar, Sanjiv Chawla, Spatial Databases-A Tour, Pearson Education.
2. V. S. Subrahmanian Principles of Multimedia Database Systems, Morgan Kauffman


**REFERENCE BOOKS:**


1. Multimedia Databases: An object relational approach, Lynne Dunckley, Pearson Education.
2. Multimedia Database Systems, Prabhakaram, Springer.

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| **III Year - I Semester** | **3** | **0** | **0** | **3** |

## INFORMATION RETRIEVAL SYSTEMS (Professional Elective - II)

**Course Objectives:**

- To learn the concepts and algorithms in Information Retrieval Systems
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems

**Course Outcomes:**

- Apply IR principles to retrieve relevant information.
- Design and apply indexing techniques for retrieval systems.
- Design document and term clustering algorithms.
- Implement information retrieval systems for web search.
- Apply text and multimedia information retrieval techniques.

**UNIT- I**

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

**UNIT- II:**

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

**UNIT- III**

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

**UNIT- IV**

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technology

**UNIT- V**

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems Multimedia Information Retrieval: Spoken

Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

**TEXT BOOK:**

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

**REFERENCE BOOKS:**


1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval by Yates and Neto Pearson Education

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| **III Year - I Semester** | **3** | **0** | **0** | **3** |

## SOFTWARE PROJECT MANAGEMENT (Professional Elective – II)

**Course Objectives:**

- To acquire knowledge on software process management
- To acquire managerial skills for software project development
- To understand software economics, workflows and frameworks.

**Course Outcomes:**

- Understand software economics and their impact on software development performance.
- Examine software life cycle phases, artifacts, workflows, and process checkpoints.
- Demonstrate knowledge of software management process framework and architectures.
- Analyze software project planning, organization, automation, and management disciplines.
- Apply software metrics, project control techniques, and process tailoring methods.

**UNIT- I**

**Software Management Renaissance Conventional Software Management:** The waterfall model, conventional software Management performance. Evolution of Software Economics-Software economics, pragmatic software cost estimation. Improving Software Economics- Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

**UNIT- II:**

**A Software Management Process Framework-I** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process. Life cycle phases- Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of the process- The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

**UNIT- III**

**A Software Management Process Framework-II** Model based software architectures- A Management perspective and technical perspective. Work Flows of the process- Software process workflows, Iteration workflows. Checkpoints of the processMajor milestones, Minor Milestones, Periodic status assessments.

**UNIT- IV**

**Software Management Discipline-I** Iterative Process Planning- Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. Project Organizations and ResponsibilitiesLine-of-Business Organizations, Project Organizations, evolution of Organizations. Process Automation: Automation building blocks, The Project Environment.

**UNIT- V**

**Software Management Discipline-II** Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. Tailoring the Process: Process discriminates. Future Software Project Management: modern Project Profiles, Next generation Software economics, modern process transitions. Case Study: The command Center Processing and Display system- Replacement (CCPDS-R).

**TEXT BOOK:**

1. Software Project Management, Walker Royce, Addison-Wesley Pearson Education, 2005.

**REFERENCE BOOKS:**

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.
3. Software Project Management in practice, Pankaj Jalote, Pearson Education. 2005.

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| **III Year - I Semester** | **3** | **0** | **0** | **3** |

**DEVOPS (Professional Elective – II)**

**Course Objectives:**

- Understand the skill sets and high-functioning teams involved in Agile, DevOps and related methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle.

**Course Outcomes:**

- Understand DevOps concepts and environment.
- Identify DevOps development models and architectures.
- Use version control and project management tools.
- Apply continuous integration and build tools.
- Select testing and deployment tools for DevOps projects.

**UNIT- I**

**Introduction to Develops:**

Introduction, Agile development model, DevOps and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, identifying bottlenecks.

**UNIT- II:**

**Software development models and DevOps:**

DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Micro services and the data tier, DevOps, architecture, and resilience.

**UNIT- III**

**Introduction to project management:**

The need for source code control, the history of source code management, Roles and code, source code management system and migrations, shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

**UNIT- IV**

**Integrating the system:**

Build systems, Jenkins build server, managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

**UNIT- V**

**Testing Tools and Deployment:**

Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development. Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, SaltStackand Docker.

**TEXT BOOK:**

1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.

**REFERENCE BOOKS:**

1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.

**DS525PE:** **Vignan's Institute of Management and Technology for Women** **VR24**

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|---|---|---|---|---|
| **III Year - I Semester** | **3** | **0** | **0** | **3** |

## COMPUTER VISION AND ROBOTICS

## (Professional Elective – II)

**Course Objectives:**

- To understand the Fundamental Concepts Related To sources, shadows and shading
- To understand the Geometry of Multiple Views

**Course Outcomes:**

- Implement fundamental image processing techniques required for computer vision
- Implement boundary tracking techniques
- Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques and Implement motion related techniques.
- Develop applications using computer vision techniques.

**UNIT- I**

**CAMERAS:** Pinhole Cameras

**Radiometry – Measuring Light:** Light in Space, Light Surfaces, Important Special Cases

**Sources, Shadows, And Shading:** Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models

**Color**: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

**UNIT- II:**

**Linear Filters:** Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates

**Edge Detection**: Noise, Estimating Derivatives, Detecting Edges

**Texture:** Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, **Application:** Synthesis by Sampling Local Models, Shape from Texture

**UNIT- III**

**The Geometry of Multiple Views:** Two Views

**Stereopsis:** Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras

**Segmentation by Clustering:** Segmentation, Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

**UNIT- IV**

**Segmentation by Fitting a Model:** The Hough Transform, Fitting Lines, Fitting Curves,

Fitting as a Probabilistic Inference Problem, Robustness

**Geometric Camera Models:** Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations

**Geometric Camera Calibration:** Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization

**UNIT- V**

**Introduction to Robotics:** Social Implications of Robotics, Brief history of Robotics, Attributes of hierarchical paradigm, Closed world assumption and frame problem, Representative Architectures, Attributes of Reactive Paradigm, Subsumption Architecture, Potential fields and Perception

**Common sensing techniques for Reactive Robots:** Logical sensors, Behavioral Sensor Fusion, Pro- preceptive sensors, Proximity Sensors, Topological Planning and Metric Path Planning

**TEXT BOOK:**


1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.
2. Robin Murphy, Introduction to AI Robotics, MIT Press


**REFERENCE BOOKS:**


1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. The Robotics premier, Maja J Matari, MIT Press
3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag London Limited 2011.

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| **III Year - I Semester** | **0** | **0** | **2** | **1** |

## R PROGRAMMING LAB

**Course Objectives:**

- Familiarize with R basic programming concepts, various data structures for handling datasets, various graph representations and Exploratory Data Analysis concepts

**Course Outcomes:**

- Setup and configure R environment and packages.
- Understand and use R data types and structures.
- Develop programming logic using R.
- Visualize and analyze data with R plots and EDA.
- Apply statistical methods like regression on datasets.

**LIST OF EXPERIMENTS:**

1. Download and install R-Programming environment and install basic packages using install. packages () command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,.)
3. Write R command to
   i) Illustrate summation, subtraction, multiplication, and division operations on vectors using vectors.
   ii) Enumerate multiplication and division operations between matrices and vectors in R console
4. Write R command to
   i) Illustrates the usage of Vector subsetting and Matrix subsetting
   ii) Write a program to create an array of 3×3 matrixes with 3 rows and 3 columns.
5. Write an R program to draw i) Pie chart ii) 3D Pie Chart, iii) Bar Chart along with chart legend by considering suitable CSV file
6. Create a CSV file having Speed and Distance attributes with 1000 records. Write R program to draw
   i) Box plots
   ii) Histogram
   iii) Line Graph
   iv) Multiple line graphs
   v) Scatter plot to demonstrate the relation between the cars speed and the distance.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. 8.Write an R program to read a csv file and analyze the data in the file using EDA (Explorative Data Analysis) techniques.
9. 9.Write an R program to illustrate Linear Regression and Multi linear Regression considering suitable CSV file.

**TEXT BOOKS:**

1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Norman Matloff Cengage Learning India

**REFERENCE BOOKS:**


1. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition, O'Reilly
2. Tilman M. Davies, The book of R a first course in programming and statistics, no starch press

CS505PC **Vignan's Institute of Management and Technology for Women** VR24

**An Autonomous Institution**

| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
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| **III Year - I Semester** | **0** | **0** | **2** | **1** |

## COMPUTER NETWORKS LAB

**(Common for CSE, CSE(AI&ML), CSE(DS))**

**Course Objectives:**

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and observe its performance
- To analyze the traffic flow and the contents of protocol frames

**Course Outcomes:**

- Implement data link layer farming methods
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design.
- Implement Encoding and Decoding techniques used in presentation layer
- To be able to work with different network tools

**LIST OF EXPERIMENTS:**

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting techniques used in buffers.
10. **Wireshark**
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics Filters.

11. How to run Nmap scan Operating System Detection using Nmap Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate & Throughput.
    vi. Simulate to Plot Congestion for Different Source/Destination
    vii. Simulate to Determine the Performance with respect to Transmission of Packets

**TEXT BOOK:**

1. Computer Networks, Andrew S Tanenbaum, David. j.Wetherall, 5th Edition. Pearson Education/PHI.

**REFERENCE BOOKS:**

1. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education.
2. Data Communications and Networking – Behrouz A. Forouzan. 3rd Edition, TMH.

EN506BS **Vignan's Institute of Management and Technology for Women** VR24

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| **III Year - I Semester** | **0** | **0** | **2** | **1** |

## Advanced English Communication Skills Lab

(Common for ECE, CSE, IT, CSE(AI&ML), CSE(DS))

**Course Outcomes:**

- Comprehend and interpret English effectively.
- Write formal letters, reports, and emails correctly.
- Communicate ideas clearly through presentations.
- Participate confidently in group discussions and debates.
- Perform well in interviews and professional communication.

1. **Introduction**

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organize ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

2. **Objectives:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by educated English speakers
- To respond appropriately in different socio-cultural and professional contexts
- To communicate their ideas relevantly and coherently in writing
- To prepare the students for placements.

3. **Syllabus**:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub- skills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice.
2. **Activities on Writing Skills**: Vocabulary for Competitive Examinations- Planning for Writing – mproving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing-Letter Writing – Writing a Letter of Application –Resume vs.Curriculum Vitae– Writing a Résumé – Styles of Résumé – e Correspondence – Emails – Blog Writing - (N)etiquette– Report Writing – mportance of Reports –Types and Formats of Reports–Technical Report Writing–Exercises for Practice.
3. **Activities on Presentation Skills -** Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear — Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation.
4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Do's and Don'ts - GD Strategies — Exercises for Practice.
5. **Interview Skills**: Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.

**4. Minimum Requirement:**

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the

lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- One PC with latest configuration for the teacher
- T. V, a digital stereo & Camcorder
- Headphones of High quality

**1. Suggested Software:**

The software consisting of the prescribed topics elaborated above should be procured and used.

- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **Oxford Advanced Learner's Dictionary**, 10th Edition
- **Cambridge Advanced Learner's Dictionary**
- **DELTA's key to the Next Generation TOEFL Test:** Advanced Skill Practice.
- **Lingua TOEFL CBT Insider**, by Dreamtech

**6. Books Recommended:**


1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*. (2nd ed.). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). *Engineering English.* Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). Academic *Writing: A Handbook for International Students.* (5th Edition). Routledge.
4. Koneru, Aruna. (2016). *Professional Communication*. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). *Technical Communication, Principles and Practice.* (4TH Edition) Oxford University Press.
6. Anderson, Paul V. (2007). *Technical Communication***.** Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). *English Vocabulary in Use* Series. Cambridge University Press
8. Sen, Leela. (2009). *Communication Skills.* PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998 ). *Writing with Power.* Oxford University Press.

**Goleman, Daniel. (2013). *Emotional Intelligence*: *Why it can matter more than IQ*. Bloomsbury Publishing.**

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## ETL- KAFKA/TALEND

**Course Objectives:**

- Develop a comprehensive understanding of Extract, Transform, Load (ETL) processes using Apache Kafka and Talend.
- Understand how to scale Kafka clusters seamlessly to handle growing data volumes, ensuring optimal performance for ETL operations.

**Course Outcomes:**

- Install and configure Apache Kafka in single-node and multi-broker environments.
- Create and manage Kafka topics, producers, and consumers using command-line tools and Java programs.
- Implement synchronous and asynchronous message production and consume messages efficiently.
- Learn to design and deploy fault-tolerant Kafka clusters, ensuring data integrity and availability in real-world scenarios.
- Gain practical experience in cluster management, topic creation, and basic operations such as producing and consuming messages.

**LIST OF EXPERIMENTS**

1. Install Apache Kafka on a single node.
2. Demonstrate setting up a single-node, single-broker Kafka cluster and show basic operations such as creating topics and producing/consuming messages.
3. Extend the cluster to multiple brokers on a single node.
4. Write a simple Java program to create a Kafka producer and Produce messages to a topic.
5. Implement sending messages both synchronously and asynchronously in the producer.
6. Develop a Java program to create a Kafka consumer and subscribe to a topic and consume messages.
7. Write a script to create a topic with specific partition and replication factor settings.
8. Simulate fault tolerance by shutting down one broker and observing the cluster behavior.
9. Implement operations such as listing topics, modifying configurations, and deleting topics.
10. Introduce Kafka Connect and demonstrate how to use connectors to integrate with external systems.
11. Implement a simple word count stream processing application using Kafka Stream
12. Implement Kafka integration with the Hadoop ecosystem

**TEXT BOOK:**

1. Neha Narkhede, Gwen Shapira, Todd Palino, Kafka – The Definitive Guide: Real-time data and stream processing at scale, O′Reilly

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## INTELLECTUAL PROPERTY RIGHTS

(Common for ECE, CSE, IT, CSE(AI&ML), CSE(DS))

**Course Objectives:**

- Significance of intellectual property and its protection
- Introduce various forms of intellectual property
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

**Course Outcomes:**

- Explain the concepts, types, and importance of Intellectual Property Rights and related international bodies.
- Analyze trademark selection, protection, and registration processes.
- Explain the fundamentals of copyright and patent laws, including ownership and protection mechanisms.
- Apply trade secret and unfair competition laws to real-world situations.
- Examine recent national and international developments in IPR and perform basic IP audits.

**UNIT – I**

**Introduction to Intellectual property**: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT – II**

**Trade Marks:** Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

**UNIT – III**

**Law of copyrights:** Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, international copyright law.

**Law of patents:** Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT – IV**

**Trade Secrets**: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

**UNIT – V**

New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

**TEXT BOOK:**

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

**REFERENCE BOOK:**

2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

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| **III Year - II Semester** | **3** | **0** | **0** | **3** |

## MACHINE LEARNING

**(Common for CSE(AI&ML), CSE(DS))**

**Course Objectives:**

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

**Course Outcomes:**

- Understand supervised, unsupervised, and semi-supervised learning.
- Apply classifiers for linear and non-linear data.
- Use ensemble methods to improve accuracy.
- Apply dimensionality reduction and evolutionary algorithms.
- Understand reinforcement and probabilistic learning models.

**UNIT - I**

Learning–Types of Machine Learning – Supervised Learning–The Brain and the Neuron–Design a Learning System–Perspectives and Issues in Machine Learning – Concept Learning Task –Concept Learning as Search –Finding a Maximally Specific Hypothesis–Version Spaces and the Candidate Elimination Algorithm–Linear Discriminants: –Perceptron–Linear Separability–Linear Regression.

**UNIT - II**

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

**UNIT - III**

Learning with Trees–Decision Trees–Constructing Decision Trees–Classification and Regression Trees – Ensemble Learning – Boosting – Bagging –Different ways to Combine Classifiers–Basic Statistics–Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning–K means Algorithms.

**UNIT - IV**

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms.

**UNIT - V**

Reinforcement Learning – Overview – Getting Lost Example Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

**TEXT BOOKS:**


1. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.


**REFERENCE BOOKS:**


1. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.
3. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014
4. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.

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| **III Year - II Semester** | **3** | **0** | **0** | **3** |

## AUTOMATA THEORY AND COMPILER DESIGN

(Common for IT, CSE(DS))

**Course Objectives**

- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation

**Course Outcomes**

- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool and design LR parsers

**UNIT - I**

**Introduction to Finite Automata:** Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

**Nondeterministic Finite Automata**: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

**Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA

**UNIT - II**

**Regular Expressions**: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

**Pumping Lemma for Regular Languages**:
Statement of the pumping lemma, Applications of the Pumping Lemma.

**Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

**UNIT - III**

**Push Down Automata**: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state

**Turing Machines**:
Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

**Undecidability:**
Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

**UNIT - IV**

**Introduction:** The structure of a compiler

**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex

**Syntax Analysis:** Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers

**UNIT - V**

**Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax- Directed Translation Schemes, Implementing L-Attributed SDD's.

**Intermediate-Code Generation:** Variants of Syntax Trees, Three-Address Code

**Run-Time Environments:** Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

**TEXT BOOKS:**


1. Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science- Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

**REFERENCE BOOKS:**


1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry
2. D. Ullman, 2nd Edition, Pearson.
3. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
4. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
5. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
6. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

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## BIG DATA ANALYTICS

**Course Objectives**

- Provide the knowledge of principles and techniques for Big data Analytics and give an exposure of the frontiers of Big data Analytics

**Courses Outcomes**

- Understand the importance of big data analytics and its types
- Perform analytics on big data
- Proficiency in big data storage and processing in Hadoop
- Data analytics through MongoDB
- Data analytics through R

**UNIT - I**

Types of Digital data: Classification of Digital Data,

Introduction to Big Data: Evolution of Big Data, definition of big data, Traditional Business Intelligence vs BigData, Coexistence of Big Data and Data Warehouse.

Big Data Analytics: introduction to Big Data Analytics, What Big Data Analytics Isn't, Sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data, Top Challenges Facing Big Data, Big Data Analytics Importance, Data Science, Terminologies used in Big Data Environments.

**UNIT - II**

Hadoop: Features of Hadoop, Key advantages of hadoop, versions of hadoop, overview of hadoop ecosystem, Hadoop distributions. Need of hadoop, RDBMS vs Hadoop, Distribution computing challenges, History of hadoop, Hadoop overview, HDFS

**UNIT - III**

Processing data with hadoop, introduction to mapreduce programming, mapper, reducer, combiner, partitioner

NoSQL: Types of NoSQL Databases, advantages of NoSQL, Use of NoSQL in industry, SQL vs NoSQL, newSQL, comparison of Nosql, sql and newsql

**UNIT - IV**

MongoDB, necessity of mongodb, terms used in mongodb and RDBMS, datatypes in mongoDB, mongodb query language

**UNIT - V**

Introduction to R programming, operators, control statements and functions, interfacing with R, vectors, matrices, lists, data frames, factors and tables, accessing input and output, graphs in R, R apply family

**TEXT BOOKS:**


1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. R programming for beginners, sandhya arora, latesh malik, university press.


**REFERENCE BOOKS:**


1. chandramouli subramanian, Asha A Geroge, C R Rene Robin, big data analytics, University press.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **III Year - II Semester** | **3** | **0** | **0** | **3** |

## SOFTWARE TESTING METHODOLOGIES
## (Professional Elective – III)

**Course Objectives**

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using the latest tools.

**Course Outcomes**

- Understand purpose of testing and path testing
- Understand strategies in data flow testing and domain testing
- Develop logic-based test strategies
- Understand graph matrices and its applications
- Implement test cases using any testing automation tool

**UNIT - I**

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

**UNIT - II**

Transaction Flow Testing: transaction flows, transaction flow testing techniques.

Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.

Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

**UNIT - III**

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

**UNIT - IV**

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

**UNIT - V**

Graph Matrices and Application: Motivational overview, matrix of graph, relations,

power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like Jmeter/selenium/soapUI/Catalon).

**TEXT BOOKS:**


1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.


**REFERENCE BOOKS:**


1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

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| **III Year - II Semester** | **3** | **0** | **0** | **3** |

## DATA VISUALIZATION TECHNIQUES
## (Professional Elective – III)

**Course Objectives**

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using the latest tools.

**Course Outcomes**

- Identify the different data types, visualization types to bring out the insight.
- Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on a large dataset.
- Demonstrate the analysis of a large dataset using various visualization techniques and tools.
- Identify the different attributes and showcasing them in plots. Identify and create various
- Visualizations for geospatial and table data. Ability to create and interpret plots using R/Python

**UNIT - I**

Introduction, A Brief History of Data Visualization, Good Graphics, Static Graphics.

**UNIT - II**

Data Visualization Through Their Graph Representations, Graph-theoretic Graphics, High-dimensional Data Visualization, Multivariate Data Glyphs: Principles and Practice, Linked Views for Visual Exploration, Linked Data Views, Visualizing Trees and Forests.

**UNIT - III**

Multidimensional Scaling, Huge Multidimensional Data Visualization, Multivariate Visualization by Density Estimation, Structured Sets of Graphs, Structural Adaptive Smoothing by Propagation– Separation Methods, Smoothing Techniques for Visualization.

**UNIT - IV**

Data Visualization via Kernel Machines, Visualizing Cluster Analysis and Finite Mixture Models, Visualizing Contingency Tables, Mosaic Plots and their Variants.

**UNIT - V**

Parallel Coordinates: Visualization, Exploration and Classification of High- Dimensional Data, Matrix Visualization, Visualization in Bayesian Data Analysis

**TEXT BOOKS:**


1. Handbook of Data Visualization by Chun-houh Chen, 2008.
2. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
3. Colin Ware, "Information Visualization Perception for Design", 2nd edition, Margon Kaufmann Publishers, 2004.


**REFERENCE BOOKS:**


1. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2nd Edition, 2007.
2. Alexandru C. Telea, "Data Visualization: Principles and Practice," A. K. Peters Ltd, 2008.

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| **III Year - II Semester** | **3** | **0** | **0** | **3** |

## SCRIPTING LANGUAGES
## (Professional Elective – III)

**Course Objectives**

- This course introduces the script programming paradigm
- Introduces scripting languages such as Perl, Ruby and TCL.
- Learning TCL

**Course Outcomes**

- Understand the differences between scripting and programming languages.
- Gain programming skills in Ruby for problem-solving and data handling.
- Implement TCL scripts for file, list, and numerical operations.
- Develop Perl scripts for text, file, and data manipulation tasks.
- Apply scripting skills to automate tasks and solve computational problems.

**UNIT - I**

Introduction: Ruby, Rails, the structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and web services RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

**UNIT - II**

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter

**UNIT - III**

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

**UNIT - IV**

**Advanced perl** Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

**UNIT - V**

TCL TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

**TEXT BOOKS:**


1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Progammers guide by Dabve Thomas Second edition


**REFERENCE BOOKS:**


1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee
2. and B. Ware (Addison Wesley) Pearson Education.
3. Perl by Example, E. Quigley, Pearson Education.
4. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
5. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
6. Perl Power, J. P. Flynt, Cengage Learning.

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| **III Year - II Semester** | **3** | **0** | **0** | **3** |

## MOBILE APPLICATION DEVELOPMENT
## (Professional Elective – III)

**Course Objectives**

- To demonstrate their understanding of the fundamentals of Android operating systems
- To improves their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

**Course Outcomes**

- Understand and work with the Android OS and application lifecycle.
- Design and develop Android user interfaces using layouts and UI components.
- Handle events, intents, and broadcast receivers in Android applications.
- Implement persistent storage using files and shared preferences.
- Use SQLite and content providers for database-driven Android apps.

**UNIT - I**

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

**UNIT - II**

Android User Interface: Measurements – Device and pixel density independent measuring unit - s Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components –Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

**UNIT - III**

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts

**UNIT - IV**

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences — Creating shared preferences, saving and retrieving data using Shared Preference

**UNIT - V**

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

**TEXT BOOK:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012

**REFERENCE BOOKS:**

1. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
2. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

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| **III Year - II Semester** | **3** | **0** | **0** | **3** |

## CRYPTOGRAPHY AND NETWORK SECURITY

**(Professional Elective – III)**

**Course Objectives:**

- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection

**Course Outcomes:**

- Understand cryptography and security principles.
- Apply symmetric and asymmetric encryption.
- Use hash functions, digital signatures, and key management.
- Implement network and wireless security protocols.
- Analyze email, IP security, and real-world applications.

**UNIT - I**

**Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security **Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

**UNIT - II**

**Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

**Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

**UNIT - III**

**Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm (SHA-512), **Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

**UNIT – IV**

**Transport-level Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

**Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

**UNIT - V**

**E-Mail Security:** Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange

**Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

**TEXT BOOKS:**


1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition


**REFERENCE BOOKS:**


1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

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| **III Year - II Semester** | **3** | **0** | **0** | **3** |

## FUNDAMENTALS OF DATA SCIENCE
## (Open Elective – I)

**Course Objectives:**

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

**Course Outcomes:**

- Understand statistical modeling and data science concepts.
- Implement R programming basics, vectors, matrices, and data frames.
- Apply control structures, loops, and functions in R programs.
- Visualize data using charts, graphs, and exploratory techniques.
- Perform predictive analysis using linear and multiple regression.

**UNIT- I**

**Introduction**

Definition of Data Science- Big Data and Data Science hype – and getting past the hype – Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model — Over fitting.

**Basics of R:** Introduction, R-Environment Setup, Programming with R, Basic Data Types.

**UNIT- II**

**Data Types & Statistical Description**

**Types of Data:** Attributes and Measurement, Attribute, The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes.

Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

**UNIT- III**

**Vectors:** Creating and Naming Vectors, Vector Arithmetic, Vector sub setting,

**Matrices:** Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.

**Factors and Data Frames:** Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, sub setting of Data Frames, Extending Data Frames, Sorting Data Frames.

**Lists:** Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

**UNIT- IV**

**Conditionals and Control Flow:** Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

**Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List.

**Functions in R:** Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

**UNIT- V**

**Charts and Graphs:** Introduction, Pie Chart: Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

**Regression:** Linear Regression Analysis, Multiple Linear regression

**TEXT BOOKS:**


1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.


**REFERENCE BOOKS:**


1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **III Year - I Semester** | **3** | **0** | **0** | **3** |

## R PROGRAMMING
## (Open Elective – I)

**Course Objectives:**

- Understanding and being able to use basic programming concepts
- Automate data analysis
- Working collaboratively and openly on code
- Knowing how to generate dynamic documents
- Being able to use a continuous test-driven development approach

**Course Outcomes:**

- Understand to use and program in the programming language R
- Understand to use R to solve statistical problems
- Implement and describe Monte Carlo the technology
- Implement minimize and maximize functions using R
- Utilize R elements for data visualization and prediction

**UNIT- I**

Introduction**:** Definition of Data Science- Big Data and Data Science hype – and getting past the hype – Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples – Statistical modeling, probability distributions, fitting a model – Over fitting. Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

**UNIT- II Data Types & Statistical Description**

Types of Data: Attributes and Measurement, Attribute, The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

**UNIT- III**

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class. Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames. Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

**UNIT- IV**

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements. Iterative

Programming in R: Introduction, While Loop, For Loop, Looping Over List. Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

**UNIT- V**

Charts and Graphs: Introduction, Pie Chart: Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot. Regression: Linear Regression Analysis, Multiple Linear regression

**TEXT BOOKS:**


1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. 2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.


**REFERENCE BOOKS:**


1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed.The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

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| **III Year - II Semester** | **0** | **0** | **2** | **1** |

## MACHINE LEARNING LAB
## (Common for CSE(AI&ML), CSE(DS))

**Course Objective:**

- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

**Course Outcomes:**

- Understand predictive data analysis concepts and trends.
- Apply Python libraries for statistical computation and data handling.
- Implement machine learning algorithms like regression, KNN, and decision trees.
- Perform clustering and classification using Python.
- Build predictive models and evaluate their performance on real datasets.

**List of Experiments**

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

**TEXT BOOK:**

1. Machine Learning – Tom M. Mitchell, - MGH

**REFERENCE BOOK:**

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

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| **III Year - II Semester** | **0** | **0** | **2** | **1** |

## BIG DATA ANALYTICS LAB

**Course Objectives**

- Provide knowledge of Big data Analytics principles and techniques.
- Designed to give an exposure of the frontiers of Big data Analytics

**Course Outcomes**

- Use Excel for data analysis and visualization.
- Program and execute Hadoop MapReduce jobs.
- Process and analyze big data using HBase and Pig.
- Perform data analytics using MongoDB.
- Apply machine learning techniques in R for big data analysis.

**List of Experiments**

1. Create a Hadoop cluster
2. Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop)
3. Process big data in HBase
4. Store and retrieve data in Pig
5. Perform data analysis using MongoDB
6. Using Power Pivot (Excel) Perform the following on any dataset
7. Big Data Analytics
8. Big Data Charting

**TEXT BOOKS:**


1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O"Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.


**REFERENCE BOOKS:**


1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark

Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.

3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al., McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

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| **B.Tech. CSE (DS)** | **L** | **T** | **P** | **C** |
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| **III Year - II Semester** | **0** | **0** | **2** | **1** |

## SOFTWARE TESTING METHODOLOGIES LAB (Professional Elective – III)

**Course Objectives:** Course Objectives

- To provide knowledge of software testing methods.
- To develop skills in automation of software testing and software test automation management using the latest tools.

**Course Outcomes:**

- Design and develop the best test strategies in accordance with the development model.
- Design and develop GUI
- Design Bitmap and database checkpoints
- Develop database checkpoints for different checks
- Perform batch testing with and without parameter passing.

**List of Experiments**

1. Recording in context sensitive mode and analog mode
2. GUI checkpoint for single property
3. GUI checkpoint for single object/window
4. GUI checkpoint for multiple objects
5. 
   a. Bitmap checkpoint for object/window
   b. Bitmap checkpoint for screen area
7. Database checkpoint for Default check
8. Database checkpoint for custom check
9. Database checkpoint for runtime record check
10. 
    a. Data driven test for dynamic test data submission
    b. Data driven test through flat files
    c. Data driven test through front grids
    d. Data driven test through excel test
    a. Batch testing without parameter passing
    b. Batch testing with parameter passing
11. Data driven batch
12. Silent mode test execution without any interruption
13. Test case for calculator in windows application

**TEXT BOOKS**


1. Software Testing techniques, Baris Beizer, 2nd Edition, Dreamtech.
2. Software Testing Tools, Dr. K.V.K.K.Prasad, Dreamtech.


**REFERENCE BOOKS**


1. The craft of software testing, Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World, Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing, Meyers, John Wiley.

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| **III Year - II Semester** | **0** | **0** | **2** | **1** |

## DATA VISUALIZATION TECHNIQUES LAB (Professional Elective – III)

**Course Objectives:** Course Objectives

- To Understand the concepts of scripting languages for developing web based projects
- To understand the applications the of Ruby, TCL, Perl scripting languages

**Course Outcomes:**

- Identify the different data types, visualization types to bring out the insight.
- Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on a large dataset.
- Demonstrate the analysis of a large dataset using various visualization techniques and tools.
- Identify the different attributes and showcasing them in plots. Identify and create various visualizations for geospatial and table data.
- Ability to create and interpret plots using R/Python.

**List of Experiments**

1. Acquiring and plotting data.
2. Statistical Analysis – such as Multivariate Analysis, PCA, LDA, Correlation regression and analysis of variance
3. Financial analysis using Clustering, Histogram and HeatMap
4. Time-series analysis – stock market
5. Visualization of various massive dataset - Finance - Healthcare - Census - Geospatial
6. Visualization on Streaming dataset (Stock market dataset, weather forecasting)
7. Market-Basket Data analysis-visualization
8. Text visualization using web analytics

**TEXT BOOKS:**


1. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
2. Colin Ware, "Information Visualization Perception for Design", 2nd edition, Margon Kaufmann Publishers, 2004.


**REFERENCE BOOKS:**


1. Robert Spence "Information visualization – Design for nteraction", Pearson Education, 2 nd Edition, 2007.
2. Alexandru C. Telea, "Data Visualization: Principles and Practice," A. K. Peters Ltd, 2008.

DS613PE **Vignan's Institute of Management and Technology for Women** VR24
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| **B.Tech. CSE (DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **III Year - II Semester** | **0** | **0** | **2** | **1** |

## SCRIPTING LANGUAGES LAB (Professional Elective – III)

**Course Objectives:** Course Objectives

- Understand the various types of data, apply and evaluate the principles of data visualization.
- Acquire skills to apply visualization techniques to a problem and its associated dataset.

**Course Outcomes:**

- Identify the different data types, visualization types to bring out the insight.
- Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on a large dataset.
- Demonstrate the analysis of a large dataset using various visualization techniques and tools.
- Identify the different attributes and showcasing them in plots. Identify and create various visualizations for geospatial and table data.
- Ability to create and interpret plots using R/Python.

**LIST OF EXPERIMENTS**

1. Write a Ruby script to create a new string which is n copies of a given string where n is a non-negative integer
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script which accept the users first and last name and print them in reverse order with a space between them
4. Write a Ruby script to accept a filename from the user print the extension of that
5. Write a Ruby script to find the greatest of three numbers
6. Write a Ruby script to print odd numbers from 10 to 1
7. Write a Ruby script to check two integers and return true if one of them is 20 otherwise return their sum
8. Write a Ruby script to check two temperatures and return true if one is less than 0 and the other is greater than 100
9. Write a Ruby script to print the elements of a given array
10. Write a Ruby program to retrieve the total marks where subject name and marks of a student stored in a hash
11. Write a TCL script to find the factorial of a number
12. Write a TCL script that multiplies the numbers from 1 to 10
13. Write a TCL script for sorting a list using a comparison function
14. Write a TCL script to (i) create a list (ii) append elements to the list (iii)

Traverse the list (iv) Concatenate the list

15. Write a TCL script to comparing the file modified times.
16. Write a TCL script to Copy a file and translate to native format.
17. a) Write a Perl script to find the largest number among three numbers.
    b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.
18. Write a Perl program to implement the following list of manipulating functions
    a) Shift
    b) Unshift
    c) Push
19. a) Write a Perl script to substitute a word, with another word in a string.
    b) Write a Perl script to validate IP address and email address.
20. Write a Perl script to print the file in reverse order using command line arguments

**TEXT BOOKS:**


1. The World of Scripting Languages, David Barron,Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Progammers guide by Dabve Thomas Second edition


**REFERENCE BOOKS:**


1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

**B.Tech. CSE (DS)** **L T P C**

**III Year - II Semester** **0 0 2 1**

## MOBILE APPLICATION DEVELOPMENT LAB (Professional Elective – III)

**Course Objectives:** Course Objectives

- To learn how to develop Applications in an android environment.
- To learn how to develop user interface applications.
- To learn how to develop URL related applications.

**Course Outcomes:**

- Understand the working of Android OS Practically.
- Develop user interfaces.
- Develop, deploy and maintain the Android Applications.
- Implement data storage, networking, and API integration in Android apps.
- Test, debug, and optimize Android applications for performance and usability.

**LIST OF EXPERIMENTS:**

1. Create an Android application that shows Hello + name of the user and run it on an emulator.

(b) Create an application that takes the name from a text box and shows hello message along with the name entered in the text box, when the user clicks the OK button.

2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Datepicker), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on the right fragment instead of the second screen with the back button. Use Fragment transactions and Rotation event listeners.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store usernames and passwords (tab separated fields and one record per line). When the user submits a login name

and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with a Login Failed message.

7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.

**TEXT BOOKS:**


1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage, 2013.


**REFERENCE BOOKS:**


1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

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| **B.Tech. CSE (DS)** | **L** | **T** | **P** | **C** |
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| **III Year - II Semester** | **0** | **0** | **2** | **1** |

## CRYPTOGRAPHY AND NETWORK SECURITY LAB (Professional Elective – III)

**Course Objectives:** Course Objectives

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.

**Course Outcomes:**

- Understand basic cryptographic algorithms, message and web authentication and security issues.
- Identify information system requirements for both of them such as client and server.
- Understand the current legal issues towards information security.
- Apply cryptographic algorithms and security protocols to secure data and communications.
- Analyze security threats and implement appropriate countermeasures in information systems.

**List of Experiments:**

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and display the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms

a. Ceaser cipher b. Substitution cipher c. Hill Cipher

4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement the RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA

**TEXT BOOKS:**

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, McGraw Hill, 3rd Edition

**REFERENCE BOOKS:**


1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, McGraw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
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| **III Year - II Semester** | **0** | **0** | **4** | **2** |

## UI Design - Flutter Lab

**Course Objectives:**

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widges and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

**Course Outcomes:**

- Implements Flutter Widgets and Layouts
- Responsive UI Design and with Navigation in Flutter
- Create custom widgets for specific UI elements and also Apply styling using themes and custom styles.
- Design a form with various input fields, along with validation and error handling
- Fetches data and write code for unit Test for UI components and also animation

**List of Experiments:** Students need to implement the following experiments

2. a. Install Flutter and Dart SDK.
   b. Write a simple Dart program to understand the language basics.
2. a. Explore various Flutter widgets (Text, Image, Container, etc.).
   b. Implement different layout structures using Row, Column, and Stack widgets.
3. a. Design a responsive UI that adapts to different screen sizes.
   b. Implement media queries and breakpoints for responsiveness.
4. a. Set up navigation between different screens using Navigator.
   b. Implement navigation with named routes.
5. a. Learn about stateful and stateless widgets.
   b. Implement state management using set State and Provider.
6. a. Create custom widgets for specific UI elements.
   b. Apply styling using themes and custom styles.
7. a. Design a form with various input fields.
   b. Implement form validation and error handling.
8. a. Add animations to UI elements using Flutter's animation framework.
   b. Experiment with different types of animations (fade, slide, etc.).
9. a. Fetch data from a REST API.
   b. Display the fetched data in a meaningful way in the UI.
10. a. Write unit tests for UI components.

b. Use Flutter's debugging tools to identify and fix issues.

**TEXT BOOK:**

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
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| **III Year - II Semester** | **3** | **0** | **0** | **0** |

## ENVIRONMENTAL SCIENCE

**(Common for ECE, CSE, IT, CSE(AI&ML), CSE(DS))**

**Course Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

**Course Outcomes:**

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

**UNIT - I**

**Ecosystems:** Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT - II**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

**UNIT - III**

**Biodiversity and Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT - IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

**UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

**TEXT BOOKS:**


1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCE BOOKS:**


1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

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| **IV Year - I Semester** | **3** | **0** | **0** | **3** |

## PREDICTIVE ANALYTICS

**Course Objectives:**

- To understand the end-to-end predictive analytics lifecycle
- To develop data preparation and preprocessing skills
- To build and evaluate predictive models using machine learning techniques
- To interpret and communicate predictive insights for decision-making
- To apply ethical and responsible practices in predictive analytics

**Course Outcomes:**

- Understand the complete processing steps involved in predictive analytics
- Develop the ability to construct, evaluate, and deploy predictive models responsibly
- Gain knowledge of machine learning, data mining, and ensemble techniques for prediction
- Apply predictive analytics techniques to real-world problem scenarios
- Perform data preprocessing and feature engineering for effective predictive modeling

**UNIT - I**

Introduction –types of analytics, applications of predictive analytics, overview of predictive analytics. Setting up the problem - processing steps, business understanding, objectives, data for predictive modeling, columns as measures, target variables, measures of success for predictive models.

**UNIT – II**

Prediction effect, deployment of prediction model, ethics and responsibilities The Data effect

**UNIT – III**

**Machine Learning for prediction**

Predictive modeling – decision trees, logistic regression, neural network, kNN, Bayesian method,

**Regression model**

Assessing Predictive models - Batch Approach to Model Assessment, Percent Correct Classification, Rank-Ordered Approach to Model Assessment, Assessing Regression Models

**UNIT – IV: Ensemble effect**

Model ensembles - motivation, wisdom of crowds, Bagging, Boosting, Random forests, stochastic gradient boosting, heterogeneous ensembles.

**UNIT - V**

Case studies: Survey analysis, question answering– challenges in text mining, persuasion by the numbers

**TEXT BOOKS:**


1. Eric Siegel, Predictive analytics- the power to predict who will Click, buy, lie, or die, John Wiley & Sons, 2013.
2. Dean Abbott, Applied Predictive Analytics - Principles and Techniques for the Professional Data Analyst, 2014. B.A. Forouzan and R.F. Gilberg, C Programming and Data Structures, Cengage Learning, (3rd Edition)


**REFERENCE BOOKS:**


1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning-Data Mining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.
2. G. James, D. Witten, T. Hastie, R. Tibshirani-An introduction to statistical learning with applications in R, Springer, 2013.
3. E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2010.

DS702PC **Vignan's Institute of Management and Technology for Women** VR24

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
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| **IV Year - I Semester** | **3** | **0** | **0** | **3** |

## WEB AND SOCIAL MEDIA ANALYTICS

**Course Objectives:**

- Exposure to various web and social media analytic techniques. To understand the various steps in program development.
- To provide exposure to web, text, and social media analytics techniques.
- To understand business intelligence and decision support systems for effective decision-making
- To learn text mining, natural language processing, and sentiment analysis concepts
- To explore web analytics, social network analysis, and prescriptive analytics for business insights

**Course Outcomes:**

- Understand the fundamentals of decision support systems
- Apply natural language processing techniques for text analytics
- Analyze and interpret sentiments from textual data
- Use web analytics and search engine optimization techniques
- Apply social media and social network analytics for decision-making

**UNIT - I**

**An Overview of Business Intelligence, Analytics, and Decision Support**

Analytics to Manage a Vaccine Supply Chain Effectively and Safely, Changing Business Environments and Computerized Decision Support, Information Systems Support for Decision Making, The Concept of Decision Support Systems (DSS), Business Analytics Overview, Brief Introduction to Big Data Analytics

**UNIT - II**

**Text Analytics and Text Mining**

Machine Versus Men on Jeopardy: The Story of Watson, Text Analytics and Text Mining Concepts and Definitions, Natural Language Processing, Text Mining Applications, Text Mining Process, Text Mining Tools

**UNIT – III**

**Sentiment Analysis**

Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis and Speech Analytics

**UNIT – IV**

**Web Analytics, Web Mining**

Security First Insurance Deepens Connection with Policyholders, Web Mining Overview, Web Content and Web Structure Mining, Search Engines, Search Engine Optimization, Web Usage Mining (Web Analytics), Web Analytics Maturity Model and

Web Analytics Tools.

**UNIT – V**

**Social Analytics and Social Network**

Analysis Social Analytics and Social Network Analysis, Social Media Definitions and Concepts, Social Media Analytics

**Prescriptive Analytics - Optimization and Multi-Criteria Systems**:

Multiple Goals, Sensitivity Analysis, What-If Analysis, and Goal Seeking

**Text Books:**


1. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics: Systems for Decision Support, Pearson Education


**Reference Books:**


1. Rajiv Sabherwal, Irma Becerra- Fernandez," Business Intelligence– Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss, ShakuAtre, "Business Intelligence Roadmap", Addison-Wesley It Service.
3. Yuli Vasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).

DS741PE **Vignan's Institute of Management and Technology for Women** VR24

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year - I Semester** | **3** | **0** | **0** | **3** |

## QUANTUM COMPUTING (Professional Elective – IV)

**Course Objectives:**

- To introduce the fundamentals of quantum computing
- The problem-solving approach using finite dimensional mathematics
- To develop an understanding of the mathematical and physical foundations underlying quantum computing
- To design and analyze quantum circuits using quantum gates and qubits
- To explore quantum error correction and quantum communication techniques

**Course Outcomes:**

- Understand basics of quantum computing
- Understand physical implementation of Qubit
- Understand Quantum algorithms and their implementation
- Understand The Impact of Quantum Computing on Cryptography Apply social media and social network analytics for decision-making
- Analyze the security implications of quantum computing**.**

**UNIT - I**

**History of Quantum Computing:** Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

**UNIT - II**

**Background Mathematics:** Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

**UNIT – III**

**Qubit:** Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

**UNIT – IV**

**Quantum Algorithms:** Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

**UNIT – V**

**Noise and error correction:** Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum

teleportation.

**Text Books:**

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge.

**Reference Books:**

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II.
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
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| **IV Year - I Semester** | **3** | **0** | **0** | **3** |

## DATABASE SECURITY (Professional Elective – IV)

**Course Objectives:**

- To learn the security of databases
- To learn the design techniques of database security
- To learn the security software design
- To learn the security of databases
- To learn the design techniques of database security
- Course Outcomes:
- Identify database security problems
- Implement different security models
- Provide security for software design
- Protect object-oriented systems
- Handle security issues for active databases

**UNIT - I**

**Introduction:** Introduction to Databases Security, Problems in Databases Security, Controls, Conclusions

**Security Models -1:** Introduction Access Matrix Model, Take-Grant Model, Acten Model, PN Model.

**UNIT - II**

**Security Models -2:** Hartson and Hsiao's Model, Fernandez's Model, Bussolati and Martella's Model for Distributed databases, Bell and LaPadula's Model, Biba's Model, Dion's Model, Sea View Model, Jajodia and Sandhu's Model, The Lattice Model for the Flow Control.

**UNIT – III**

**Security Mechanisms:** Introduction User Identification/Authentication, Memory Protection, Resource Protection, Control Flow Mechanisms, Isolation Security Functionalities in Some Operating Systems Trusted Computer System Evaluation Criteria

**Security Software Design:** Introduction A Methodological Approach to Security Software Design Secure Operating System Design Secure DBMS Design Security Packages Database Security Design

**UNIT – IV**

**Statistical Database Protection & Intrusion Detection Systems:** Introduction Statistics Concepts and Definitions Types of Attacks Inference Controls Evaluation Criteria for Control Comparison. Introduction IDES System RETISS System ASES System Discovery.

**UNIT – V**

**Models For the Protection of New Generation Database Systems**: Introduction A Model for the Protection of Frame Based Systems A Model for the Protection of Object-Oriented Systems SORION Model for the Protection of Object-Oriented Databases, The Orion Model, Jajodia and Kogan's ModelA Model for the Protection of Active Databases Conclusions

**Text Books:**

1. Database Security by Castano Pearson Edition (1/e).

**Reference Books:**

1. Database security by alfred basta, melissa zgola, CENGAGE learning.
2. Database Security and Auditing: Protecting Data Integrity and Accessibility, 1st Edition, Hassan Afyouni, THOMSON Edition.

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| **IV Year - I Semester** | **3** | **0** | **0** | **3** |

## NATURAL LANGUAGE PROCESSING (Professional Elective – IV)

**Course Objectives:**

- Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.
- Introduce problems and solutions in NLP
- Understand linguistics and statistical foundations of NLP
- Learn morphological, syntactic, and semantic analysis
- Study language modeling techniques

**Course Outcomes:**

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms; and design different language modeling Techniques.Analyze the security implications of quantum computing**.**
- Apply NLP techniques to analyze and process natural language data**.**

**UNIT - I**

**Finding the Structure of Words:** Words and Their Components, Issues and Challenges, Morphological Models.

**Finding the Structure of Documents:** Introduction, Methods, Complexity of the Approaches, Performances of the Approaches, Features

**UNIT - II**

**Syntax I:** Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms

**UNIT – III**

**Syntax II:** Models for Ambiguity Resolution in Parsing, Multilingual Issues

**Semantic Parsing I:** Introduction, Semantic Interpretation, System Paradigms, Word Sense

**UNIT – IV**

**Semantic Parsing II:** Predicate-Argument Structure, Meaning Representation Systems

**UNIT – V**

**Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Bayesian parameter estimation, Language Model Adaptation, Language Models- class

based, variable length, Bayesian topic based, Multilingual and Cross Lingual Language Modeling.

**Text Books:**

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication

**Reference Books:**


1. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

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| **B.Tech. CSE(DS)** | **L** | **T** | **P** | **C** |
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| **IV Year - I Semester** | **3** | **0** | **0** | **3** |

## INFORMATION STORAGE MANAGEMENT (Professional Elective – IV)

**Course Objectives:**

- To understand various segments of storage technology and architectures
- To explore the inherent power of information
- To describe the different backup, recovery and replication strategies
- Understand storage technologies and architectures
- Learn backup, recovery, and replication methods

**Course Outcomes:**

- Understand the evolution of storage technology and Intelligent Storage Systems
- Explore the key concepts of various Storage Networking Technologies - DAS, SANs, NAS and CAS
- Understand the basics of Storage Virtualization
- Understand the concepts of Storage security and Storage Infrastructure Management
- Analyze the purpose of backup, recovery and replication Strategies

**UNIT - I**

**Introduction to Information Storage and Management:** Information Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle. Storage System Environment - Data Protection: RAID - Intelligent Storage System

**UNIT - II**

**Direct-Attached Storage and Introduction to SCSI**

Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, SCSI Command Model

**Storage Area Networks**

Fibre Channel: Overview, The SAN and Its Evolution, Components of SAN, FC Connectivity, Fibre Channel Ports, Fibre Channel Architecture, Zoning, Fibre Channel Login Types, FC Topologies, Concepts in Practice: EMC Connectrix

**Network-Attached Storage**

General-Purpose Servers vs. NAS Devices, Benefits of NAS, NAS File I/O, Components of NAS, NAS Implementations, NAS File-Sharing Protocols, NAS I/O Operations, Factors Affecting NAS Performance and Availability, Concepts in Practice: EMC Celerra

**UNIT – III**

**Content-Addressed Storage**

Fixed Content and Archives, Types of Archives, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, CAS Examples, Concepts in Practice: EMC Centera Storage Virtualization Forms of Virtualization, SNIA Storage

Virtualization Taxonomy

**Storage Virtualization** Configurations, Storage Virtualization Challenges, Types of Storage Virtualization, Concepts in Practice

**UNIT – IV**

Backup and Recovery Backup

Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Process, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Technologies, Concepts in Practice: EMC NetWorker

**Local Replication**

Local Replication, Source and Target, Uses of Local Replicas, Data Consistency, Local Replication Technologies, Restore and Restart Considerations, Creating Multiple Replicas, Management Interface, Concepts in Practice: EMC TimeFinder and EMC SnapView

**Remote Replication**

Modes of Remote Replication, Remote Replication Technologies, Network Infrastructure, Concepts in Practice: EMC SRDF, EMC SAN Copy, and EMC MirrorView

**UNIT – V**

**Securing the Storage Infrastructure**

Storage Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking

**Managing the Storage Infrastructure**

Monitoring the Storage Infrastructure, Storage Management Activities, Storage Infrastructure Management Challenges, Developing an Ideal Solution, Concepts in Practice: EMC Control Center

**Text Books:**


1. Marc Farley Osborne, “Building Storage Networks", Tata McGraw Hill, 2001.
2. Robert Spalding and Robert Spalding, “Storage Networks: The Complete Reference”, Tata McGraw Hill, 2003.
3. Meeta Gupta, “Storage Area Network Fundamentals”, Pearson Education Ltd., 2002.


**Reference Books:**


1. Gerald J Kowalski and Mark T Maybury,” Information Storage Retrieval Systems theory & Implementation”, BS Publications, 2000.
2. Thejendra BS, “Disaster Recovery & Business continuity”, Shroff Publishers & Distributors, 2006.

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| **IV Year - I Semester** | **3** | **0** | **0** | **3** |

## INTERNET OF THINGS (Professional Elective – IV)

**Course Objectives:**

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

**Course Outcomes:**

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Identify the applications of IoT in Industry.
- Understand the applications and impact of IoT in real-world scenarios**.**

**UNIT - I**

**Introduction to Internet of Things** –Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Deployment Templates

**Domain Specific IoTs** – Home automation, Environment, Agriculture, Health and Lifestyle

**UNIT - II**

**IoT and M2M** – M2M, Difference between IoT and M2M, SDN and NFV for IoT

**IoT System Management with NETCOZF, YANG**- Need for IoT system Management, Simple Network management protocol, Network operator requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG

**UNIT – III**

**IoT Systems – Logical design using Python**-Introduction to Python – Python Data types & Data structures, Control flow, Functions, Modules, Packaging, File handling, Data/Time operations, Classes, Exception, Python packages of Interest for IoT

**UNIT – IV**

**IoT Physical Devices and Endpoints** - Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry PI with Python, Other IoT devices.

**IoT Physical Servers and Cloud Offerings** – Introduction to Cloud Storage models and communication APIs, WAMP-AutoBahn for IoT, Xively Cloud for IoT, Python web application framework –Django, Designing a RESTful web API.

**UNIT – V**

**Case studies-** Home Automation, Environment-weather monitoring-weather reporting-air pollution monitoring, Agriculture.

**Text Books:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.

**Reference Books:**

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

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| **IV Year - I Semester** | **3** | **0** | **0** | **3** |

## PRIVACY PRESERVING DATA PUBLISHING (Professional Elective – V)

**Course Objectives:**

- The aim of the course is to introduce the fundamentals of Privacy Preserving Data Mining Methods
- The course gives an overview of - Anonymity and its Measures, Multiplicative Perturbation for Privacy-Preserving Data Mining, techniques for Utility-based Privacy Preserving Data
- Understand the fundamentals of privacy-preserving data mining
- Learn data anonymization and anonymity measures
- Explore multiplicative perturbation and utility-based privacy techniques

**Course Outcomes:**

- Understand the concepts of Privacy Preserving Data Mining Models and Algorithms
- Demonstrate a comprehensive understanding of different tasks associated in Inference Control Methods for Privacy-Preserving Data Mining
- Understand the concepts of Data Anonymization Methods and its Measures
- Evaluate and Appraise the solution designed for Multiplicative Perturbation
- Formulate, Design and Implement the solutions for Utility-based Privacy Preserving Data

**UNIT - I**

Introduction, Privacy-Preserving Data Mining Algorithms, The Randomization Method, Group Based Anonymization, Distributed Privacy-Preserving Data Mining

**UNIT - II**

**Interface Control Methods**

Introduction, A Classification of Microdata Protection Methods, Perturbative Masking Methods, Non Perturbative Masking Methods, Synthetic Microdata Generation, Trading off Information Loss and Disclosure Risk.

**UNIT – III**

**Measure of Anonymity**

Data Anonymization Methods, A Classification of Methods, Statistical Measure of Anonymous, Probabilistic Measure of Anonymity, Computational Measure of Anonymity, reconstruction Methods for Randomization, Application of Randomization

**UNIT – IV**

**Multiplicative Perturbation**

Definition of Multiplicative Perturbation, Transformation Invariant Data Mining Models, Privacy Evaluation for Multiplicative Perturbation, Attack Resilient Multiplicative Perturbation, Metrics for Quantifying Privacy Level, Metrics for

Quantifying Hiding Failure, Metrics for Quantifying Data Quality.

**UNIT – V**

**Utility-Based Privacy-Preserving Data**

Types of Utility-Based Privacy Preserving Methods, Utility-Based Anonymization Using Local Recording, The Utility-Based Privacy Preserving Methods in Classification Problems, Anonymization Merginal: Injection Utility into Anonymization Data Sets.

**Text Books:**

1. Privacy – Preserving Data Mining: Models and Algorithms Edited by Charu C. Aggarwal and S. Yu, Springer

**Reference Books:**

1. Charu C. Agarwal, Data Mining: The Textbook, 1st Edition, Springer.
2. Han and M. Kamber, Data Mining: Concepts and Techniques, 3rd Edition, Elsevier
3. Privacy Preserving Data Mining by Jaideep Vaidya, Yu Michael Zhu and Chirstopher W. Clifton, Springer.

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| **IV Year - I Semester** | **3** | **0** | **0** | **3** |

## CLOUD COMPUTING (Professional Elective – V)

**Course Objectives:**

- This course provides an insight into cloud computing.
- Topics covered include- Cloud Computing Architecture, Deployment Models, Service Models, Technological Drivers for Cloud Computing, Networking for Cloud Computing and Security in Cloud Computing.
- To provide an insight into cloud computing concepts and architecture
- To learn about cloud deployment models, service models, and enabling technologies
- To understand cloud security, networking, and programming models

**Course Outcomes:**

- Understand different computing paradigms and potential of the paradigms and specifically cloud computing
- Understand cloud service types, cloud deployment models and technologies supporting and driving the cloud
- Acquire the knowledge of programming models for cloud and development of software application that runs the cloud and various services available from major cloud providers
- Understand the security concerns and issues in cloud computing
- Acquire the knowledge of advances in cloud computing.

**UNIT - I**

Computing Paradigms, Cloud Computing Fundamentals, Cloud Computing Architecture and Management

**UNIT - II**

**Cloud Deployment Models, Cloud Service Models, Technological Drivers for Cloud Computing:** SOA and Cloud, Multicore Technology, Web 2.0 and Web 3.0, Pervasive Computing, Operating System, Application Environment

**UNIT – III**

**Virtualization, Programming Models for Cloud Computing:** MapReduce, Cloud Haskell, Software Development in Cloud

**UNIT – IV**

**Networking for Cloud Computing:** Introduction, Overview of Data Center Environment, Networking Issues in Data Centers, Transport Layer Issues in DCNs, Cloud Service Providers

**UNIT – V**

Security in Cloud Computing, and Advanced Concepts in Cloud Computing.

**Text Books:**

1. Chandrasekaran, K. Essentials of cloud computing. CRC Press, 2014

**Reference Books:**

1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
2. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010
3. 3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

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## DATA SCIENCE APPLICATIONS (Professional Elective – V)

**Course Objectives:**

- To give deep knowledge of data science and how it can be applied in various fields to make life easy
- Understand the fundamentals of data science
- Learn **a**pplications of data science in various domains
- Explore tools and techniques used by data scientists
- Apply data science methods to real-world case studies

**Course Outcomes:**

- Correlate data science and solutions to modern problems.
- Decide when to use which type of technique in data science.
- Correlate data science techniques with real-world problems
- Decide appropriate methods and tools for specific data science tasks
- Apply data science approaches to analyze and optimize data in various domains

**UNIT - I**

Data Science Applications in various domains, Challenges and opportunities, tools for data scientists Recommender systems – Introduction, methods, application, challenges.

**UNIT - II**

Time series data – stock market index movement forecasting. Supply Chain Management – Real world case study in logistics

**UNIT – III**

Data Science in Education, social media

**UNIT – IV**

Data Science in Healthcare, Bioinformatics

**UNIT – V**

Case studies in data optimization using Python.

**Text Books:**


1. Aakanksha Sharaff, G.K. Sinha, "Data Science and its applications ", CRC Press, 2021.
2. Q.A. Menon, S.A. Khoja, "Data Science: Theory, Analysis and Applications", CRC Press, 2020

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## MINING MASSIVE DATASETS (Professional Elective – V)

**Course Objectives:**

- This course will cover practical algorithms for solving key problems in mining of massive datasets.
- This course focuses on parallel algorithmic techniques that are used for large datasets.
- This course will cover stream processing algorithms for data streams that arrive constantly, page ranking algorithms for web search, and online advertisement systems that are studied in detail.
- Learn practical algorithms for mining massive datasets.
- Understand parallel and stream processing techniques for large-scale data

**Course Outcomes:**

- Handle massive data using MapReduce.
- Develop and implement algorithms for massive data sets and methodologies in the context of data mining.
- Understand the algorithms for extracting models and information from large datasets
- Develop recommendation systems.
- Gain experience in matching various algorithms for particular classes of problems.

**UNIT - I**

**Data Mining**-Introduction-Definition of Data Mining-Statistical Limits on Data Mining **MapReduce and the New Software Stack**-Distributed File Systems, MapReduce, Algorithms Using MapReduce.

**UNIT - II**

**Similarity Search:** Finding Similar Items-Applications of Near-Neighbor Search, Shingling of Documents, Similarity-Preserving Summaries of Sets, Distance Measures.

**Streaming Data:** Mining Data Streams-The Stream Data Model , Sampling Data in a Stream, Filtering Streams

**UNIT – III**

**Link Analysis**-PageRank, Efficient Computation of PageRank, Link Spam

**Frequent Itemsets**-Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, Counting Frequent Items in a Stream.

**Clustering**-The CURE Algorithm, Clustering in Non-Euclidean Spaces, Clustering for Streams and Parallelism

**UNIT – IV**

**Advertising on the Web-Issues** in On-Line Advertising, On-Line Algorithms, The Matching Problem, The Adwords Problem, Adwords Implementation. **Recommendation Systems**-A Model for Recommendation Systems, Content-Based

Recommendations, Collaborative Filtering, Dimensionality Reduction, The NetFlix Challenge.

**UNIT – V**

**Mining Social-Network Graphs**-Social Networks as Graphs, Clustering of Social-Network Graphs, Partitioning of Graphs, Simrank, Counting Triangles

**Text Books:**

1. Jure Leskovec, Anand Rajaraman, Jeff Ullman, Mining of Massive Datasets, 3rd Edition.

**Reference Books:**

1. Jiawei Han & Micheline Kamber, Data Mining – Concepts and Techniques 3rd Edition Elsevier.
2. Margaret H Dunham, Data Mining Introductory and Advanced topics, PEA.
3. 3. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann.

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## EXPLORATORY DATA ANALYSIS (Professional Elective – V)

**Course Objectives:**

- Analysis of data, exploring various models in exploratory data analysis, question answering and predictive analysis
- Analyze data using the Epicycle of Analysis process
- Explore and refine data-related questions effectively
- Conduct Exploratory Data Analysis (EDA**)** for insights
- Apply formal modeling techniques for prediction and inference

**Course Outcomes:**

- Apply the Epicycle of Analysis process effectively.
- Articulate and refine data-related questions using the Epicycle approach.
- Perform systematic data exploration, validation, and visualization to understand data characteristics.
- Develop the skills necessary to use formal modeling techniques for data inference.
- Apply data analysis and modeling techniques to extract meaningful insights**.**

**UNIT - I**

Epicycles of Analysis: Setting the Scene, Epicycle of Analysis, Setting Expectations, Collecting Information, Comparing Expectations to Data, Applying the Epicycle of Analysis process.

**UNIT - II**

Stating and Refining the Question: Types of Questions, Applying the Epicycle to stating and Refining Your Question, Characteristics of good Question, Translating a Question into a Data Problem, Case Study.

**UNIT – III**

Exploratory Data Analysis: Formulate your question, read in your data, Checking Packaging, look at the top and bottom of the data, always be checking, validate with at least one External Source, make a plot, Try the Easy Solution First.

**UNIT – IV**

Using Models to Explore your data: Models as Expectations, Reacting to Data Refining Our Expectations, Examining Linear Relationships, Stopping Criteria. Inference: Identify the population, Describe the sampling process, Describe the Model for the population, Factors Affecting the Quality of Inference, Case Study.

**UNIT – V**

Formal Modeling: Goals of Formal Modeling, General Frame work, Associational Analysis, Prediction Analysis, and Summary

**Text Books:**

1. "The Art of Data Science: A Guide for Anyone Who Works with Data" by Roger D. Peng and Elizabeth Matsui.

**Reference Books:**

1. “Exploratory Data Analytics “by John Tukey.
2. “Python for Data Analysis “by Wes McKinney

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| **IV Year - I Semester** | **3** | **0** | **0** | **3** |

## DATA MINING (Open Elective – II)

**Course Objectives:**

- Students will become acquainted with both the strengths and limitations of various data mining techniques like Association, Classification, Cluster and Outlier analysis.
- To introduce fundamental concepts, processes, and issues involved in data mining and knowledge discovery.
- To familiarize students with data preprocessing techniques such as cleaning, integration, transformation, and reduction.
- To provide in-depth knowledge of core data mining techniques including association, classification, clustering, and outlier analysis.
- To expose learners to advanced data mining applications such as web, spatial, and temporal data mining

**Course Outcomes:**

- Understand the need of data mining and pre-processing techniques.
- Perform market basket analysis using association rule mining.
- Utilize classification techniques for analysis and interpretation of data.
- Identify appropriate clustering and outlier detection techniques to handle complex data.
- Understand the mining of data from web, text and time series data.

**UNIT - I Introduction** –

**Introduction to Data Mining:** What Data mining? Kinds of Data, Knowledge Discovery process, Data Mining Functionalities, Kinds of Patterns, Major Issues in Data Mining. Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity, Data Pre-processing: Major Tasks in Data Pre-processing, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

**UNIT – II**

**Association Analysis:** Basic Concepts, Market Basket Analysis, Apriori Algorithm, FP-growth, From Association Analysis to Correlation Analysis, Pattern Mining in Multilevel Associations and Multidimensional Associations

**UNIT – III**

**Classification:** Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Ensemble Methods, Multilayer FeedForward Neural Network, Support Vector Machines, k-Nearest-Neighbor Classifiers.

**UNIT – IV**

**Cluster Analysis:** Requirements for Cluster Analysis, Overview of Basic Clustering Methods, Partitioning Methods-k-Means, k-Medoids, Hierarchical Methods-AGENES,

DIANA, BIRCH, DensityBased Method-DBSCAN, Outlier Analysis: Types of Outliers, Challenges of Outlier Detection, and Overview of Outlier Detection Methods.

**UNIT - V**

**Advanced Concepts:** Web Mining- Web Content Mining, Web Structure Mining, Web Usage Mining, Spatial Mining- Spatial Data Overview, Spatial Data Mining Primitives, Spatial Rules, Spatial Classification Algorithm, Spatial Clustering Algorithms, Temporal Mining- Modeling Temporal Events, Time Series, Pattern Detection, Sequences, Temporal Association Rules.

**TEXT BOOKS:**


1. Jiawei Han, Micheline Kamber, Jian Pei., Data Mining: Concepts and Techniques, 3rd Edition, Morgan Kaufmann/Elsevier, 2012.
2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, 2nd Edition, Pearson Education, India, 2006.


**REFERENCE BOOKS:**


1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne and Vipin Kumar, Introduction to Data Mining, 2nd Edition, Pearson Education India, 2021.
3. Amitesh Sinha, Data Warehousing, Thomson Learning, India, 2007.

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| **IV Year - I Semester** | **3** | **0** | **0** | **3** |

## DATA ANALYTICS (Open Elective – II)

**Course Objectives:**

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.
- To develop a strong foundation in data analytics by applying statistical, modeling, and visualization techniques to support effective business decision-making.

**Course Outcomes:**

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

**UNIT - I Introduction** –

**Data Management:** Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

**UNIT – II**

**Data Analytics:** Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and Variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

**UNIT – III**

**Regression** – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

**Logistic Regression:** Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

**UNIT – IV**

**Object Segmentation:** Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc.

**Time Series Methods:** Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction.

**UNIT - V**

**Data Visualization:** Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

**TEXT BOOKS:**

1. Student's Handbook for Associate Analytics – II, III. 2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, 2nd Edition, Pearson Education, India, 2006.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

**REFERENCE BOOKS:**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

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## PREDICTIVE ANALYTICS LAB

**Course Objectives:**

- To learn the basics and applications of predictive analytics using different techniques
- To introduce the Epicycle of Analysis framework for structured data-driven problem solving.
- To enable students to formulate, refine, and translate real-world questions into data problems.
- To develop proficiency in data exploration, validation, and visualization techniques.
- To provide foundational knowledge of modeling and inference methods for extracting meaningful insights from data

**Course Outcomes:**

- Understand the processing steps for predictive analytics
- Construct and deploy prediction models with integrity
- Explore various techniques (machine learning/data mining, ensemble) for predictive analytics.
- Apply predictive analytics to real world examples.
- Extract meaningful insights from data to support informed decision-making

**List of Experiments:**

Following experiments to be carried out using Python/SPSS/SAS/R/Power BI

1. Simple Linear regression
2. Multiple Linear regression
3. Logistic Regression
4. CHAID
5. CART
6. ARIMA – stock market data
7. Exponential Smoothing
8. Hierarchical clustering
9. Ward's method of clustering
10. Crowdsource predictive analytics- Netflix data

**TEXT BOOKS:**


1. Eric Eric Siegel, Predictive analytics- the power to predict who will Click, buy, lie, or die, John Wiley & Sons, 2013.
2. Dean Abbott, Applied Predictive Analytics - Principles and Techniques for the Professional Data Analyst, 2014.

**REFERENCE BOOKS:**


1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning-Data Mining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.
2. G. James, D. Witten, T. Hastie, R. Tibshirani-An introduction to statistical learning with applications in R, Springer, 2013
3. E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2010

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## WEB AND SOCIAL MEDIA ANALYTICS LAB

**Course Objectives:**

- Exposure to various web and social media analytic techniques.
- To provide exposure to web and social media analytics techniques for analyzing online data.
- To develop an understanding of text analytics using natural language processing concepts.
- To enable learners to perform sentiment analysis on customer and social media data.
- To familiarize students with web analytics, search engine optimization, and decision support systems

**Course Outcomes:**

- Knowledge on decision support systems
- Apply natural language processing concepts on text analytics
- Understand sentiment analysis
- Knowledge on search engine optimization and web analytics Extract meaningful insights from data to support informed decision-making
- Apply web, text, and social media analytics techniques to analyze online data and support decision-making

**List of Experiments:**

1. Preprocessing text document using NLTK of Python
    a. Stopword elimination
    b. Stemming
    c. Lemmatization
    d. POS tagging
    e. Lexical analysis
2. Sentiment analysis on customer review on products
3. Web analytics
    a. Web usage data (web server log data, clickstream analysis)
    b. Hyperlink data
4. Search engine optimization- implement spamdexing
5. Use Google analytics tools to implement the following
    a. Conversion Statistics
    b. Visitor Profiles
6. Use Google analytics tools to implement the Traffic Sources.

**TEXT BOOKS:**

1. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics Systems for Decision Support, Pearson Education**.**

**REFERENCE BOOKS:**

1. Rajiv Sabherwal, Irma Becerra-Fernandez, "Business Intelligence–Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss, Shaku Atre, "Business Intelligence Roadmap", Addison-Wesley It Service.
3. Yuli Vasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

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| **IV Year - II Semester** | **3** | **0** | **0** | **3** |

## ORGANIZATIONAL BEHAVIOUR

**Course Objectives:**

- This course demonstrates individual, group behavior aspects: The dynamics of organizational climate, structure and its impact on Organizations.

**Course Outcomes:** The student will learn

- Understand the basic concepts, models, and importance of Organizational Behaviour.
- Identify and explain individual behaviour factors such as personality, perception, attitudes, emotions, and motivation.
- Understand group behaviour, group dynamics, communication, and team building in organizations.
- Explain leadership styles, leadership theories, and sources of power in organizations.
- Understand organizational culture, change, stress, and their impact on organizational effectiveness.

**UNIT - I**: **Organizational Behaviour:**

Definition, need and importance of organizational behaviour – Nature and scope – Frame work –Organizational behaviour models.

**UNIT - II: Individual Behaviour**:

Personality – types – Factors influencing personality – Theories – Learning – Types of learners – The learning process – Learning theories – Organizational behaviour modification, Misbehaviour – Types – Management Intervention. Emotions - Emotional Labour – Emotional Intelligence – Theories. Attitudes – Characteristics – Components – Formation – Measurement- Values. Perceptions – Importance – Factors influencing perception – Interpersonal perception- Impression Management. Motivation – importance – Types – Effects on work behavior.

**UNIT - III**: **Group Behaviour**:

Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Team building - Interpersonal relations – Communication – Control.

**UNIT - IV**: **Leadership and Power**:

Meaning – Importance – Leadership styles – Theories of leadership – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

**UNIT - V**: **Dynamics of Organizational Behaviour**:

Organizational culture and climate – Factors affecting organizational climate – Importance. Job satisfaction – Determinants – Measurements – Influence on behavior. Organizational change – Importance – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change. Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life.

Organizational development – Characteristics – objectives –. Organizational effectiveness.

**Text Books:**


1. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.
2. Fred Luthans, Organisational Behavior, McGraw Hill, 11th Edition, 2001.


**Reference Books:**


1. Schermerhorn, Hunt and Osborn, Organisational behavior, John Wiley, 9th Edition, 2008.
2. Udai Pareek, Understanding Organisational Behaviour, 2nd Edition, Oxford Higher Education, 2004.

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| **B.Tech. CSE (DS)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year - II Semester** | **3** | **0** | **0** | **3** |

**DATA STREAM MINING (Professional Elective – VI)**

**Course Objectives:**

- The aim of the course is to introduce the fundamentals of Data Stream Mining.
- The course gives an overview of – Mining Strategies, methods and algorithms for data stream mining.

**Course Outcomes:** The student will learn

- Understand how to formulate a knowledge extraction problem from data streams.
- Ability to apply methods / algorithms to new data stream analysis problems.
- Evaluate the results and understand the functioning of the methods studied.
- Demonstrate decision tree and adaptive Hoeffding Tree concepts

**UNIT - I**:

MOA Stream Mining, Assumptions, Requirements, Mining Strategies, Change Detection Strategies, MOA Experimental Settings, Previous Evaluation Practices, Evaluation Procedures for Data Streams, Testing Framework, Environments, Data Sources, Generation Speed and Data Size, Evolving Stream Experimental Setting.

**UNIT - II:**

Hoeffding Trees, The Hoeffding Bound for Tree Induction, The Basic Algorithm, Memory Management, Numeric Attributes, Batch Setting Approaches, Data Stream Approaches.

**UNIT - III**:

Prediction Strategies, Majority Class, Naïve Bayes Leaves, Adaptive Hybrid, Hoeffding Tree Ensembles, Data Stream Setting, Realistic Ensemble Sizes.

**UNIT - IV**:

Evolving Data Streams, Algorithms for Mining with Change, A Methodology for Adaptive Stream Mining, Optimal Change Detector and Predictor, Adaptive Sliding Windows, Introduction, Maintaining Updated Windows of Varying Length.

**UNIT - V**:

Adaptive Hoeffding Trees, Introduction, Decision Trees on Sliding Windows, Hoeffding Adaptive Trees, Adaptive Ensemble Methods, New methods of Bagging using trees of different size, New method of bagging using ADWIN, Adaptive Hoeffding Option Trees, Method performance.

**Text Books:**

1. DATA STREAM MINING: A Practical Approach by Albert Bifet and Richard Kirkby.

**Reference Books:**

1. Knowledge discovery from data streams by Gama João. ISBN: 978-1-4398-2611-9
2. Machine Learning for Data Streams by Albert Bifet, Ricard Gavalda; MIT Press, 2017

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| **IV Year - II Semester** | **3** | **0** | **0** | **3** |

**WEB SECURITY (Professional Elective –VI)**

**Course Objectives:**

- Give an Overview of information security
- Give an overview of Access control of relational databases

**Course Outcomes:** The student will learn

- Understand web architecture, web security issues, risk analysis, and cryptographic fundamentals.
- Understand client-side and server-side security mechanisms and privacy-protection techniques.
- Identify common web application mistakes and explain how they can be exploited.
- Apply database security techniques including access control, trust management, and data warehouse security.
- Analyze advanced and emerging trends in web and database security and privacy.

**UNIT - I**:

The Web Security, The Web Security Problem, Risk Analysis and Best Practices Cryptography and the Web: Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification

**UNIT - II:**

The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Antitheft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications

**UNIT - III**:

Database Security: Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems

**UNIT - IV**:

Security Re-engineering for Databases: Concepts and Techniques, Database Watermarking for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities

**UNIT - V**:

Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy-enhanced Location Based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

**Text Books:**


1. Web Security, Privacy and Commerce Simson G Arfinkel, Gene Spafford, O'Reilly.
2. Handbook on Database security applications and trends Michael Gertz, Sushil Jajodia

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## VIDEO ANALYTICS (Professional Elective –VI)

**Course Objectives:**

- To know the fundamental concepts of big data and analytics
- To learn various techniques for mining data streams
- To acquire the knowledge of extracting information from surveillance videos.
- To learn Event Modelling for different applications.
- To understand the models used for recognition of objects in videos

**Course Outcomes:** The student will learn

- Understand the basics of video- signals and systems.
- Estimate motion in a video
- Detect the objects and track them
- Recognize activity and analyze behavior
- Evaluate face recognition technologies

**UNIT - I**: **Introduction**

Multi-dimensional signals and systems: signals, transforms, systems, sampling theorem. Digital Images and Video: human visual system and color, digital video, 3D video, digital-video applications, image and video quality.

**UNIT - II: Motion Estimation**

Image formation, motion models, 2D apparent motion estimation, differential methods, matching methods, non-linear optimization methods, transform domain methods, 3D motion and structure estimation

**UNIT - III**: **Video Analytics**

Introduction- Video Basics - Fundamentals for Video Surveillance- Scene Artifacts- Object Detection and Tracking: Adaptive Background Modelling and Subtraction- Pedestrian Detection and Tracking Vehicle Detection and Tracking- Articulated Human Motion Tracking in Low-Dimensional Latent Spaces.

**UNIT - IV**: **Behavioural Analysis & Activity Recognition**

Event Modelling- Behavioural Analysis- Human Activity Recognition-Complex Activity Recognition Activity modelling using 3D shape, Video summarization, shape-based activity models- Suspicious Activity Detection.

**UNIT - V**: **Human Face Recognition & Gait Analysis**

Introduction: Overview of Recognition algorithms – Human Recognition using Face: Face Recognition from still images, Face Recognition from video, Evaluation of Face Recognition Technologies- Human Recognition using gait: HMM Framework for Gait Recognition, View Invariant Gait Recognition, Role of Shape and Dynamics in Gait Recognition

**Text Books:**


1. Murat Tekalp, “Digital Video Processing”, second edition, Pearson, 2015
2. Rama Chellappa, Amit K. Roy-Chowdhury, Kevin Zhou. S, “Recognition of Humans and their Activities using Video”, Morgan & Claypool Publishers, 2005.
3. Yunqian Ma, Gang Qian, “Intelligent Video Surveillance: Systems and Technology”, CRC Press (Taylor and Francis Group), 2009.


**Reference Books:**


1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer, 2011.
2. Yao Wang, Jorn Ostermann and Ya-Qin Zhang, “Video Processing and Communications”, Prentice Hall, 2001.
3. Thierry Bouwmans, Fatih Porikli, Benjamin Höferlin and Antoine Vacavant, “Background Modeling and Foreground Detection for Video Surveillance: Traditional and Recent Approaches, Implementations, Benchmarking and Evaluation”, CRC Press, Taylor and Francis Group, 2014.
4. Md. Atiqur Rahman Ahad, “Computer Vision and Action Recognition-A Guide for Image Processing and Computer Vision Community for Action Understanding”, Atlantis Press, 2011.

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| **IV Year - II Semester** | **3** | **0** | **0** | **3** |

**BLOCKCHAIN TECHNOLOGY (Professional Elective –VI)**

**Course Objectives:**

- Knowledge in information security and applied cryptography.
- Knowledge in Computer Networks.

**Course Outcomes:** The student will learn

- Understand blockchain fundamentals and cryptocurrency concepts.
- Apply smart contracts in decentralized applications.
- Differentiate public, private, and consortium blockchain frameworks.
- Analyze security, privacy, and scalability issues in blockchain systems.
- Develop blockchain applications using Python and Hyperledger Fabric.

**UNIT - I**: **Fundamentals of Blockchain:**

Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.

Blockchain Types and Consensus Mechanism: Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol.

Cryptocurrency – Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

**UNIT - II:**

**Public Blockchain System**: Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.

**Smart Contracts:** Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

**UNIT - III**:

**Private Blockchain System:** Introduction, Key Characteristics of Private Blockchain, Need of Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E- commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

**Consortium Blockchain:** Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.

**Initial Coin Offering:** Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

**UNIT - IV**:

**Security in Blockchain:** Introduction, Security Aspects in Bitcoin, Security and

Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.

**Applications of Blockchain:** Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain In Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain

**UNIT - V**:

**Blockchain Case Studies:** Case Study 1 – Retail, Case Study 2 – Banking and Financial Services, Case Study 3 – Healthcare, Case Study 4 – Energy and Utilities.

**Blockchain Platform using Python:** Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.

**Blockchain platform using Hyperledger Fabric**: Introduction, Components of Hyper ledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK.

**Text Books:**

1. Blockchain Technology, Chandramouli Subramanian, Asha A. George, Abhilasj K A and Meena Karthikeyan, Universities Press.

**Reference Books:**

1. Michael Juntao Yuan, Building Blockchain Apps, Pearson, India.
2. Blockchain Blueprint for Economy, Melanie Swan, SPD O'reilly.
3. Blockchain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gaur, Pearson.

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| **IV Year - II Semester** | **3** | **0** | **0** | **3** |

**PARALLEL AND DISTRIBUTED COMPUTING (Professional Elective –VI)**

**Course Objectives:**

- To learn core ideas behind parallel and distributed computing.
- To explore the methodologies adopted for parallel and distributed environments.
- To understand the networking aspects of parallel and distributed computing.
- To provide an overview of the computational aspects of parallel and distributed computing.
- To learn parallel and distributed computing models.

**Course Outcomes:** The student will learn

- Explore the methodologies adopted for parallel and distributed environments.
- Analyze the networking aspects of Distributed and Parallel Computing.
- Explore the different performance issues and tasks in parallel and distributed computing.
- Tools usage for parallel and distributed computing.
- Understand high performance computing techniques.

**UNIT - I**:

Parallel and Distributed Computing— Introduction- Benefits and Needs- Parallel and Distributed Systems- Programming Environment- Theoretical Foundations- Parallel Algorithms— Introduction- Parallel Models and Algorithms- Sorting- Matrix Multiplication

**UNIT - II:**

Architecture of Parallel and Distributed Systems, Parallel Operating Systems.

**UNIT - III**:

Management of Resources in Parallel Systems- Parallel Database Systems and Multimedia Object Servers.

**UNIT - IV**:

Networking Aspects of Distributed and Parallel Computing- Process- Parallel and Distributed Scientific Computing

**UNIT - V**:

Multimedia Applications for Parallel and Distributed Systems

**Text Books:**

1. Jacek Błażewicz, et al., "Handbook on parallel and distributed processing", Springer Science & Business Media, 2013.

**Reference Books:**

1. George F. Coulouris, Jean Dollimore, and Tim Kindberg, "Distributed systems:

concepts and design", Pearson Education, 2005.

3. Gregor Kosec and Roman Trobec, "Parallel Scientific Computing: Theory, Algorithms, and Applications of Mesh Based and Meshless Methods", Springer, 2015.
4. Andrew S. Tanenbaum, and Maarten Van Steen, "Distributed Systems: Principles and Paradigms". Prentice-Hall, 2007.

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| **IV Year - II Semester** | **3** | **0** | **0** | **3** |

## INTRODUCTION TO SOCIAL MEDIA MINING (Open Elective –III)

**Course Objectives:**

- The purpose of this course is to provide the students with knowledge of social media mining principles and techniques.
- This course is also designed to give an exposure of the frontiers of social media mining (Facebook, twitter)
- To introduce new technology for data analytics and introduce community Analysis
- To introduce various Recommendation algorithms

**Course Outcomes:** The student will learn

- Understand social media and its data.
- Apply mining technologies on twitter, Facebook, LinkedIn and Google.
- Learn about community
- Apply various Recommendation Algorithms
- Analyze the Behavior of people.

**UNIT - I**:

**Introduction:** Social Media Mining, New Challenges for Mining

**Graph Essentials:** Graph Basics, Graph Representation, Types of Graphs, Connectivity in Graphs, Special Graphs, Graph Algorithms

**UNIT - II:**

**Network Measures:** Centrality, Transitivity and Reciprocity, Balance and Status, Similarity.

**Network Models:** Properties of Real-World Networks, Random Graphs, Small-World Model, Preferential Attachment Model

**UNIT - III**:

**Data Mining Essentials:** Data, Data Preprocessing, Data Mining Algorithms, Supervised Learning, Unsupervised Learning

**Community Analysis:** Community Detection, Community Evaluation, Community Evaluation

**UNIT - IV**:

**Information Diffusion in Social Media:** Herd Behavior, Information Cascades, Diffusion of innovations, Epidemics

**Influence and Homophily:** Measuring Assortativity, Influence, Homophily, Distinguishing Influence and Homophily.

**UNIT - V**:

**Recommendation in Social Media:** Challenges, Classical Recommendation Algorithms, Recommendation Using Social Context, Evaluating Recommendations

**Behavior Analytics:** Individual Behavior, Collective Behavior.

**Text Books:**

1. Social Media Mining (An Introduction), Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, Cambridge University Press, Draft Version: April 20, 2014

**Reference Books:**

1. Mining the Social Web, 2nd Edition Data Mining Face book, Twitter, LinkedIn, Google+, GitHub, and More By Matthew A. Russell Publisher: O'Reilly Media.
2. Social Media Mining with R [Kindle Edition] NATHAN DANNEMAN RICHARD HEIMANN

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| **IV Year - II Semester** | **3** | **0** | **0** | **3** |

## DATA VISUALIZATION USING PYTHON (Open Elective –III)

**Course Objectives:**

- Learn data wrangling techniques
- Introduce visual perception and core skills for visual analysis

**Course Outcomes:** The student will learn

- Perform data wrangling
- Explain principles of visual perception
- Apply core skills for visual analysis
- Apply visualization techniques for various data analysis tasks
- Evaluate visualization techniques

**UNIT - I**:

An Introduction to Data Visualization in Python, Types of Plots- statistical plots, Images, Networks/ Graphs, Geographical, 3D and Interactive, Grids and Meshes

**UNIT - II:**

Manipulating and visualizing data with Pandas: defining data frames, Creating and manipulating data frames, visualization with pandas

Matplotlib: Features of matplotlib, Anatomy and Customization of matplotlib plot, Plotting and plot customization, Customizing a plot, Visualization examples

**UNIT - III**:

**Seaborn:** Features of seaborn, Creating plots with seaborn, Visualization examples

**Altair:** Altair's declarative API, creating an Altair Chart and Plot, changing mark/Plot Types, Global Configuration, Encoding arguments, Altair Datatypes, Creating Titles, Properties, Tooltips, Saving Altair Charts, Making Plots Interactive, Visualization Examples,

**UNIT - IV**:

**Plotly:** Plotly and JSON, Online and Offline plotting, Structure of Plotly Plot, Graph Objectives VS Dictionaries, Plotly Express, updating plots- Adding and Updating Traces, Creating Subplots, Drop- Down Menus, Dash Interactivity, Example Plots

**UNIT - V**:

**CGPlot2/Plotnine:** The Gammar of Graphics, Creating Plots, Changing Geoms, Stats, Faceting, Coordinates, Annotations, Scaling, Themes, Legends, and Palettes, Visualization Examples.

**Text Books:**

1. Daniel Nelson, Data Visualization in Python
2. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick A K Peters, Ltd.

**Reference Books:**


1. Jacqueline Kazil and Katharine Jarmul, Data Wrangling with Python: Tips and Tools to Make Your Life Easier, O'Reilly.
2. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.