



MALINENI LAKSHMAIAH WOMEN'S ENGINEERING COLLEGE (AUTONOMOUS)

(Accredited by "NBA" & NAAC A+ Grade | Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada)
Pulladigunta (Vil), Vatticherukuru (Md), Prathipadu Road, Guntur – 522 017
Andhra Pradesh. www.mlewguntur.com



COURSE STRUCTURE & SYLLABUS

BACHELOR of TECHNOLOGY (B.Tech) **in** **COMPUTER SCIENCE AND ENGINEERING** **(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)**

(For **Four-Year (REGULAR)** / **Three- Year (LATERAL)** Entry
UG Programme)

(Applicable for batches admitted from 2023-24)

SEMESTER-WISE COURSE STRUCTURE

For B.Tech. **CSE(AI&ML)**

Year-I Semester-I

S.No.	Category	Course Code	Title	L/D	T	P	Credits
1	BS	23BS11T03	Engineering Physics	3	0	0	3
2	BS	23BS11T02	Linear Algebra & Calculus	3	0	0	3
3	ES	23ES11T03	Basic Electrical & Electronics Engineering	3	0	0	3
4	ES	23ES11D01	Engineering Graphics	1	0	4	3
5	ES	23ES11T02	Introduction to Programming	3	0	0	3
6	ES	23ES11L04	IT Workshop	0	0	2	1
7	BS	23BS11L03	Engineering Physics Lab	0	0	2	1
8	ES	23ES11L03	Electrical & Electronics Engineering Workshop	0	0	3	1.5
9	ES	23ES11L02	Computer Programming Lab	0	0	3	1.5
10	HM	23HM11L03	NSS/NCC/Scouts & Guides/Community Service	-	-	1	0.5
Total				13	00	15	20.5

Category		Credits
HM	Humanities & Management	0.5
BS	Basic Sciences	7
ES	Engineering Science	13
Total Credits		20.5

For B.Tech. **CSE(AI&ML)**

Year-I Semester-II

S. No.	Category	Course Code	Title	L/D	T	P	Credits
1	HM	23HM12T01	Communicative English	2	0	0	2
2	BS	23BS12T01	Chemistry	3	0	0	3
3	BS	23BS12T04	Differential Equations & Vector Calculus	3	0	0	3
4	ES	23ES12T01	Basic Civil & Mechanical Engineering	3	0	0	3
5	ES	23ES12T05	Data Structures	3	0	0	3
6	HM	23HM12L01	Communicative English Lab	0	0	2	1
7	BS	23BS12L01	Chemistry Lab	0	0	2	1
8	ES	23ES12L01	Engineering Workshop	0	0	3	1.5
9	ES	23ES12L05	Data Structures Lab	0	0	3	1.5
10	HM	23HM12L02	Health and Wellness, Yoga and Sports	-	-	1	0.5
Total				14	00	11	19.5

Category		Credits
HM	Humanities & Management	3.5
BS	Basic Sciences	7.0
ES	Engineering Science	9.0
Total Credits		19.5

23BS11T03 - **ENGINEERING PHYSICS**

Course category	Basic Sciences (BS)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	I	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

- To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Analyze the intensity variation of light due to polarization, interference and diffraction.	L4
CO2	Familiarize with the basics of crystals and their structures.	L2
CO3	Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.	L3
CO4	Summarize various types of polarization of dielectrics and classify the magnetic materials.	L4
CO5	Explain the conductivity in semiconductor based on its band structure and Hall Effect.	L3

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT I - Wave Optics

Interference: Introduction - Principle of superposition –Conditions For Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of Wavelength and Refractive Index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT II - Crystallography and X-ray diffraction

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

UNIT III - Dielectric and Magnetic Materials

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector–Relation between the electric vectors-Types of polarizations-Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction-Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT IV - Quantum Mechanics and Free electron Theory

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT V - Semiconductors

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications.

Textbooks:

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)
3. Basic Engineering Physics P.Sreenivasarao and K.muralidhar, Himalaya publishing house 2013.
4. Engineering Physics P.Sreenivasarao and K.muralidhar,Himalaya publishinghouse 2017.

Reference Book

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

Web Resources:

<https://www.loc.gov/rr/scitech/selected-internet/physics.htm>.

23BS11T02 - **LINEAR ALGEBRA & CALCULUS**

Course category	Basic Sciences (BS)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	I	CIE Marks	30
Semester	I	SEE Marks	70
		Total Marks	100

Course Objectives:

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics and to develop the confidence and ability among the students to handle various real-world problems and their applications.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Develop the matrix algebra techniques that are needed by engineers for practical applications.	L5
CO2	Utilize the mean value theorems to real life problems.	L3
CO3	Familiarize with functions of several variables which is useful in optimization.	L3
CO4	Learn important tools of calculus in higher dimensions.	L4
CO5	Familiarize with double and triple integrals of functions of several variables in to dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.	L3

Note: L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

COURSE CONTENTS

UNIT I Matrices

Rank of Matrix, Linear transformation, Linear dependence, Linear Independence, Rank of a matrix by echelon form, normal form. Diagonalization of a matrix, Cauchy–Binet formulae (without proof). 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, Jacobi and Gauss Seidel Iteration Methods.

UNIT II Eigen values, Eigenvectors and Orthogonal Transformation

Eigenvalues, Eigenvectors and their properties, 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, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT IV Partial differentiation and Applications (Multi variable calculus)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V Multiple Integrals (Multi variable Calculus)

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9th edition
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021)

23ES11T03 –

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Course category	Engineering Sciences (ES)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	I	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

- To expose to the field of electrical & electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Describe fundamental laws, operating principles of motors/generators, MC/MI instruments	L2
CO2	Demonstrate the working of electrical machines, measuring instruments and power generation stations.	L2
CO3	Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits and machines.	L3
CO4	Understand the operation of PN junction diode and its application as a rectifier	L2
CO5	Understand the operation of transistor along with its characteristics and to analyse its application as amplifier	L4
CO6	Study the functionality of logic gates and apply it for the design of combinational and sequential circuits	L3

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT II Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT III Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity Bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Textbooks:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013

3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhattacharya, Person Publications, 2018, Second Edition.

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

UNIT I SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT III DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only).

Textbooks:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

Web Resources:

1. <https://nptel.ac.in/courses/108105053>
2. <https://nptel.ac.in/courses/108108076>

End examination pattern:

- i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
- ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1 mark.
- iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
- iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

23ES11D01 – **ENGINEERING GRAPHICS**

Course category	Engineering Sciences (ES)	Credits	3
Course Type	Drawing	L-T-P	1-0-4
Year	I	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing.
- To impart knowledge on the projection of points, lines and plane surfaces.
- To improve the visualization skills for better understanding of projection of solids.
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.	L2
CO2	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.	L3
CO3	Understand and draw projection of solids in various positions in first quadrant.	L2
CO4	Explain principles behind development of surfaces.	L2
CO5	Prepare isometric and perspective sections of simple solids.	L6

Note: L1- Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involute, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes.

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

Text Books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kanniah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc, 2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

E-resources and other digital material

1. <https://ktuengineeringgraphics.wordpress.com/projections-of-solids/>
2. <https://www.educationalstuffs.in/engineering-drawing-introduction/>
3. <https://www.geeksforgeeks.org/difference-between-orthographic-and-isometric-projection/>
4. https://www.brainkart.com/article/Projection-of-Straight-Lines-and-Planes--First-Angle-_6519/

23ES11T02 - **INTRODUCTION TO PROGRAMMING**

Course category	Engineering Sciences (ES)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	I	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Apply the fundamentals of algorithms flowcharts and C-Program.	L3
CO2	Analyze a problem and develop an algorithm to solve it.	L3
CO3	Implement various algorithms using the C programming language.	L4
CO4	Develop C programs using pointer and its related concepts.	L3
CO5	Develop problem-solving skills and the ability to debug and optimize the code.	L3

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT I Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program- Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithm's.

UNIT II Control Structures

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

UNIT III Arrays and Strings

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code.

UNIT IV Pointers & User Defined Data types

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.

UNIT V Functions & File Handling

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions, Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

Note: The syllabus is designed with C Language as the fundamental language of implementation.

Textbooks:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition.

E-resources and other digital material

1. https://onlinecourses.nptel.ac.in/noc20_cs06/preview
2. <https://www.w3resource.com/c-programming-exercises/>
3. <https://www.geeksforgeeks.org/c-programming-examples/>

23ES11L04 - **IT WORKSHOP**

Course category	Engineering Sciences (ES)	Credits	1
Course Type	Practicals	L-T-P	0-0-1
Year	I	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Perform Hardware troubleshooting.	L3
CO2	Discuss the basic hardware components and their relationships among the components.	L2
CO3	Safeguard computer systems from viruses / worms.	L4
CO4	Document/Presentation preparation.	L3
CO5	Perform calculations using spreadsheets.	L3

Note: L1- Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

PC Hardware & Software Installation

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 (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. 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 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 La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX 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 La TeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using La TeX 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 La TeX 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

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point 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.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
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, David Anfinson and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan–CISCO Press, Pearson Education, 3rd edition.

23BS11L03 - **ENGINEERING PHYSICS LAB**

Course category	Basic Sciences (BS)	Credits	1
Course Type	Practicals	L-T-P	0-0-2
Year	I	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

- To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Operate optical instruments like travelling microscope and spectrometer.	L3
CO2	Estimate the wavelengths of different colours using diffraction grating.	L4
CO3	Plot the intensity of the magnetic field of circular coil carrying current with distance.	L3
CO4	Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.	L5
CO5	Identify the type of semiconductor using Hall effect and calculate the band gap of a semiconductor.	L3

Note:- L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6>Create

COURSE CONTENTS

List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

References:

- A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

Web Resources

- www.vlab.co.in
- <https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>

23ES11L03 – **ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP**

Course category	Engineering Science (ES)	Credits	1.5
Course Type	Practicals	L-T-P	0-0-3
Year	I	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

- To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.
- To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Measure voltage, current and power in an electrical circuit	L2
CO2	Measure of Resistance using Wheat stone bridge (L4).	L2
CO3	Discover critical field resistance and critical speed of DC shunt generators.	L4
CO4	Investigate the effect of reactive power and power factor in electrical loads	L3
CO5	Identify & testing of various electronic components.	L4
CO6	Understand the usage of electronic measuring instruments.	L4
CO7	Plot and discuss the characteristics of various electron devices.	L5

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

Activities:

1. Components:
 - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
 - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments.
2. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
 - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
3. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
 - Provide some exercises so that measuring instruments are learned to be used by the students.

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger.
7. Calculation of Electrical Energy for Domestic Premises

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition

2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs. Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

References:

1. R. L. Boylestad& Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

23ES11L02 - **COMPUTER PROGRAMMING LAB**

Course category	Engineering Sciences (ES)	Credits	1.5
Course Type	Theory	L-T-P	0-0-3
Year	I	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

- The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Apply C program concepts for execution.	L3
CO2	Apply the right control structure for solving the problem.	L3
CO3	Develop C programs which utilize memory efficiently using programming constructs like pointers.	L4
CO4	Develop programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.	L3

Note:- L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT I WEEK 1

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

- i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- ii) Exposure to Turbo C, gcc.
- iii) Writing simple programs using printf(), scanf()

WEEK 2

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

- i) Sum and average of 3 numbers
- ii) Conversion of Fahrenheit to Celsius and vice versa
- iii) Simple interest calculation

WEEK 3

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

- i) Finding the square root of a given number
- ii) Finding compound interest
- iii) Area of a triangle using heron's formulae
- iv) Distance travelled by an object

UNIT II WEEK 4

Objective: Explore the full scope of expressions, type-compatibility of

variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial 4: Operators and the precedence and as associativity:

Lab 4: Simple computational problems using the operator' precedence and associativity

- i) Evaluate the following expressions.
 - a. $A+B*C+(D*E) + F*G$
 - b. $A/B*C-B+A*D/3$
 - c. $A+++B---A$
 - d. $J= (i++) + (++i)$
- ii) Find the maximum of three numbers using conditional operator
- iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

Objective: Explore the full scope of different variants of “if construct” namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for “if construct”.

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

- i) Write a C program to find the max and min of four numbers using if-else.
- ii) Write a C program to generate electricity bill.
- iii) Find the roots of the quadratic equation.
- iv) Write a C program to simulate a calculator using switch case.
- v) Write a C program to find the given year is a leap year or not.

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

- i) Find the factorial of given number using any loop.
- ii) Find the given number is a prime or not.
- iii) Compute sine and cos series
- iv) Checking a number palindrome
- v) Construct a pyramid of numbers.

UNIT III WEEK 7:

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7: 1D Array manipulation, linear search

- i) Find the min and max of a 1-D integer array.
- ii) Perform linear search on 1D array.
- iii) The reverse of a 1D integer array
- iv) Find 2's complement of the given binary number.
- v) Eliminate duplicate elements in an array.

WEEK 8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

- i) Addition of two matrices
- ii) Multiplication two matrices
- iii) Sort array elements using bubble sort
- iv) Concatenate two strings without built-in functions
- v) Reverse a string using built-in and without built-in string functions

UNIT IV WEEK 9:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C.

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

- i) Write a C program to find the sum of a 1D array using malloc()
- ii) Write a C program to find the total, average of n students using structures
- iii) Enter n students data using calloc() and display failed students list
- iv) Read student name and marks from the command line and display the student details along with the total.
- v) Write a C program to implement realloc()

WEEK 10:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10 : Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

- i) Create and display a singly linked list using self-referential structure.
- ii) Demonstrate the differences between structures and unions using a C program.
- iii) Write a C program to shift/rotate using bitfields.
- iv) Write a C program to copy one structure variable to another structure of the same type.

UNIT V WEEK 11:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

- i) Write a C function to calculate NCR value.
- ii) Write a C function to find the length of a string.
- iii) Write a C function to transpose of a matrix.
- iv) Write a C function to demonstrate numerical integration of differentialequations using Euler's method

WEEK 12:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

- i) Write a recursive function to generate Fibonacci series.
- ii) Write a recursive function to find the lcm of two numbers.
- iii) Write a recursive function to find the factorial of a number.
- iv) Write a C Program to implement Ackermann function using recursion.
- v) Write a recursive function to find the sum of series.

WEEK 13:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

- i) Write a C program to swap two numbers using call by reference.
- ii) Demonstrate Dangling pointer problem using a C program.
- iii) Write a C program to copy one string into another using pointer.

- iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK14:

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

- i) Write a C program to write and read text into a file.
- ii) Write a C program to write and read text into a binary file using fread() and fwrite()
- iii) Copy the contents of one file to another file.
- iv) Write a C program to merge two files into the third file using command-line arguments.
- v) Find no. of lines, words and characters in a file
- vi) Write a C program to print last n characters of a given file.

Textbooks:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice- Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

E-resources and other digital material

4. https://onlinecourses.nptel.ac.in/noc20_cs06/preview
5. <https://www.w3resource.com/c-programming-exercises/>
6. <https://www.geeksforgeeks.org/c-programming-examples/>

23HM11L03 –

NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

Course category	Basic Sciences (HM)	Credits	0.5
Course Type	Practicals	L-T-P	0-0-1
Year	I	CIE Marks	100
Sem.	I	SEE Marks	--
		Total Marks	100

Course Objectives:

- The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Understand the importance of discipline, character and service motto.	L2
CO2	Solve some societal issues by applying acquired knowledge, facts, and techniques.	L3
CO3	Explore human relationships by analyzing social problems.	L3
CO4	Determine to extend their help for the fellow beings and downtrodden people.	L3
CO5	Develop leadership skills and civic responsibilities.	L5

Note: L1-Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

COURSE CONTENTS

UNIT-I Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

- i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
- ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
- iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
- iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT-II Nature & Care

Activities:

- i) Best out of waste competition.
- ii) Poster and signs making competition to spread environmental awareness.
- iii) Recycling and environmental pollution article writing competition.
- iv) Organising Zero-waste day.
- v) Digital Environmental awareness activity via various social media platforms.
- vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
- vii) Write a summary on any book related to environmental issues.

UNIT-III Community Service

Activities:

- i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authoritiesexperts-etc.
- ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
- iii) Conducting consumer Awareness. Explaining various legal provisions etc.
- iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
- v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., “Introduction to Environmental Engineering”, McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. “Introduction to Environmental Engineering and Science”, Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

23HM12T01 - **COMMUNICATIVE ENGLISH**

Course category	Humanities & Management (HM)	Credits	2
Course Type	Theory	L-T-P	2-0-0
Year	I	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

- The main objective of introducing this course, *Communicative English*, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Understand the context, topic, and pieces of specific information from social or Transactional dialogues.	L2
CO2	Apply grammatical structures to formulate sentences and correct word forms.	L3
CO3	Create and design proper structural English for writing.	L5
CO4	Evaluate LSRW Skills for global competitiveness	L6
CO5	Create a coherent paragraph, essay, and resume.	L5

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT- I

Lesson: HUMAN VALUES: Gift of Magi (Short Story)

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT- II

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Structure of a paragraph - Paragraph writing (specific topics)

Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.

Vocabulary: Homonyms, Homophones, Homographs.

UNIT- III

Lesson: BIOGRAPHY: Elon Musk

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text

clues for comprehension.

Writing: Summarizing, Note-making, paraphrasing

Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations

Vocabulary: Compound words, Collocations

UNIT- IV

Lesson: INSPIRATION: The Toys of Peace by Saki

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing: Letter Writing: Official Letters, Resumes

Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice

Vocabulary: Words often confused, Jargons

UNIT- V

Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts

Reading: Reading comprehension.

Writing: Writing structured essays on specific topics.

Grammar: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Vocabulary: Technical Jargons

Textbooks:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:**GRAMMAR:**

1. www.bbc.co.uk/learningenglish
2. <https://dictionary.cambridge.org/grammar/british-grammar/>
3. www.eslpod.com/index.html
4. <https://www.learngrammar.net/>
5. <https://english4today.com/english-grammar-online-with-quizzes/>
6. <https://www.talkenglish.com/grammar/grammar.aspx>

VOCABULARY

1. <https://www.youtube.com/c/DailyVideoVocabulary/videos>
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

23BS12T01 – CHEMISTRY

Course category	Basic Sciences (BS)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	I	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

- To know the principles of quantum mechanics Schrodinger wave equation.
- To Familiarise applications and properties of semi conductors, Nano materials.
- To Train the students on the principles and applications of Electrochemistry.
- Importance of usage of plastics in automotive industries and other appliances.
- To Introduce advance Instrumental Techniques.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Illustrate the Schrodinger wave equation and molecular orbital theory.	L3
CO2	Use and properties of semi conductors and Nano materials.	L3
CO3	Compare the materials of construction for Battery and Electrochemical Sensors	L4
CO4	Explain the preparation, properties, and applications of Thermoplastics & Thermosetting & Elastomers Conducting Polymers	L2
CO5	Explain the principles of Spectrometry and Instrumental Techniques.	L2

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT-I Structure and Bonding Models:

Fundamentals of Quantum mechanics, Schrodinger Wave equation, Significance of Ψ and Ψ^2 , particle in one dimensional box, Molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O₂ and CO, etc. π -molecular orbitals of Butadiene and Benzene, calculation of bond order.

UNIT-II Modern Engineering materials

Semiconductors – Introduction, basic concept, applications.

Super conductors-Introduction basic concept, applications.

Supercapacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphenes nanoparticles.

UNIT III Electrochemistry and Applications

Electrochemical cell, single Electrode potential, Nernst equation, cell potential calculations and numerical problems, Electro chemical series, standard hydrogen electrode, calomel electrode.

Electrochemical sensors–Potentiometric sensors with examples, Amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –Lithium-ion batteries- working of the batteries including cell reactions, Lead(Pb)-lead acid storage batteries, Fuel cells- Hydrogen-Oxygenfuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT IV Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

UNIT V Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation of UV, IR spectroscopy and Instrumentation of IR, Magnetic resonance image(MRI) and CT scan(procedure and applications of MRI and CT scan)

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. BillmayerJr, 3rd Edition

23BS12T04 – **DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**

Course category	Basic Sciences (BS)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	I	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Importance of first order and first degree differential equations.	L2
CO2	Solve the Higher order differential equations related to various engineering fields.	L3
CO3	Identify solution methods for partial differential equations that model physical processes.	L2
CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence.	L3
CO5	Estimate the work done against a field, circulation and flux using vector calculus & Importance of vector integral theorems	L4

Note: L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

COURSE CONTENTS

UNIT-I Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay Electrical circuits.

UNIT-II Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT-III Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

Application of PDE: Method of Separation of Variables-Solution of One Dimensional Wave and Heat equation.

UNIT-IV Vector differentiation

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions Gradient, Directional derivative, Scalar potential, solinoidal, irrotational, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT-V Vector integration

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.

2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017

23ES12T01 – **BASIC CIVIL & MECHANICAL ENGINEERING**

Course category	Engineering Sciences (ES)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	I	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

PART A: BASIC CIVIL ENGINEERING**Course Objectives:**

- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.	L2
CO2	Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.	L2
CO3	Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.	L2
CO4	Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.	L2
CO5	Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.	L2

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society-VariouS Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

UNIT II

Surveying: Objectives of Surveying- Horizontal Measurements-Angular Measurements- Introduction to Bearings Levelling instruments used for levelling - Simple problems on levelling and bearings-Contour mapping.

UNIT III

Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements- Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology-Rainwater Harvesting- Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Text Books:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

Reference Books:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016.

3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

E-resources and other digital material

1. <https://theconstructor.org/surveying/surveying-principles-methods-civil-engineering/13048/>
2. https://www.brainkart.com/article/Classification-of-sources-of-water-supply_3268/
3. <https://digimat.in/nptel/courses/video/105105107/L04.html>

PART B: BASIC MECHANICAL ENGINEERING

Course Objectives:

- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Understand the different manufacturing processes.	L2
CO2	Explain the basics of thermal engineering and its applications.	L2
CO3	Describe the working of different mechanical power transmission systems and power plants.	L2
CO4	Describe the basics of robotics and its applications.	L2

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT-I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT-II

Manufacturing Processes: Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – Working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT-III

Power plants – Working principle of Steam, Diesel, Hydro, Nuclear power plants. **Mechanical Power Transmission** - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject.)

Text Books:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

1. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications

(India) Pvt. Ltd.

2. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
3. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak MPandey, Springer publications
4. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I

E-resources and other digital material

1. <https://www.tlv.com/global/TI/steam-theory/principal-applications-for-steam.html>
2. <https://ocw.mit.edu/courses/2-61-internal-combustion-engines-spring-2017/>
3. <https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing-andprocess- industry/>
4. <https://alison.com/tag/3d-printing>
5. [Videos | Makino \(For Machine Tool Operation\)](#)

23ES12T05 - **DATA STRUCTURES**

Course category	Engineering Sciences (ES)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	I	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Apply the role of linear data structures in organizing and accessing data efficiently in algorithms.	L3
CO2	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.	L3
CO3	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.	L4
CO4	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.	L3
CO5	Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.	L3
CO6	Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.	L2

Note: L1- Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT I

Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort

UNIT II

Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

UNIT III

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

UNIT IV

Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.

Deque: Introduction to deque (double-ended queue), Operations on deque and their applications.

UNIT V

Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal

Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.

Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick.

E-resources and other digital material

1. <https://www.javatpoint.com/data-structure-tutorial>
2. <https://www.geeksforgeeks.org/data-structures/>

23HM12L01 - **COMMUNICATIVE ENGLISH LAB**

Course category	Humanities & Management (HM)	Credits	1
Course Type	Practicals	L-T-P	0-0-2
Year	I	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

- The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Understand the different aspects of the English language proficiency with emphasis on LSRW skills.	L2
CO2	Apply communication skills through various language learning activities.	L3
CO3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.	L4
CO4	Analyze and exhibit professionalism in participating in debates and group discussions.	L4
CO5	Produce effective Speaking	L3

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:

- Walden Infotech
- Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India,2016
3. Hewing's, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed) , Kindle, 2013

Web Resources:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. <https://www.britishcouncil.in/english/online>
5. <http://www.letstalkpodcast.com/>
6. https://www.youtube.com/c/mmmEnglish_Emma/featured

7. <https://www.youtube.com/c/ArnelsEverydayEnglish/featured>
8. <https://www.youtube.com/c/engvidAdam/featured>
9. <https://www.youtube.com/c/EnglishClass101/featured>
10. <https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists>
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTMOWNw

Voice & Accent:

1. <https://www.youtube.com/user/letstalkaccent/videos>
2. <https://www.youtube.com/c/EngLanguageClub/featured>
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

23BS12L01 - **CHEMISTRY LAB**

Course category	Basic Sciences (BS)	Credits	1
Course Type	Practicals	L-T-P	0-0-2
Year	I	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

- Verify the fundamental concepts with experiments.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Determine the cell constant and conductance of solutions.	L3
CO2	Prepare advanced polymer Bakelite materials.	L3
CO3	Measure the strength of an acid present in secondary batteries.	L3
CO4	Analyse the UV spectra of some organic compounds.	L4
CO5	Calculate strength of acid in Pb-Acid battery.	L3

Note:- L1- Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

List of Experiments:

1. Determination of alkalinity of water sample by using 0.02N sulphuric acid solution.
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Determination of total hardness present in given water sample by EDTA method.
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry
13. Potentiometry - determination of redox potentials and emfs
14. Estimation of vitamin -c.
15. Estimation of Mg^{+2} (Magnesium) ion present in Antacid solution.

Reference:

- "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar

23ES12L01 – **ENGINEERING WORKSHOP**

Course category	Engineering Sciences (ES)	Credits	1.5
Course Type	Laboratory	L-T-P	0-0-3
Year	I	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

- To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Identify workshop tools and their operational capabilities.	L2
CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.	L3
CO3	Apply fitting operations in various applications.	L2
CO4	Apply basic electrical engineering knowledge for House Wiring Practice.	L2

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

1. **Demonstration:** Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
 - a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
 - a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
 - a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.
 - a) Parallel and series b) Two-way switch c) Godown lighting
 - d) Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop:** Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.
9. **Basic repairs of Two-wheeler vehicle** – Demonstration of working of two-wheeler vehicle and its repairs.

Text Books:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.

2. A Course in Workshop Technology Vol I. & II, B. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

E-resources and other digital material

1. <https://ourelabs.blogspot.com/2013/08/tin-smithy-sheet-metal.html?m=1>
2. <https://www.teachmint.com/tfile/studymaterial/btech/workshoppractice/welding/1ffb7299-b706-46ef-945e-92d92bb43c76>

23ES12L05 - **DATA STRUCTURES LAB**

Course category	Engineering Sciences (ES)	Credits	1.5
Course Type	Theory	L-T-P	0-0-3
Year	I	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

- The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Apply the role of linear data structures in organizing and accessing data efficiently in algorithms.	L3
CO2	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.	L3
CO3	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.	L4
CO4	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.	L3
CO5	Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.	L3

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

List of Experiments:

Exercise 1: Array Manipulation

- i) Write a program to reverse an array.
- ii) C Programs to implement the Searching Techniques – Linear & Binary Search
- iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

Exercise 2: Linked List Implementation

- i) Implement a singly linked list and perform insertion and deletion operations.
- ii) Develop a program to reverse a linked list iteratively and recursively.
- iii) Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications

- i) Create a program to detect and remove duplicates from a linked list.
- ii) Implement a linked list to represent polynomials and perform addition.
- iii) Implement a double-ended queue (deque) with essential operations.

Exercise 4: Double Linked List Implementation

- i) Implement a doubly linked list and perform various operations to understand its properties and applications.
- ii) Implement a circular linked list and perform insertion, deletion, and traversal.

Exercise 5: Stack Operations

- i) Implement a stack using arrays and linked lists.
- ii) Write a program to evaluate a postfix expression using a stack.
- iii) Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations

- i) Implement a queue using arrays and linked lists.
- ii) Develop a program to simulate a simple printer queue system.
- iii) Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications

- i) Use a stack to evaluate an infix expression and convert it to postfix.
- ii) Create a program to determine whether a given string is a palindrome or not.
- iii) Implement a stack or queue to perform comparison and check for symmetry.

Exercise 8: Binary Search Tree

- i) Implementing a BST using Linked List.
- ii) Traversing of BST.

Exercise 9: Hashing

- i) Implement a hash table with collision resolution techniques.
- ii) Write a program to implement a simple cache using hashing.

Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms by Robert Sedgewick.

E-resources and other digital material

1. <https://www.geeksforgeeks.org/data-structures/>
2. <https://www.programiz.com/dsa>
3. <https://www.javatpoint.com/data-structure-tutorial>

23HM12L02 –

HEALTH AND WELLNESS, YOGA AND SPORTS

Course category	Humanities & Management (HM)	Credits	0.5
Course Type	Practicals	L-T-P	0-0-1
Year	I	CIE Marks	100
Sem.	II	SEE Marks	--
		Total Marks	100

Course Objectives:

- The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Understand the importance of yoga and sports for Physical fitness and sound health.	L2
CO2	Demonstrate an understanding of health-related fitness components.	L3
CO3	Compare and contrast various activities that help enhance their health.	L4
CO4	Assess current personal fitness levels.	L6
CO5	Develop Positive Personality	L3

Note: L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5- Evaluate, L6-Create

COURSE CONTENTS

UNIT-I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

- i) Organizing health awareness programmes in community
- ii) Preparation of health profile
- iii) Preparation of chart for balance diet for all age groups

UNIT-II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT-III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

- i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
Practicing general and specific warm up, aerobics
- ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J. Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc. 2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

SEMESTER-WISE COURSE STRUCTUREFor B.Tech. **CSE(AI&ML)**

Year-II Semester-I

S. No.	Category	Course Code	Title	L	T	P	Credits
1	BS&H	23BS21T01	Discrete Mathematics & Graph Theory	3	0	0	3
2	BS&H	23HM21T01	Universal Human Values-Understanding Harmony and Ethical Human Conduct	2	1	0	3
3	ES	23ES21T02	Artificial Intelligence	3	0	0	3
4	PC	23CS21T01	Advanced Data Structures & Algorithm Analysis	3	0	0	3
5	PC	23CS21T02	Object Oriented Programming Through Java	3	0	0	3
6	PC	23CS21L01	Advanced Data Structures and Algorithms Analysis Lab	0	0	3	1.5
7	PC	23CS21L02	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	SEC	23AM21S01	Python programming	0	1	2	2
9	AC	23BS21T01	Environmental Science	2	0	0	-
Total				16	02	08	20

Category		Credits	Category		Credits
BS&H	Basic Science & Humanities	6	SEC	Skill Enhancement Course	2
ES	Engineering Science	3	AC	Audit Course	-
PC	Professional Core	9			
Total Credits					20

For B.Tech. **CSE(AI&ML)**

Year-II Semester-II

S. No.	Category	Course Code	Title	L	T	P	Credits
1	MC-I	23HM22T02	Optimization Techniques	2	0	0	2
2	ES/BS	23BS22T01	Probability & Statistics	3	0	0	3
3	PC	23AM22T01	Machine Learning	3	0	0	3
4	PC	23CS22T02	Database Management Systems	3	0	0	3
5	PC	23AM22T01	Digital Logic & Computer Organization	3	0	0	3
6	PC	23AM22L01	AI & ML Lab	0	0	3	1.5
7	PC	23CS22L02	Database Management Systems Lab	0	0	3	1.5
8	SEC	23AM22S01	Full Stack Development -1	0	1	2	2
9	BS&H	23BS22L01	Design Thinking & Innovation	1	0	2	2
Total				15	01	12	21

Mandatory Community Service Project Internship of 08 weeks duration during summer vacation

Category		Credits	Category		Credits
MC	Management Course	2	PC	Professional Core	12
ES/BS	Engineering Science/Basic Science	3	SEC	Skill Enhancement Course	2
BS&H	Basic Science & Humanities	2			
Total Credits					21

23BS21T01 – **DISCRETE MATHEMATICS AND GRAPH THEORY**

Course category	Basic Sciences (BS&H)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	II	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Build skills in solving mathematical problems	L3
CO2	Comprehend mathematical principles and logic	L4
CO3	Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software	L6
CO4	Manipulate and analyze data numerically and/or graphically using appropriate Software	L3
CO5	How to communicate effectively mathematical ideas/results verbally or in writing	L1

Note: L1- Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT-I: Mathematical Logic:

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulae, Truth Tables, Tautologies, Equivalence of Formulae, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof.

Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT-II: Set Theory:

Sets: Operations on Sets, Principle of Inclusion-Exclusion.

Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Lattice and its Properties.

Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions.

UNIT-III: Combinatorics and Recurrence Relations:

Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems.

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.

UNIT-IV: Graph Theory:

Basic Concepts, Graph Theory and its Applications, Subgraphs.

Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs.

UNIT-V: Multi Graphs:

Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, BFS and DFS Spanning Trees, Prim's and Kruskal's Algorithms.

Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P.Tremblay and P. Manohar, Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D.P. Mohapatra, 3rd Edition, Tata McGraw Hill.

Reference Books:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J.L. Mott, A.Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and SharonCutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K.H. Rosen, 7th Edition, Tata McGraw Hill.

23HM21T01 – **UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT**

Course category	Basic Sciences (BS&H)	Credits	3
Course Type	Theory	L-T-P	2-1-0
Year	II	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Define the terms like Natural Acceptance, Happiness and Prosperity	L1, L2
CO2	Identify one's self, and one's surroundings (family, society nature)	L1, L2
CO3	Apply what they have learnt to their own self in different day-to-day settings in real life	L3
CO4	Relate human values with human relationship and human society.	L4
CO5	Justify the need for universal human values and harmonious existence	L5
CO6	Develop as socially and ecologically responsible engineers	L3, L6

Note: L1- Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE TOPICS

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I Introduction to Value Education (6 lectures and 3 tutorials for practice session)

Lecture 1 : Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2 : Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself

Lecture 3 : Self-exploration as the Process for Value Education

Lecture 4 : Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

Lecture 5 : Happiness and Prosperity – Current Scenario

Lecture 6 : Method to Fulfil the Basic Human Aspirations

Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7 : Understanding Human being as the Co-existence of the self and the body.

Lecture 8 : Distinguishing between the Needs of the self and the body

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.

Lecture 9 : The body as an Instrument of the self

Lecture 10 : Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self

Lecture 11 : Harmony of the self with the body

Lecture 12 : Programme to ensure self-regulation and Health

Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III Harmony in the Family and Society (6 lectures and 3 tutorials for Practice session)

Lecture 13 : Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14 : 'Trust' – the Foundational Value in Relationship

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust

Lecture 15 : 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Lecture 16 : Other Feelings, Justice in Human-to-Human Relationship

Lecture 17 : Understanding Harmony in the Society

Lecture 18 : Vision for the Universal Human Order

Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV Harmony in the Nature/Existence (4 lectures and 2 tutorials for Practice session)

Lecture 19 : Understanding Harmony in the Nature

Lecture 20 : Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature

Lecture 21 : Realizing Existence as Co-existence at All Levels

Lecture 22 : The Holistic Perception of Harmony in Existence

Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

Lecture 23 : Natural Acceptance of Human Values

Lecture 24 : Definitiveness of (Ethical) Human Conduct

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Lecture 25 : A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 26 : Competence in Professional Ethics

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education

Lecture 27 : Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture 28 : Strategies for Transition towards Value-based Life and Profession

Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education

PS1 Sharing about Oneself

PS2 Exploring Human Consciousness

PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

PS4 Exploring the difference of Needs of self and body

PS5 Exploring Sources of Imagination in the self

PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society

PS7 Exploring the Feeling of Trust

PS8 Exploring the Feeling of Respect

PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:

Textbook and Teachers Manual

a. The Textbook

R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

b. The Teacher's Manual

R R Gaur, R Asthana, G P Bagaria, Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

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

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than "extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

Online Resources:

1. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf>
2. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf>
3. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf>
4. <https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf>
5. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf>
6. <https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDPSI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf>
7. <https://fdp-si.aicteindia.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf>
8. <https://www.studocu.com/in/document/kiet-group-of-institutions/universal-humanvalues/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385>
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

23ES21T02 – **ARTIFICIAL INTELLIGENCE**

Course category	Engineering Science (ES)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	II	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Pre-requisite:

1. Knowledge in Computer Programming.
2. A course on “Mathematical Foundations of Computer Science”.
3. Background in linear algebra, data structures and algorithms, and probability.

Course Objectives:

- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.
- To learn different knowledge representation techniques

COURSE CONTENTS

UNIT – I: Introduction:

AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT – II: Searching:

Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction, Game Playing-Adversarial search, Games, minimax algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT – III: Representation of Knowledge:

Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and Dempster-Shafer theory.

UNIT – IV: Logic concepts:

First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT – V: Expert Systems:

Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

Textbooks:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill.

Reference Books:

1. David Poole, Alan Mackworth, Randy Goebel," Computational Intelligence: a logical approach", Oxford University Press.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
4. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning.

Online Learning Resources:

1. <https://ai.google/>
2. https://swayam.gov.in/nd1_noc19_me71/preview

23CS21T01 – **ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS**

Course category	Professional Core (PC)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	II	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

The main objectives of the course is to

- provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

COURSE CONTENTS

UNIT – I:

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.

AVL Trees – Creation, Insertion, Deletion operations and Applications

B-Trees – Creation, Insertion, Deletion operations and Applications

UNIT – II:

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications

Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT – III:

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths

Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

UNIT – IV:

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

UNIT – V:

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem

NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

Text books:

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh 2nd Edition Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran 2nd Edition University Press

Reference Books:

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein & Tanenbaum, Pearson, 1995
5. Algorithms + Data Structures & Programs:, N.Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni & Mehta, Galgottia Pub.
7. Data structures in Java:, Thomas Standish, Pearson Education Asia

Online Learning Resources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. <http://peterindia.net/Algorithms.html>
3. Abdul Bari, 1. Introduction to Algorithms (youtube.com)

23CS21T02 – **OBJECT-ORIENTED PROGRAMMING THROUGH JAVA**

Course category	Professional Core (PC)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	II	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

The learning objectives of this course are to:

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java APIs for program development

COURSE CONTENTS

UNIT I: Object Oriented Programming: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators: Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if-else Expressions, Ternary Operator?., Switch Statement, Iteration Statements, while Expression, do-while Loop, for Loop, Nested for Loop, For-Each for Loop, Break Statement, Continue Statement.

UNIT II: Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III: Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Threedimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV: Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

UNIT V: String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Text Books:

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:

1. The complete Reference Java, 11th edition, Herbert Schildt, TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Resources:

1. <https://nptel.ac.in/courses/106/105/106105191/>
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

23CS21L01 – **ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB**

Course category	Professional Core (PC)	Credits	1.5
Course Type	Practicals	L-T-P	0-0-3
Year	II	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

The objectives of the course is to

- acquire practical skills in constructing and managing Data structures
- apply the popular algorithm design methods in problem-solving scenarios

COURSE CONTENTS

Experiments covering the Topics:

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

Sample Programs:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.

3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by
 - a) Adjacency Matrix
 - b) Adjacency Lists
5. Write a program for finding the bi-connected components in a given graph.
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
8. Implement Job sequencing with deadlines using Greedy strategy.
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Backtracking.
11. Use Backtracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, Sahni Sartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill

Online Learning Resources:

1. <http://cse01-iiith.vlabs.ac.in/>
2. <http://peterindia.net/Algorithms.html>

23CS21L02 – **OBJECT-ORIENTED PROGRAMMING THROUGH JAVA LAB**

Course category	Professional Core (PC)	Credits	1.5
Course Type	Practicals	L-T-P	0-0-3
Year	II	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

The aim of this course is to

- Practice object oriented programming in the Java programming language
- implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

COURSE CONTENTS

Experiments covering the Topics:

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

Sample Experiments:

Exercise – 1:

- a) Write a JAVA program to display default value of all primitive data type of JAVA
- b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2

- a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
- b) Write a JAVA program to sort for an element in a given list of elements using bubble sort
- c) Write a JAVA program using StringBuffer to delete, remove character.

Exercise - 3

- a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
- b) Write a JAVA program implement method overloading.
- c) Write a JAVA program to implement constructor.
- d) Write a JAVA program to implement constructor overloading.

Exercise - 4

- a) Write a JAVA program to implement Single Inheritance
- b) Write a JAVA program to implement multi level Inheritance
- c) Write a JAVA program for abstract class to find areas of different shapes

Exercise - 5

- a) Write a JAVA program give example for “super” keyword.
- b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
- c) Write a JAVA program that implements Runtime polymorphism

Exercise - 6

- a) Write a JAVA program that describes exception handling mechanism
- b) Write a JAVA program Illustrating Multiple catch clauses
 - Write a JAVA program for creation of Java Built-in Exceptions
 - Write a JAVA program for creation of User Defined Exception

Exercise - 7

- a) Write a JAVA program that creates threads by extending Thread class. First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds, (Repeat the same by implementing Runnable)
- b) Write a program illustrating **is Alive** and **join ()**
- c) Write a Program illustrating Daemon Threads.
- d) Write a JAVA program Producer Consumer Problem

Exercise – 8

- a) Write a JAVA program that import and use the user defined packages
- b) Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
- c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

Exercise – 9

- a) Write a java program that connects to a database using JDBC
- b) Write a java program to connect to a database using JDBC and insert values into it.
- c) Write a java program to connect to a database using JDBC and delete values from it.

Reference Book(s)

1. Java: A Beginner's Guide by Herbert Schildt
2. Head First Java by Kathy Sierra and Bert Bates
3. The Complete Reference Java 2 - Patrick Naughton & Hebert Schildt, 3rd Edition, TMH

Online Learning Resources:

1. <https://www.oracle.com/technetwork/java/javase/overview/index.html>.
2. <https://www.oracle.com/technetwork/java/javase/downloads/index.html>).
3. <https://docs.oracle.com/javase/tutorial/>.

23AM21S01 – PYTHON PROGRAMMING

Course category	Skill Enhancement Course (SEC)	Credits	2
Course Type	Practicals	L-T-P	0-1-2
Year	II	CIE Marks	30
Sem.	I	SEE Marks	70
		Total Marks	100

Course Objectives:

The main objectives of the course are to

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

COURSE CONTENTS

UNIT-I: History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
 - i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators
 - iv) Logical Operators v) Bit wise Operators vi) Ternary Operator
 - vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II: Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. Write a program to perform the given operations on a list:
 - i. Addition
 - ii. Insertion
 - iii. slicing
6. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III: Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. Write a program to sum all the items in a given dictionary.

UNIT-IV: Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of the items in the array.
5. Write a program to add, transpose and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V: Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array () function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
 - a) Apply head () function to the pandas data frame
 - b) Perform various data selection operations on Data Frame
7. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Reference Books:

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2ndEdition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Online Learning Resources/Virtual Labs:

1. <https://www.coursera.org/learn/python-for-applied-data-science-ai>
2. <https://www.coursera.org/learn/python?specialization=python#syllabus>

23BS21T01 – ENVIRONMENTAL SCIENCE

Course category	Audit Course (AC)	Credits	-
Course Type	Theory	L-T-P	2-0-0
Year	II	CIE Marks	0
Sem.	I	SEE Marks	0
		Total Marks	00

Course Objectives:

- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
- To save earth from the inventions by the engineers.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Grasp multi disciplinary nature of environmental studies and various renewable and non-renewable resources.	L2
CO2	Understand flow and bio-geo- chemical cycles and ecological pyramids.	L2
CO3	Understand various causes of pollution and solid waste management and related preventive measures.	L2
CO4	Understand the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.	L2
CO5	Illustrate the causes of population explosion, value education and welfare programmes.	L3

Note: L1- Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT – I

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation: Introduction and Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

Environmental Pollution: Definition, Cause, effects and control measures of:

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution

- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/ Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Textbooks:

1. Erach Bharucha, Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.
2. Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.
3. S. Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, SciTech Publications (India), Pvt. Ltd, 2010.

Reference Books:

1. Deeksha Dave and E. Sai Baba Reddy, Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
2. M. Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, 2014.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
4. J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
5. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.
6. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc23_hs155/preview
- https://www.edx.org/learn/environmental-science/rice-university-ap-renvironmental-science-part-3-pollution-andresources?index=product&objectID=course-3a6da9f2-d84c-4773-8388-1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science++Part+3%3A+Pollution+and+Resources&source=edX&product_category=cours&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmentalscience
- <http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-I/Data%20Files/pdf/lec07.pdf>
- <https://www.youtube.com/watch?v=5QxxaVfgQ3k>

23HM22T02 – **OPTIMIZATION TECHNIQUES**

Course category	Management Course (MC-1)	Credits	2
Course Type	Theory	L-T-P	2-0-0
Year	II	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Pre-requisite:

Course Objectives:

- To define an objective function and constraint functions in terms of design variables, and then state the optimization problem.
- To state single variable and multi variable optimization problems, without and with constraints.
- To explain linear programming technique to an optimization problem, define slack and surplus variables, by using Simplex method.
- To state transportation and assignment problem as a linear programming problem to determine Simplex method.
- To study and explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.	L1
CO2	Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.	L3
CO3	Apply and Solve transportation and assignment problem by using Linear programming Simplex method.	L3
CO4	Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions	L3
CO5	Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.	L3

Note: L1- Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT I: Introduction and Classical Optimization Techniques:

Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems.

Classical Optimization Techniques: Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions

UNIT II: Linear Programming:

Standard form of a linear programming problem, geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm.

UNIT III: Transportation Problem:

Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method, testing for optimality of balanced transportation problems, Special cases in transportation problem.

UNIT IV: Nonlinear Programming:

Unconstrained cases, One – dimensional minimization methods: Classification, Fibonacci method, Univariate method, steepest descent method. Constrained cases– Characteristics of a constrained problem, Classification, Basic approach of PenaltyFunction method, Basic approaches of Interior and Exterior penalty function methods.

UNIT V: Dynamic Programming:

Dynamic programming multistage decision processes, types, concept of sub optimization and the principle of optimality, computational procedure in dynamic programming, examples illustrating the calculus method of solution, examples illustrating the tabular method of solution.

Textbooks:

1. "Engineering optimization: Theory and practice", S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. "Introductory Operations Research", H.S. Kasene& K.D. Kumar, Springer (India), Pvt.LTd.

Reference Books:

1. “Optimization Methods in Operations Research and systems Analysis”, by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research, Dr. S.D. Sharma, Kedarnath, Ramnath & Co

23BS22T01 – **PROBABILITY AND STATISTICS**

Course category	Engineering Science/Basic Science (ES/BS)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	II	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Classify the concepts of data science and its importance	L2
CO2	Interpret the association of characteristics and through correlation and regression tool	L4
CO3	Apply discrete and continuous probability distributions	L3
CO4	Design the components of a classical hypothesis test	L6
CO5	Infer the statistical inferential methods based on small and large sampling tests	L4

Note: L1- Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT-I: Descriptive statistics and methods for data science:

Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data.

Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability – Skewness – Kurtosis.

UNIT-II: Correlation and Regression:

Correlation – Correlation coefficient – Rank correlation.

Linear Regression: Straight line – Multiple Linear Regression – Regression coefficients and properties.

Curvilinear Regression: Parabola – Exponential – Power curves.

UNIT-III: Probability and Distributions:

Probability– Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT-IV: Sampling Theory:

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only), Central limit theorem (without proof) – Point and Interval estimations – Maximum error of estimate -- Introduction to t , χ^2 and F-distributions.

UNIT-V: Tests of Hypothesis:

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two - tail tests.

Test of significance for large samples and Small Samples: Single and difference means – Single and two proportions – Student's t - test, F-test, χ^2 - test.

Text Books:

- **Miller and Freund's**, Probability and Statistics for Engineers, 7/e, Pearson, 2008.

- **S. C. Gupta and V.K. Kapoor**, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

- **Shron L. Myers, Keying Ye, Ronald E Walpole**, Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
- **Jay I. Devore**, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
- **Sheldon M. Ross**, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
- **Johannes Ledolter and Robert V. Hogg**, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

23AM22T01 – **MACHINE LEARNING**

Course category	Professional Core (PC)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	II	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

The objectives of the course is to

- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbours (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.

COURSE CONTENTS**UNIT-I: Introduction to Machine Learning:**

Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

UNIT-II: Nearest Neighbor-Based Models:

Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures, K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

UNIT-III: Models Based on Decision Trees:

Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression. The Bayes Classifier: Introduction to the Bayes Classifier, Bayes’ Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification Class Conditional Independence and Naive Bayes Classifier (NBC)

UNIT-IV: Linear Discriminants for Machine Learning:

Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

UNIT-V: Clustering:

Introduction to Clustering, Partitioning of Data, Matrix Factorization Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough KMeans Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

Text Books:

1. "Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana, Universities Press (India), 2024.

Reference Books:

1. "Machine Learning", Tom M. Mitchell, McGraw-Hill Publication, 2017.
2. "Machine Learning in Action", Peter Harrington, DreamTech.
3. "Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

23CS22T02 – **DATABASE MANAGEMENT SYSTEMS**

Course category	Professional Core (PC)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	II	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

The main objectives of the course is to

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

COURSE CONTENTS

UNIT I: Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

Unit II: Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT III: SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity

constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV: Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V: Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing:

Text Books:

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts, 5th edition, Silberschatz, Korth, Sudarsan, TMH (For Chapter 1 and Chapter 5)

Reference Books:

1. Introduction to Database Systems, 8th edition, C J Date, Pearson.
2. Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web-Resources:

1. <https://nptel.ac.in/courses/106/105/106105175/>
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

23AM22T01 – **DIGITAL LOGIC & COMPUTER ORGANIZATION**

Course category	Professional Core (PC)	Credits	3
Course Type	Theory	L-T-P	3-0-0
Year	II	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

The main objectives of the course is to

- provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

COURSE CONTENTS

UNIT – I:

Data Representation: Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

UNIT – II:

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters

Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture

UNIT – III:

Computer Arithmetic : Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

UNIT – IV:

The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

UNIT – V:

Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces

Textbooks:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th edition, McGraw Hill, 2023.
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education, 2018.
3. Computer Organization and Architecture, William Stallings, 11th Edition, Pearson, 2022.

Reference Books:

1. Computer Systems Architecture, M. Moris Mano, 3rd Edition, Pearson, 2017.
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier, 2004.
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson, 2003.

Online Learning Resources:

<https://nptel.ac.in/courses/106/103/106103068/>

23AM22L01 – **AI&ML LAB**

Course category	Professional Core (PC)	Credits	1.5
Course Type	Practicals	L-T-P	0-0-3
Year	II	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

- To learn about computing central tendency measures and Data preprocessing techniques
- To learn about classification and regression algorithms
- To apply different clustering algorithms for a problem.

Software Required: Python/R/Weka

Lab should cover the concepts studied in the course work, sample list of Experiments:

1. Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.
2. Apply the following Pre-processing techniques for a given dataset.
 - a. Attribute selection
 - b. Handling Missing Values
 - c. Discretization
 - d. Elimination of Outliers
3. Apply KNN algorithm for classification and regression
4. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results
5. Demonstrate decision tree algorithm for a regression problem
6. Apply Random Forest algorithm for classification and regression
7. Demonstrate Naïve Bayes Classification algorithm.
8. Apply Support Vector algorithm for classification
9. Demonstrate simple linear regression algorithm for a regression problem
10. Apply Logistic regression algorithm for a classification problem
11. Demonstrate Multi-layer Perceptron algorithm for a classification problem
12. Implement the K-means algorithm and apply it to the data you selected.
Evaluate performance by measuring the sum of the Euclidean distance of

each example from its class center. Test the performance of the algorithm as a function of the parameters K .

13. Demonstrate the use of Fuzzy C-Means Clustering

14. Demonstrate the use of Expectation Maximization based clustering algorithm

List of Text Books

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

List of Reference Books

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, 2nd edition, Springer series in statistics.
2. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

List of URLs, Text Books, Notes, Multimedia Content, etc

1. <https://medium.com/ml-research-lab/machine-learning-algorithm-overview>
2. <https://www.analyticsvidhya.com/blog/2017/09/common-machine-learning-algorithms/>

23CS22L02 – DATABASE MANAGEMENT SYSTEMS LAB

Course category	Professional Core (PC)	Credits	1.5
Course Type	Practicals	L-T-P	0-0-3
Year	II	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Experiments covering the topics:

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

Sample Experiments:

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
- 5.

- i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
 - ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISEAPPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and nonindexing techniques.
13. Write a Java program that connects to a database using JDBC
14. Write a Java program to connect to a database using JDBC and insert values into it
15. Write a Java program to connect to a database using JDBC and delete values from it

Text Books/Suggested Reading:

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

23AM22S01 – **FULL STACK DEVELOPMENT – 1**

Course category	Skill Enhancement Course (SEC)	Credits	2
Course Type	Practicals	L-T-P	0-1-2
Year	II	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

The main objectives of the course are to

- Make use of HTML elements and their attributes for designing static web pages
- Build a web page by applying appropriate CSS styles to HTML elements
- Experiment with JavaScript to develop dynamic web pages and validate forms

Experiments covering the Topics:

- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML 5 and Cascading Style Sheets, Types of CSS
- Selector forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying JavaScript - internal and external, I/O, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events
- Node.js

Sample Experiments:

1. Lists, Links and Images

- a. Write a HTML program, to explain the working of lists.

Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.

- b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.

- c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.
- d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

2. HTML Tables, Forms and Frames

- Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>, <td> and attributes: border, rowspan, colspan)
- Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).
- Write a HTML program, to explain the working of forms by designing Registration form. (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).
- Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame image, second frame paragraph, third frame hyperlink. And also make sure of using "no frame" attribute such that frames to be fixed).

3. HTML 5 and Cascading Style Sheets, Types of CSS

- a. Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, <footer>, <header>, <main>, <nav>, <section>, <div>, tags.
- b. Write a HTML program, to embed audio and video into HTML web page.
- c. Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value).

4. Selector forms

- a. Write a program to apply different types of selector forms
 - Simple selector (element, id, class, group, universal)
 - Combinator selector (descendant, child, adjacent sibling, general sibling)
 - Pseudo-class selector
 - Pseudo-element selector
 - Attribute selector

5. CSS with Color, Background, Font, Text and CSS Box Model

- a. Write a program to demonstrate the various ways you can reference a color in CSS.
- b. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
- c. Write a program using the following terms related to CSS font and text:
 - i. font-size
 - ii. font-weight
 - iii. font-style
 - iv. text-decoration
 - v. text-transformation
 - vi. text-alignment
- d. Write a program, to explain the importance of CSS Box model using
 - i. Content
 - ii. Border
 - iii. Margin
 - iv. Padding

6. Applying JavaScript - internal and external, I/O, Type Conversion

- a. Write a program to embed internal and external JavaScript in a web page.
- b. Write a program to explain the different ways for displaying output.
- c. Write a program to explain the different ways for taking input.
- d. Create a webpage which uses prompt dialogue box to ask a voter for his name and age.
Display the information in table format along with either the voter can vote or not

7. JavaScript Pre-defined and User-defined Objects

- a. Write a program using document object properties and methods.
- b. Write a program using window object properties and methods.
- c. Write a program using array object properties and methods.
- d. Write a program using math object properties and methods.
- e. Write a program using string object properties and methods.
- f. Write a program using regex object properties and methods.
- g. Write a program using date object properties and methods.
- h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

8. JavaScript Conditional Statements and Loops

- a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
- b. Write a program to display week days using switch case.

- c. Write a program to print 1 to 10 numbers using for, while and do-while loops.
- d. Write a program to print data in object using for-in, for-each and for-of loops
- e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e., $1^3 + 5^3 + 3^3 = 153$]
- f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1-10's, 1-2's & 1-1's)

9. Javascript Functions and Events

- a. Design a appropriate function should be called to display
 - Factorial of that number
 - Fibonacci series up to that number
 - Prime numbers up to that number
 - Is it palindrome or not
- b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
 4. Factorial of that number
 5. Fibonacci series up to that number
 6. Prime numbers up to that number
 7. Is it palindrome or not
- c. Write a program to validate the following fields in a registration page
 - i. Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
 - ii. Mobile (only numbers and length 10 digits)
 - iii. E-mail (should contain format like [xxxxxxx@xxxxxx.xxx](#))

Text Books:

1. Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
2. Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

Web Links:

1. <https://www.w3schools.com/html>
2. <https://www.w3schools.com/css>
3. <https://www.w3schools.com/js/>
4. <https://www.w3schools.com/nodejs>
5. <https://www.w3schools.com/typescript>

23BS22L01 – **DESIGN THINKING & INNOVATION**

Course category	Basic Science & Humanities (BS&H)	Credits	2
Course Type	Practicals	L-T-P	1-0-2
Year	II	CIE Marks	30
Sem.	II	SEE Marks	70
		Total Marks	100

Course Objectives:

The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process.

Course Outcomes:

Course Outcomes (COs)		Bloom's Taxonomy Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Define the concepts related to design thinking.	L1
CO2	Explain the fundamentals of Design Thinking and innovation.	L2
CO3	Apply the design thinking techniques for solving problems in various sectors.	L3
CO4	Analyse to work in a multidisciplinary environment.	L4
CO5	Evaluate the value of creativity.	L5

Note: L1- Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create

COURSE CONTENTS

UNIT-I Introduction to Design Thinking: Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT-II Design Thinking Process: Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT-III Innovation: Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT-IV Product Design: Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT-V Design Thinking in Business Processes: Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.

2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Online Learning Resources:

- <https://nptel.ac.in/courses/110/106/110106124/>
- <https://nptel.ac.in/courses/109/104/109104109/>
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview



MALINENI LAKSHMAIAH WOMEN'S ENGINEERING COLLEGE

(AUTONOMOUS)

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B. Tech CSE (AI&ML)

COURSE STRUCTURE & SYLLABUS

B.Tech. – III Year I Semester

S.No.	Category	Title	L	T	P	C
1	Professional Core	Information Retrieval Systems	3	0	0	3
2	Professional Core	Computer Networks	3	0	0	3
3	Professional Core	Operating Systems	3	0	0	3
4	Professional Elective-I	1. Software Engineering 2. Cloud Computing 3. Internet of Things 4. Exploratory Data Analysis with Python 5. Automata Theory & Compiler Design	3	0	0	3
5	Open Elective- I	Offered by Other Department / Entrepreneurship Development & Venture Creation	3	0	0	3
6	Professional Core	Information Retrieval Lab	0	0	3	1.5
7	Professional Core	Computer Networks Lab	0	0	3	1.5
8	Skill Enhancement course	Full Stack development -2 /SWAYAM Plus-Data Engineer/AI Engineer/	0	1	2	2
9	ES	Tinkering Lab (User Interface Design using Flutter)	0	0	2	1
10	Evaluation of Community Service Project Internship		-	-	-	2
Total			15	1	10	23
MC	Student may select from the Same Minor Pool		3	0	3	4.5
MC	Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)		3	0	0	3
HC	Student may select from the Same Honors Pool		3	0	0	3
HC	Student may select from the Same Honors Pool		3	0	0	3



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B. Tech CSE (AI&ML)

COURSE STRUCTURE & SYLLABUS

B. Tech.– III Year II Semester

S.No.	Category	Title	L	T	P	C
1	Professional Core	Natural Language Processing	3	0	0	3
2	Professional Core	Deep Learning	3	0	0	3
3	Professional Core	Data Visualization	3	0	0	3
4	Professional Elective-II	1. Software Testing Methodology 2. Cryptography & Network Security 3. DevOps 4. Recommender Systems 5. Any of the 12-Week SWAYAM /NPTEL Course suggested by the BoS	3	0	0	3
5	Professional Elective-III	1. Software Project Management 2. Mobile Adhoc Networks 3. Computer Vision 4. NoSQL Databases 5. Any of the 12-Week SWAYAM /NPTEL Course suggested by the BoS	3	0	0	3
6	Open Elective - II	Offered by Other Department	3	0	0	3
7	Professional Core	Deep Learning Lab	0	0	3	1.5
8	Professional Core	Data Visualization Lab	0	0	3	1.5
9	Skill Enhancement course	Soft skills	0	1	2	2
10	Audit Course	Technical Paper Writing & IPR	2	0	0	-
Total			20	1	8	23
Mandatory Industry Internship / Mini Project of 08 weeks duration during summer vacation						
MC	Student may select from the same minor pool		3	0	3	4.5
MC	Minor Course (Student may select from the same specialized minors pool)		3	0	0	3
HC	Student may select from the same honor's pool		3	0	0	3
HC	Honors Course (Student may select from the honors pool)		3	0	0	3



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B. Tech CSE (AI&ML)

COURSE STRUCTURE & SYLLABUS

****Under Industry Internship interested students can pursue SWAYAM Plus courses viz, Hands on Masterclass on Data Analytics OR Artificial Intelligence for Real –World Applications.***

Note: Student need to do at least ONE MOOC Course (3 credits out of 160 credits) to meet the mandatory requirement (11th criteria, as per R23 Regulations)

Open Electives, offered to other department students:

Open Elective I: Operating Systems / Computer Organization and Architecture

Open Elective II: Database Management Systems

Open Elective III: Object Oriented Programming Through Java

Open Elective IV: Computer Networks / Software Engineering / IOT Based Smart Systems



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B. Tech CSE (AI&ML)

COURSE STRUCTURE & SYLLABUS

III B. Tech I Semester	INFORMATION RETRIEVAL SYSTEMS	L	T	P	C
		3	0	0	3

Unit I: Introduction to Information storage and retrieval systems: Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation.

Introduction to Data structures and algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

Unit II: Inverted Files and Signature Files: Introduction, Structures used in Inverted Files, building an Inverted file using a sorted array, Modifications to the Basic Techniques.

Signature Files: Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

Unit III: New Indices for Text, Lexical Analysis and Stoplists: PAT Trees and PAT Arrays:

Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICA Trees, PAT representation as Arrays. Stoplists.

Unit IV: Stemming Algorithms and Thesaurus Construction: Types of Stemming algorithms, Experimental Evaluations of Stemming, stemming to Compress Inverted Files.

Thesaurus Construction: Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

Unit V: String Searching Algorithms: Introduction, Preliminaries, The Naive Algorithm, The Knutt-Morris-Pratt Algorithm, The Boyer-Moore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm.

TEXT BOOKS

1. Modern Information Retrieval, Ricardo Baeza-Yates, Neto, PEA, 2007.
2. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark Academic Press, 2000.



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B. Tech CSE (AI&ML)

COURSE STRUCTURE & SYLLABUS

III B. Tech I Semester	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives:

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

UNIT I: Introduction: Types of Computer Networks, Reference Models- The OSI Reference Model, The TCP/IP Reference Model, A Critique of the OSI Model and Protocols, A Critique of the TCP/IP Reference Model. History of Internet.

UNIT II: The Data Link Layer: Transmission Media, Guided and Un-guided media, Data Link Layer Design Issues, Services Provided to the Network Layer, Error detecting and Error Correcting codes, Elementary Data Link Protocols, Sliding Window Protocols, HDLC, PPP. Multiple Access Protocols Wired Lans: Ethernet, Fast Ethernet, Gigabit Ethernet

UNIT III: The Network Layer: Network Layer Design Issues, Routing Algorithms, Congestion, Congestion control algorithms. The Network Layer in the Internet, The IP Version 4 Protocol, IP Addresses-Classful, CIDR, NAT, IP Version 6 Protocol, Transition from IPV4 to IPV6

UNIT IV: The Transport Layer: The Transport Layer Services, Transport Layer Protocols: UDP, TCP and SCTP

UNIT V: The Application Layer: The World Wide Web, HTTP, Domain Name Space, Remote Logging, Electronic Mail and File Transfer

Text Books:

1. "Computer Networks", Andrew S Tanenbaum, David J Wetherall, 5th Edition, Pearson
2. "Data Communications and Networking", Behrouz A Forouzan, 4th Edition, Tata McGraw Hill Education

Reference Books:

1. "Data and Computer Communication", William Stallings, Pearson
2. "TCP/IP Protocol Suite", Behrouz Forouzan, McGraw Hill.



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COURSE STRUCTURE & SYLLABUS

III B. Tech I Semester	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

UNIT-I: Operating Systems Overview: Introduction, operating system functions, operating systems operations, Computing environments, Free and Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, operating system Design and Implementation, operating system structure, Building and Booting an Operating System, Operating system debugging

UNIT-II: Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication. Threads and Concurrency: Multithreading models, Thread libraries, Threading issues. CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

UNIT-III: Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, semaphores, Monitors, Classic problems of Synchronization. Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT-IV: Memory- Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping. Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement Allocation of frames, Thrashing Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT-V: File System: File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing. Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix

Text Books:

1. Operating System Concepts, Silberschatz A, GalvinPB, GagneG, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum AS, 4th Edition, Pearson, 2016

Reference Books:

1. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D. M Dhamdhare, 3rd Edition, McGraw- Hill, 2013

Online Learning Resources:

1. <https://nptel.ac.in/courses/106/106/106106144/>
2. <http://peterindia.net/OperatingSystems.html>



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COURSE STRUCTURE & SYLLABUS

III B. Tech I Semester	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

The objectives of this course are to introduce

- Software life cycle models, Software requirements and SRS document.
- Project Planning, quality control and ensuring good quality software.
- Software Testing strategies, use of CASE tools, Implementation issues, validation & verification procedures.

UNIT-I: Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

Software Life Cycle Models: Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.

UNIT-II: Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.
Requirements Analysis and Specification: Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

UNIT-III: Software Design: Overview of the design process, how to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design. Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2)

Function-Oriented Software Design: Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.

User Interface Design: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

UNIT-IV: Coding and Testing: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, testing object-oriented programs, Smoke testing, and Some general issues associated with testing.

Software Reliability and Quality Management: Software reliability. Statistical testing, Software quality Software quality management system, ISO9000, SEI Capability maturity model. Few other Important quality standards, and Six Sigma.



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UNIT-V: Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.

Software Maintenance: Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.

Software Reuse: Reuse-definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.

Text Books:

1. Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI.
2. Software Engineering A Practitioner's Approach, Roger S. Pressman, 9th Edition, McGraw Hill International Edition.

Reference Books:

1. Software Engineering, Ian Sommerville, 10th Edition, Pearson.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

e- Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105182/>
- 2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
- 3) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview



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COURSE STRUCTURE & SYLLABUS

III B. Tech I Semester	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

Course Objectives:

- To explain the evolving utility computing model called cloud computing.
- To introduce the various levels of services offered by cloud.
- To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
- To emphasize the security and other challenges in cloud computing.
- To introduce the advanced concepts such as containers, serverless computing and cloud-centric Internet of Things.

UNIT -I: Introduction to Cloud Computing Fundamentals: Cloud computing at a glance, defining a cloud, cloud computing reference model, types of services (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google App Engine).

UNIT-II: Cloud Enabling Technologies: Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication, technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), Web services, virtualization.

UNIT-III: Virtualization and Containers: Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration, Docker Swarm and Kubernetes, public cloud VM (e.g. Amazon EC2) and container (e.g. Amazon Elastic Container Service) offerings.

UNIT-IV: Cloud computing challenges: Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, cloud shared responsibility model, security in cloud deployment models.

UNIT -V: Advanced concepts in cloud computing: Serverless computing, Function-as-a-Service, serverless computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. OpenFaaS) serverless platforms, Internet of Things (IoT), applications, cloud-centric IoT and layers, edge and fog computing, DevOps, infrastructure-as-code, quantum cloud computing.



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Text Books:

1. Mastering Cloud Computing, 2nd edition, RajkumarBuyya, Christian Vecchiola, ThamaraiSelvi, ShivanandaPoojara, Satish N. Srirama, Mc Graw Hill, 2024.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

Reference Books:

1. Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier, 2018.
2. Essentials of cloud Computing, K. Chandrasekhran, CRC press, 2014.
3. Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)



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COURSE STRUCTURE & SYLLABUS

III B. Tech I Semester	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

Course Objectives:

- Vision and Introduction to Internet of Things(IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

UNIT I: The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles for Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT II: Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High- level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III: Design Principles for the Web Connectivity for Connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for Connected-Devices.

UNIT IV: Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT V: Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

Reference Books:

1. **Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley**
2. Getting Started with the Internet of Things, CunoPfister ,Oreilly



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COURSE STRUCTURE & SYLLABUS

III B. Tech I Semester	EXPLORATORY DATA ANALYSIS WITH PYTHON	L	T	P	C
		3	0	0	3

Course Objectives: The main objectives of the course are to

- Introduce the fundamentals of Exploratory Data Analysis
- Cover essential exploratory techniques for understanding multivariate data by
- Summarizing it through statistical methods and graphical methods.
- Evaluate the Models and select the best model

UNIT-I: Exploratory Data Analysis Fundamentals: Understanding data science, the significance of EDA, steps in EDA, Making sense of data, Numerical data, Categorical data, Measurement scales, Comparing EDA with classical and Bayesian analysis, Software tools available for EDA, Getting started with EDA.

Sample Experiments:

1. a) Download Dataset from Kaggle using the following link :
<https://www.kaggle.com/datasets/sukhmanibedi/cars4u>
 b) Install python libraries required for Exploratory Data Analysis (numpy, pandas, matplotlib, seaborn)
2. Perform Numpy Array basic operations and Explore Numpy Built-in functions.
3. Loading Dataset into pandas dataframe
4. Selecting rows and columns in the dataframe

UNIT-II: Visual Aids for EDA: Technical requirements, Line chart, Bar charts, Scatter plot using seaborn, Polar chart, Histogram, Choosing the best chart

Case Study: EDA with Personal Email, Technical requirements, Loading the dataset, Data transformation, Data cleansing, Applying descriptive statistics, Data refactoring, Data analysis.

Sample Experiments:

1. Apply different visualization techniques using sample dataset
 - a. Line Chart b. Bar Chart c. Scatter Plots d. Bubble Plot
2. Generate Scatter Plot using seaborn library for iris dataset
3. Apply following visualization Techniques for a sample dataset
 - a. Area Plot b. Stacked Plot c. Pie chart d. Table Chart
4. Generate the following charts for a dataset.
 - a. Polar Chart b. Histogram c. Lollipop chart
5. Case Study: Perform Exploratory Data Analysis with Personal Email Data

UNIT-III: Data Transformation: Merging database-style data frames, Concatenating along with an axis, Merging on index, Reshaping and pivoting, Transformation techniques, Handling missing data, Mathematical operations with NaN, Filling missing values, Discretization and binning, Outlier detection and filtering, Permutation and random sampling, Benefits of data transformation, Challenges.

Sample Experiments:



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1. Perform the following operations
 - a) Merging Dataframes b) Reshaping with Hierarchical Indexing
 - c) Data Deduplication d) Replacing Values
2. Apply different Missing Data handling techniques
 - a) NaN values in mathematical Operations b) Filling in missing data
 - c) Forward and Backward filling of missing values d) Filling with index values
 - e) Interpolation of missing values
3. Apply different data transformation techniques
 - a) Renaming axis indexes b) Discretization and Binning
 - c) Permutation and Random Sampling d) Dummy variables

UNIT-IV : Descriptive Statistics: Distribution function, Measures of central tendency, Measures of dispersion, Types of kurtosis, Calculating percentiles, Quartiles, Grouping Datasets, Correlation, Understanding univariate, bivariate, multivariate analysis, Time Series Analysis

Sample Experiments:

1. Study the following Distribution Techniques on a sample data
 - a) Uniform Distribution b) Normal Distribution c) Gamma Distribution
 - d) Exponential Distribution e) Poisson Distribution f) Binomial Distribution
2. Perform Data Cleaning on a sample dataset.
3. Compute measure of Central Tendency on a sample dataset
 - a) Mean b) Median c) Mode
4. Explore Measures of Dispersion on a sample dataset
 - a) Variance b) Standard Deviation c) Skewness d) Kurtosis
5. a) Calculating percentiles on sample dataset
 - b) Calculate Inter Quartile Range(IQR) and Visualize using Box Plots
6. Perform the following analysis on automobile dataset.
 - a) Bivariate analysis b) Multivariate analysis
7. Perform Time Series Analysis on Open Power systems dataset

UNIT-V: Model Development and Evaluation: Unified machine learning workflow, Data preprocessing, Data preparation, Training sets and corpus creation, Model creation and training, Model evaluation, Best model selection and evaluation, Model deployment Case Study: EDA on Wine Quality Data Analysis

Sample Experiments:

1. Perform hypothesis testing using stats models library
 - a) Z-Test b) T-Test
2. Develop model and Perform Model Evaluation using different metrics such as prediction score, R2 Score, MAE Score, MSE Score.
3. Case Study: Perform Exploratory Data Analysis with Wine Quality Dataset



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Text Book:

1. Suresh Kumar Mukhiya, Usman Ahmed, Hands-On Exploratory Data Analysis with Python, Packt Publishing, 2020.

Reference Books:

1. Ronald K. Pearson, Exploratory Data Analysis Using R, CRC Press, 2020
2. RadhikaDatar, Harish Garg, Hands-On Exploratory Data Analysis with R: Become an expert in exploratory data analysis using R packages, 1st Edition, Packt Publishing, 2019

Web References:

1. <https://github.com/PacktPublishing/Hands-on-Exploratory-Data-Analysis-with-Python>
2. <https://www.analyticsvidhya.com/blog/2022/07/step-by-step-exploratory-dataanalysis-eda-using-python/#h-conclusion>
3. <https://github.com/PacktPublishing/Exploratory-Data-Analysis-with-Python-Cookbook>



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COURSE STRUCTURE & SYLLABUS

III B. Tech I Semester	AUTOMATA THEORY AND COMPILER DESIGN	L	T	P	C
		3	0	0	3

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 ϵ -transitions to NFA without ϵ -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 R18 B.Tech. CS&D Syllabus JNTU Hyderabad

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



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COURSE STRUCTURE & SYLLABUS

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, 2nd Edition, Pearson.
3. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekar, 2nd Edition, PHI.

REFERENCE BOOKS:

1. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
2. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
3. lex&yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
4. Compiler Construction, Kenneth C. Loudon, Thomson. Course Technology.



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COURSE STRUCTURE & SYLLABUS

III B. Tech I Semester	INFORMATION LAB	RETRIEVAL	L	T	P	C
			0	0	3	1.5

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

- Compute the similarity between text documents
- Apply all pre-processing steps for text-data
- Implement classification of text documents.
- Perform document clustering using different algorithms.
- Implement Page Rank algorithm for any network.

Programming Language: Python/R

Lab Experiments:

1. Representation of a Text Document in Vector Space Model and Computing Similarity between two documents.
2. Pre-processing of a Text Document: stop word removal and stemming
3. Construction of an Inverted Index for a given document collection comprising of at least 50 documents with a total vocabulary size of at least 1000 words.
4. Classification of a set of Text Documents into known classes (You may use any of the Classification algorithms like Naive Bayes, Max Entropy, Rochio's, Support Vector Machine). Standard Datasets will have to be used to show the results.
5. Text Document Clustering using K-means. Demonstrate with a standard dataset and compute performance measures- Purity, Precision, Recall and F-measure.
6. Crawling/ Searching the Web to collect news stories on a specific topic (based on user input). The program should have an option to limit the crawling to certain selected websites only.
7. To parse XML text, generate Web graph and compute topic specific page rank
8. Implement Matrix Decomposition and LSI for a standard dataset.
9. Mining Twitter to identify tweets for a specific period (and/or from a geographical location) and identify trends and named entities.
10. Implementation of PageRank on Scholarly Citation Network.



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COURSE STRUCTURE & SYLLABUS

III B. Tech I Semester	COMPUTER NETWORKS LAB	L	T	P	C
		0	0	3	1.5

List of Experiments:

- Study of Network devices in detail and connect the computers in Local Area Network.
- Write a Program to implement the data link layer framing methods such as
 - Character stuffing
 - bit stuffing.
- Write a Program to implement data link layer framing method checksum.
- Write a program for Hamming Code generation for error detection and correction.
- Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
- Write a Program to implement Sliding window protocol for Goback N.
- Write a Program to implement Sliding window protocol for Selective repeat.
- Write a Program to implement Stop and Wait Protocol.
- Write a program for congestion control using leaky bucket algorithm
- Write a Program to implement Dijkstra's algorithm to compute the Shortest path through a graph.
- Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
- Write a Program to implement Broadcast tree by taking subnet of hosts.
- Wireshark
 - Packet Capture Using Wire shark
 - Starting Wire shark
 - Viewing Captured Traffic
 - Analysis and Statistics & Filters.
- How to run Nmap scan
- Operating System Detection using Nmap
- Do the following using NS2 Simulator
 - NS2 Simulator-Introduction
 - Simulate to Find the Number of Packets Dropped
 - Simulate to Find the Number of Packets Dropped by TCP/UDP
 - Simulate to Find the Number of Packets Dropped due to Congestion
 - Simulate to Compare Data Rate& Throughput.



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COURSE STRUCTURE & SYLLABUS

III B. Tech I Semester	FULL STACK DEVELOPMENT- 2	L	T	P	C
		0	0	2	1

Course Objectives:

The main objectives of the course are to

- Make use of router, template engine and authentication using sessions to develop application in Express JS.
- Build a single page application using RESTful APIs in ExpressJS
- Apply router and hooks in designing ReactJS application
- Make use of Mongo DB queries to perform CRUD operations on document database

Experiments covering the Topics:

- Typescript
- ExpressJS – Routing, HTTP Methods, Middleware, Templating, Form Data
- ExpressJS – Cookies, Sessions, Authentication, Database, RESTful APIs
- ReactJS – Render HTML, JSX, Components – function & Class, Props and States, Styles, Respond to Events
- ReactJS – Conditional Rendering, Rendering Lists, React Forms, React Router, Updating the Screen
- ReactJS – Hooks, Sharing data between Components, Applications – To-do list and Quiz
- MongoDB – Installation, Configuration, CRUD operations, Databases, Collections and Records

Sample Experiments:

1. Typescript

- Write a program to understand simple and special types.
- Write a program to understand function parameter and return types.
- Write a program to show the importance with Arrow function. Use optional, default and REST parameters.
- Write a program to understand the working of typescript with class, constructor, properties, methods and access specifiers.
- Write a program to understand the working of namespaces and modules.
- Write a program to understand generics with variables, functions and constraints.

2. Express JS – Routing, HTTP Methods, Middleware.

- Write a program to define a route, Handling Routes, Route Parameters, Query Parameters and URL building.
- Write a program to accept data, retrieve data and delete a specified resource using http methods.
- Write a program to show the working of middleware.

3. Express JS – Templating, Form Data

- Write a program using templating engine.
- Write a program to work with form data.

4. Express JS – Cookies, Sessions, Authentication

- Write a program for session management using cookies and sessions.
- Write a program for user authentication.



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5. ExpressJS – Database, RESTful APIs

- Write a program to connect MongoDB database using Mongoose and perform CRUD operations.
- Write a program to develop a single page application using RESTful APIs.

6. ReactJS – Render HTML, JSX, Components – function & Class

- Write a program to render HTML to a web page.
- Write a program for writing markup with JSX.
- Write a program for creating and nesting components (function and class).

7. ReactJS – Props and States, Styles, Respond to Events

- Write a program to work with props and states.
- Write a program to add styles (CSS & Sass Styling) and display data.
- Write a program for responding to events.

8. ReactJS – Conditional Rendering, Rendering Lists, React Forms

- Write a program for conditional rendering.
- Write a program for rendering lists.
- Write a program for working with different form fields using react forms.

9. ReactJS – React Router, Updating the Screen

- Write a program for routing to different pages using react router.
- Write a program for updating the screen.

10. ReactJS – Hooks, Sharing data between Components

- Write a program to understand the importance of using hooks.
- Write a program for sharing data between components.

11. ReactJS Applications – To-do list and Quiz

- Design to-do list application.

12. MongoDB – Installation, Configuration, CRUD operations

- Install MongoDB and configure ATLAS
- Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove()

13. MongoDB – Databases, Collections and Records

- Write MongoDB queries to Create and drop databases and collections.
- Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().

14. Augmented Programs: (Any 2 must be completed)

- Design a to-do list application using NodeJS and ExpressJS.
- Design a Quiz app using ReactJS.
- Complete the MongoDB certification from MongoDB University website.

Text Books:

- Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
- Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasani Subramanian, 2nd edition, APress, O'Reilly.



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COURSE STRUCTURE & SYLLABUS

Web Links:

1. ExpressJS - <https://www.tutorialspoint.com/expressjs>
2. ReactJS - <https://www.w3schools.com/REACT> (and) <https://react.dev/learn#>
3. MongoDB - <https://learn.mongodb.com/learning-paths/introduction-to-mongodb>



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COURSE STRUCTURE & SYLLABUS

III B.Tech I Semester	TINKERING LAB (USER INTERFACE DESIGN USING FLUTTER)	L	T	P	C
		0	0	3	1.5

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

List of Experiments:

Students need to implement the following experiments

1. 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.
2. Rap Payne, Beginning App Development with Flutter: Create Cross-Platform Mobile Apps 1st Edition, Apres.



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

Course Objectives: This course introduces the fundamental concepts and techniques of natural language processing (NLP).

- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
- Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes:

After completion of this course

- Demonstrate a given text with basic Language features
- To design an innovative application using NLP components
- Explain a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

UNIT I: INTRODUCTION: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT II: WORD LEVEL ANALYSIS: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III: SYNTACTIC ANALYSIS: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures

UNIT IV: SEMANTICS AND PRAGMATICS: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.



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UNIT V: DISCOURSE ANALYSIS AND LEXICAL RESOURCES: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text Books:

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2nd Edition, Daniel Jurafsky, James H. Martin -Pearson Publication, 2014.
2. Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein and Edward Loper, O'Reilly Media, 2009.

Reference Books:

1. Language Processing with Java and Ling Pipe Cookbook, 1st Edition, Breck Baldwin, Atlantic Publisher, 2015.
2. Natural Language Processing with Java, 2nd Edition, Richard M Reese, O'Reilly Media, 2015.
3. Handbook of Natural Language Processing, Second, Nitin Indurkha and Fred J. Damerau, Chapman and Hall/CRC Press, 2010. Edition
4. Natural Language Processing and Information Retrieval, 3rd Edition, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press, 2008



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	DEEP LEARNING	L	T	P	C
		3	0	0	3

Course Objectives:

1. The objective of this course is to cover the fundamentals of neural networks as well as some advanced topics such as recurrent neural networks, long short-term memory cells and convolution neural networks.

Course Outcomes:

After completion of course, students would be able to:

- Explore feed forward networks and Deep Neural networks
- Mathematically understand the deep learning approaches and paradigms
- Apply the deep learning techniques for various applications

UNIT-I: Basics- Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability, Convergence theorem for Perceptron Learning Algorithm.

UNIT-II: Feed forward Networks- Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, auto encoders.

Deep Neural Networks: Difficulty of training deep neural networks, Greedy layer wise training.

UNIT-III: Better Training of Neural Networks- Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization).

UNIT IV: Recurrent Neural Networks- Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs.

Convolutional Neural Networks: LeNet, AlexNet. Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.

UNITV: Recent trends- Variational Auto encoders, Transformers, GPT Applications: Vision, NLP, Speech

Text Books:

1. Deep Learning, Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.

Reference Books:

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007
3. Deep Learning with Python, François Chollet, Manning Publications, 2017



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	DATA VISUALIZATION	L	T	P	C
		3	0	0	3

Course Objective:

- Familiarize students with the basic and advanced techniques of information visualization and scientific visualization
- Learn key techniques of the visualization process
- A detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques

UNIT-1: Introduction: What Is Visualization? History of Visualization, Relationship between Visualization and Other Fields the Visualization Process, Introduction of visual perception, visual representation of data, Gestalt principles, information overloads.

UNIT-II: Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT-III: Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT-IV: Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

UNIT-V: Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations **Recent trends** in various perception techniques, various visualization techniques, data structures used in data visualization.

TEXTBOOK:

1. WARD, GRINSTEIN, KEIM. Interactive Data Visualization: Foundations, Techniques, and Applications. Natick : A K Peters, Ltd.
2. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.

Resources:

1. https://kdd.cs.ksu.edu/Courses/CIS536/Lectures/Slides/Lecture-34-Main_6up.pdf



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	SOFTWARE TESTING METHODOLOGY	L	T	P	C
		3	0	0	3

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.

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:

- Software Testing techniques - BarisBeizer, Dreamtech, second edition.
- Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

Reference Books:

- The craft of software testing - Brian Marick, Pearson Education.
- Software Testing Techniques – SPD(Oreille)
- Software Testing in the Real World – Edward Kit, Pearson.
- Effective methods of Software Testing, Perry, John Wiley.
- Art of Software Testing – Meyers, John Wiley.



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	CRYPTOGRAPHY & NETWORK SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. Explain the objectives of information security
2. Explain the importance and application of each of confidentiality, integrity, authentication and availability
3. Understand the basic categories of threats to computers and networks
4. Discusses the Mathematics of Cryptography
5. Discuss the fundamental ideas of Symmetric and Asymmetric Cryptographic Algorithms
6. Discusses the Network layer, Transport Layer and Application Layer Protocols Enhanced security mechanisms

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. Classical Encryption Techniques-symmetric cipher model, Substitution techniques, Transposition techniques, Rotor Machines, Steganography.

UNIT – II: Introduction to Symmetric Cryptography: Algebraic Structures-Groups, Rings, Fields, $GF(2^n)$ fields, Polynomials.

Mathematics of Asymmetric cryptography: Primes, checking for Primness, Euler's phi-functions, Fermat's Little Theorem, Euler's Theorem, Generating Primes, Primality Testing, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm.

UNIT – III: Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, IDEA, Block cipher operation, Stream ciphers: RC4, RC5

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Elgamal Cryptographic system, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

UNIT – IV: Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithms (SHA)

Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MAC'S, MAC'S Based On Hash Functions: HMAC, MAC'S Based On Block Ciphers: DAA and CMAC

Digital Signatures: Digital Signatures, Elgamal Digital Signature Scheme, Elliptic Curve Digital Signature Algorithm, RSA-PSS Digital Signature Algorithm.



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UNIT – V: Network and Internet Security: Transport-Level Security: Web Security Considerations, Transport Level Security, HTTPS, SSH.

IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Authentication Header Protocol.

Electronic-Mail Security: Internet-mail Security, Email Format, Email Threats and Comprehensive Email Security, S/MIME, PGP.

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 7th Edition, 2017
2. Cryptography and Network Security: Behrouz A. Forouzan Debdeep, Mc Graw Hill, 3rd Edition, 2015

REFERENCE BOOKS:

1. Cryptography and Network Security: AtulKahate, Mc Graw Hill, 3rd Edition
2. Introduction to Cryptography with Coding Theory: Wade Trappe, Lawrence C. Washington, Pearson.
3. Modern Cryptography: Theory and Practice ByWenbo Mao. Pearson.



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	DEVOPS	L	T	P	C
		3	0	3	4.5

Course Objectives: The main objectives of this course are to:

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. Implement automated system update and DevOps lifecycle.

UNIT-I: Introduction to DevOps: Introduction to SDLC, Agile Model. Introduction to DevOps. DevOps Features, DevOps Architecture, DevOps Lifecycle, Understanding Workflow and principles, Introduction to DevOps tools, Build Automation, Delivery Automation, Understanding Code Quality, Automation of CI/ CD. Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT-II: Source Code Management(GIT): The need for source code control, The history of source code management, Roles and code, source code management system and migrations. What is Version Control and GIT, GIT Installation, GIT features, GIT workflow, working with remote repository, GIT commands, GIT branching, GIT staging and collaboration.

UNIT TESTING-CODE COVERAGE: Junit, n Unit& Code Coverage with Sonar Qube, SonarQube - Code Quality Analysis.

UNIT-III: Build Automation - Continuous Integration (CI): Build Automation, what is CI Why CI is Required, CI tools, Introduction to Jenkins (With Architecture), Jenkins workflow, Jenkins master slave architecture, Jenkins Pipelines, **PIPELINE BASICS** - Jenkins Master, Node, Agent, and Executor Freestyle Projects& Pipelines, Jenkins for Continuous Integration, Create and Manage Builds, User Management in Jenkins Schedule Builds, Launch Builds on Slave Nodes.

UNIT-IV: Continuous Delivery: Importance of Continuous Delivery, CONTINUOUS DEPLOYMENT CD Flow, Containerization with Docker: Introduction to Docker, Docker installation, Docker commands, Images & Containers, Docker File, running containers, working with containers and publish to DockerHub.

Testing Tools: Introduction to Selenium and its features, Java Scripttesting.

UNIT-V: Configuration Management - ANSIBLE: Introduction to Ansible, Ansibletasks Roles, Jinja2 templating, Vaults, Deployments using Ansible.

CONTAINERIZATION USING KUBERNETES(OPENSHIFT): Introduction to Kubernetes Namespace& Resources, CI/CD - On OCP, BC, DC & ConfigMaps, Deploying Apps on Openshift Container Pods. Introduction to Puppet master and Chef.



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List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

Text Books

1. Joyner, Joseph., Devops for Beginners: Devops Software Development Method Guide for Software Developers and It Professionals, 1st Edition Mihails Konoplow, 2015.
2. Alisson Machado de Menezes., Hands-on DevOps with Linux, 1st Edition, BPB Publications, India, 2021.

Reference Books

1. LenBass, IngoWeber, LimingZhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10
2. Gene Kim Je Humble, Patrick Debois, John Willis. The DevOps Handbook, 1st Edition, IT Revolution Press, 2016.
3. Verona, Joakim Practical DevOps, 1st Edition, Packt Publishing, 2016.
4. Joakim Verona. Practical Devops, 2nd Edition. Ingramshorttitle; 2nd edition (2018). ISBN10: 1788392574
5. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	RECOMMENDER SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives:

- This course covers the basic concepts of recommender systems, including personalization algorithms, evaluation tools, and user experiences

UNIT-I: Introduction: Recommender system functions, Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses, covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system.

UNIT-II: Collaborative Filtering: User-based nearest neighbour recommendation, Item-based nearest neighbour recommendation, Model based and pre-processing based approaches, Attacks on collaborative recommender systems.

UNIT-III: Content-based recommendation: High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, discovering features of documents, obtaining item features from tags, representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

Knowledge based recommendation: Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders.

UNIT-IV: Hybrid approaches: Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies.

UNIT-V: Evaluating Recommender System: Introduction, General properties of evaluation research, Evaluation designs, Evaluation on historical datasets, Error metrics, Decision-Support metrics, User-Centred metrics.

Recommender Systems and communities: Communities, collaboration and recommender systems in personalized web search, Social tagging recommender systems, Trust and recommendations

Text Books:

- Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed.
- Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed.

References:

- Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives: At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

UNIT-I: 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. **The old way and the new:** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT-II: Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of the process:** The artifactsets, Management artifacts, Engineering artifacts, programm aticartifacts.

UNIT-III: Model based software architectures: A Management perspective and technical perspective.

Work Flows of the process: Software process work flows, Iteration work flows.

Check points of the process: Major milestones, Minor Mile stones, Periodic status assessments.

Iterative Process Planning: Work break down structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT-IV: Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT-V: Agile Methodology, ADAPTING to Scrum, Patterns for Adopting Scrum, Iterating towards Agility. Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps ecosystem. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, Peoplesaspect, processes



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COURSE STRUCTURE & SYLLABUS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

Text Books:

1. Software Project Management, Walker Royce, PEA, 2005.
2. Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim, John Willis, Patrick Debois, Jez Humble, 1st Edition, O'Reilly publications, 2016.

Reference Books:

1. Software Project Management, Bob Hughes, 3/e, Mike Cotterell, TMH
2. Software Project Management, Joel Henry, PEA
3. Software Project Management in practice, Pankaj Jalote, PEA, 2005,
4. Effective Software Project Management, Robert K. Wysocki, Wiley, 2006.
5. Project Management in IT, Kathy Schwalbe, Cengage.



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COURSE STRUCTURE & SYLLABUS

III B .Tech II Semester	MOBILE ADHOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3

UNIT-I: Introduction- Adhoc networks. Mobile Ad-Hoc networking with a View of 4G Wireless, Off-the-Shelf Enables of Ad Hoc, IEEE 802.11 in Ad Hoc Networks:

UNIT-II: Protocols, Performance and Open Issues, Scatternet Formation in Bluetooth Networks, Antenna Beamforming and Power Control for Ad Hoc Networks, Topology Control in Wireless Ad Hoc Networks, Broadcasting and Activity Scheduling in Ad Hoc Networks.

UNIT-III: Location Discovery, Routing Approaches in Mobile AdHoc Networks, Energy-Efficient Communication in AdHoc Wireless, AdHoc Networks Security, Self-Organized and Cooperative Ad Hoc Networking.

UNIT-IV: Simulation and Modeling of Wireless, Mobile, and AdHoc Networks, Modeling Cross-Layering Interaction Using Inverse Optimization Algorithmic Challenges in Ad Hoc Networks.

UNIT-V: Sensor Networks: Introduction to sensor network, Unique constraints and challenges, Localization and Tracking, Networking Sensors, Infrastructure establishment, Sensor Tasking and Control, Sensor network databases, Sensor Network Platforms and tools, Industrial Applications and Research directions.

Text Books:

1. Mobile Adhoc Networks–Aggelou, George(McGraw-Hill).
2. Mobile Adhoc Networking –Stefano Basagni (Editor), Marco Conti(Editor), Silvia Giordano(Editor),Ivan Stojmenovi&Cacute (Editor) (Wiley-IEEE Press).

References:

1. Wireless Sensor Networks: An Information Processing Approach–Feng Zhao,Leonidas Guibas(Elsevier).
2. Hand book of Sensor Networks: Algorithms and Architectures–Ivan Stojmenovi& Cacute(Wiley).



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	COMPUTER VISION	L	T	P	C
		3	0	0	3

Course Objectives:

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

UNIT-I: CAMERAS: Pinhole Cameras Radiometry –Measuring Light: Lightin Space, Light Surfaces, Important Special Cases Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, **inter reflections:** 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 Texture0: 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 Stereopsis, Binocular Fusion, Using More Cameras Segmentation by Clustering: What is Segmentation? Human Vision: Grouping and Get stalt, **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 Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, tracking with Linear Dynamic Models : Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples

UNIT-V: Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection EquationsGeometricCameraCalibration:Least-SquaresParameterEstimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry,

Case study: Mobile Robot Localization Model- Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Case study: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

Text Books:

- David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.



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Guntur-522 017, Andhra Pradesh.

B. Tech CSE (AI&ML)

COURSE STRUCTURE & SYLLABUS

Reference Books:

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. R. C. Gonzalez and R. E. Woods “Digital Image Processing” Addison Wesley 2008.
3. Richard Szeliski “Computer Vision: Algorithms and Applications” Springer-Verlag London Limited 2011.



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	No SQL Databases	L	T	P	C
		3	0	0	3

Course Outcomes: At the end of the Course the student will be able to CO1:

Explain and compare different types of NoSQL Databases

CO2: Compare and contrast RDBMS with different NoSQL databases.

CO3: Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases.

CO4: Explain performance tune of Key-Value Pair NoSQL databases.

CO5: Apply NoSQL development tools on different types of NoSQL Databases.

UNIT-I: Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.

UNIT-II: Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, Map Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT-III: NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT-IV: Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT-V: NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

TEXT BOOKS:

1. Sadalage,P.&Fowler,NoSQLDistilled:ABriefGuidetotheEmergingWorldof PolyglotPersistence, Wiley Publications,1st Edition,2019.



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WEB REFERENCES:

1. <https://www.ibm.com/cloud/learn/nosql-databases>
2. <https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp>
3. <https://www.geeksforgeeks.org/introduction-to-nosql/>
4. <https://www.javatpoint.com/nosql-databa>



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	DEEP LEARNING LAB	L	T	P	C
		0	0	3	1.5

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

- Implement deep neural networks to solve real world problems
- Choose appropriate pre-trained model to solve real time problem
- Interpret the results of two different deep learning models

Software Packages required:

- Keras
- Tensorflow
- PyTorch

List of Experiments:

1. Implement multi-layer perceptron algorithm for MNIST Handwritten Digit Classification.
2. Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
3. Design a neural Network for classifying news wires (Multi class classification) using Reuters dataset.
4. Design a neural network for predicting house prices using Boston Housing Price dataset.
5. Build a Convolution Neural Network for MNIST Hand written Digit Classification.
6. Build a Convolution Neural Network for simple image(dogs and Cats) Classification
7. Use a pre-trained convolution neural network (VGG16) for image.
8. Implement one hot encoding of words or characters
9. Implement word embedding's for IMDB dataset.
10. Implement a Recurrent Neural Network for IMDB movie review classification problem

Text Books:

1. Reza ZadehandBharath Ram sundar, "Tensorflow for Deep Learning", O'Reilly publishers, 2018

References:

1. <https://github.com/fchollet/deep-learning-with-python-notebooks>



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	DATA VISUALIZATION LAB	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To visualize the different datasets using histograms, line charts.
- To understand the use of bar charts and box plots.
- To understand Scatter plots, mosaic plots
- To understand different Map visualizations
- To learn advanced graphs such as correlogram, heatmap and 3D graphs.

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

- Visualize the different datasets using histograms, line charts.
- Make use of bar charts and box plots on different datasets
- Apply Scatter plots, mosaic plots in R for different datasets
- Apply different Map visualizations in R
- Create advanced graphs such as correlogram, heatmap and 3D graphs.

List of Experiments:

- a) Load VADeaths(Death Rates in Virginia) dataset in R and visualize the data using different histograms.
 - b) Load air quality dataset in R and visualize La Guardia Airport's daily maximum temperature using histogram.
- Load AirPassengers dataset in R and visualize the data using line chart that shows increase in air passengers over given time period.
- a) Load iris dataset in R, visualize the data using different Bar Charts and also demonstrate the use of stacked plots.
 - b) Load air quality dataset in R and visualize ozone concentration in air.
- a) Load iris dataset in R, visualize the data using different Box plots including group by option and also use color palette to represent species.
 - b) Load air quality dataset in R and visualize air quality parameters using box plots.
- Visualize iris dataset using simple scatter, multivariate scatter plot and also visualize scatter plot matrix to visualize multiple variables across each other.
- Load diamonds dataset in R and visualize the structure in datasets with large data points using hexagon binning and also add color palette then use the
- Load HairEyeColor dataset in R and plot categorical data using mosaic plot.



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8. Load mtcars dataset in R and visualize data using heat map.
9. Install leaflet library in R and perform different map visualizations.
10. Visualize iris dataset using 3d graphs such as scatter3d, cloud, xyplot.
11. Make use of correlogram to visualize data in correlation matrices for iris dataset.
12. Install maps library in R and draw different map visualizations.

Web References:

1. <https://www.analyticsvidhya.com/blog/2015/07/guide-data-visualization-r/>
2. <https://www.geeksforgeeks.org/data-visualization-in-r/>



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	SOFT SKILLS	L	T	P	C
		0	1	2	2

Course Objectives:

- To equip the students with the skills to effectively communicate in English
- To train the students in interview skills, group discussions and presentation skills
- To motivate the students to develop confidence
- To enhance the students' interpersonal skills
- To improve the students' writing skills

UNIT – I: Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.

Communication Skills: Verbal Communication; Non Verbal Communication (Body Language)

UNIT – II: Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities

Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT – III: Standard Operation Methods: Basic Grammars, Tenses, Prepositions, Pronunciation, Letter Writing; Note Making, Note Taking, Minutes Preparation, Email & Letter Writing

UNIT-IV: Job-Oriented Skills: Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews

UNIT-V: Interpersonal relationships: Introduction, Importance, Types, Uses, Factors affecting interpersonal relationships, Accommodating different styles, Consequences of interpersonal relationships

Text books:

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

Reference books:

1. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand& Company Ltd., 2018.
2. Raman, Meenakshi& Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

E-resources:

1. https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01



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COURSE STRUCTURE & SYLLABUS

III B. Tech II Semester	TECHNICAL PAPER WRITING & IPR	L	T	P	C
		2	0	0	-

Course Objective:

- The course will explain the basic related to writing the technical reports and understanding the concepts related to formatting and structuring the report. This will help students to comprehend the concept of proofreading, proposals and practice

Unit I: Introduction: An introduction to writing technical reports, technical sentences formation, using transitions to join sentences, Using tenses for technical writing.

Planning and Structuring: Planning the report, identifying reader(s), Voice, Formatting and structuring the report, Sections of a technical report, Minutes of meeting writing.

Unit II: Drafting report and design issues: The use of drafts, Illustrations and graphics.

Final edits: Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity.

Unit III: Proofreading and summaries: Proofreading, summaries, Activities on summaries.

Presenting final reports: Printed presentation, Verbal presentation skills, Introduction to proposals and practice.

Unit IV: Using word processor: Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index, Creating an Outline, Adding Comments, Tracking Changes, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes, Working with Footnotes and Endnotes, Inserting citations and Bibliography, Comparing Documents, Combining Documents, Mark documents final and make them read only., Password protect Microsoft Word documents., Using Macros,

Unit V: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of **Patenting and Development:** technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property

Text Books:

- Kompal Bansal & Parshit Bansal, "Fundamentals of IPR for Beginner's", 1st Ed., BS Publications, 2016.
- William S. Pfeiffer and Kaye A. Adkins, "Technical Communication: A Practical Approach", Pearson.
- Ramappa, T., "Intellectual Property Rights Under WTO", 2nd Ed., S Chand, 2015.

Reference Books:

- Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.
- Day R, How to Write and Publish a Scientific Paper, Cambridge University Press (2006)



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E-resources:

1. <https://www.udemy.com/course/reportwriting/>
2. <https://www.udemy.com/course/professional-business-english-and-technical-report-writing/>
3. <https://www.udemy.com/course/betterbusinesswriting/>

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S. No.	Category	Title	L	T	P	Credits
1	Professional Core	Reinforcement Learning	3	0	0	3
2	Management Course-II	Human Resource & Project Management	2	0	0	2
3	Professional Elective-IV	1. Responsible A.I. 2. Blockchain Technology 3. Quantum Computing 4. Robotic Process Automation 5. Any of the 12-Week SWAYAM/ NPTEL Course suggested by the BoS	3	0	0	3
4	Professional Elective-V	1. Agile Methodologies 2. Augmented Reality & Virtual Reality 3. High Performance Computing 4. Big Data Analytics 5. Any of the 12-Week SWAYAM/NPTEL Course suggested by the BoS	3	0	0	3
5	Open Elective-III		3	0	0	3
6	Open Elective-IV		3	0	0	3
7	Skill Enhancement Course	Prompt Engineering / SWAYAM Plus-Certificate Program in Prompt Engineering and Chat GPT /	0	1	2	2
8	Audit Course	Constitution of India	2	0	0	-
9	Evaluation of Industry Internship / Mini Project		-	-	-	2
Total			19	1	02	21
MC	Student may select from the same minor's pool		3	0	0	3
HC	Student may select from the same honor's pool		3	0	0	3
HC	Student may select from the same honor's pool		3	0	0	3



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IV B.Tech II Semester

S. No.	Category	Title	L	T	P	Credits
1	Internship / Project Work	Full semester Internship /Project Work	0	0	24	12

Note: Student need to do atleast ONE MOOC Course (3credits out of 160 credits) to meet the mandatory requirement (11th criteria, as per R23 Regulations)

Open Electives, offered to other department students:

Open Elective I: Operating Systems / Computer Organization and Architecture

Open Elective II: Database Management Systems

Open Elective III: Object Oriented Programming Through Java

Open Elective IV: Computer Networks / Software Engineering / IOT Based Smart Systems

HONORS

1. Agentic AI
2. Adversarial Machine Learning



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COURSE STRUCTURE & SYLLABUS

IV B.Tech I Semester	REINFORCEMENT LEARNING	L	T	P	C
		3	0	0	3

Course Objective:

- To provide the fundamentals of Reinforcement learning.

Course Outcomes:

- Enumerate the elements of Reinforcement Learning
- Solve then-armed Bandit problem
- Compare different Finite Markov Decision Process
- Discuss about Monte Carlo Methods in solving real world problems
- List the Applications and Case Studies of Reinforcement Learning

UNIT-I: The Reinforcement Learning Problem: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe, Summary, History of Reinforcement Learning.

UNIT-II: Multi-arm Bandits: An n-Armed Bandit Problem, Action-Value Methods, Incremental Implementation, tracking a Non stationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandits, Associative Search (Contextual Bandits)

UNIT-III: Finite Markov Decision Processes: The Agent–Environment Interface, Goals and Rewards, Returns, Unified Notation for Episodic and Continuing Tasks, The Markov Property, Markov Decision Processes, Value Functions, Optimal Value Functions, Optimality and Approximation.

UNIT-IV: Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off- policy Prediction via Importance Sampling, Incremental Implementation, Off-Policy Monte Carlo Control, Importance Sampling on Truncated Returns

UNIT-V: Applications and Case Studies: TD-Gammon, Samuel's Checkers Player, The Acrobot, Elevator Dispatching, Dynamic Channel Allocation, Job-Shop Scheduling.

Text Books:

- Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning-An Introduction", 2nd Edition, The MIT Press, 2018
- Marco Wiering, Martijn van Otterlo Reinforcement Learning: State-of-the-Art (Adaptation, Learning, and Optimization(12)) 2012th Edition

Reference Books:

- Vincent François-Lavet, Peter Henderson, Riashat Islam, An Introduction to Deep Reinforcement Learning (Foundations and Trends(r) in Machine Learning) , 2019



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COURSE STRUCTURE & SYLLABUS

IV B.Tech I Semester	HUMAN RESOURCES & PROJECT MANAGEMENT	L	T	P	C
		2	0	0	2

Course Objectives: The main objectives of the course are to

- Provide knowledge about HR planning, recruitment, selection, and job design.
- Develop skills in managing HR functions such as performance appraisal, compensation, and employee relations.
- Emphasize the importance of ethical practices and HR audits in maintaining organizational health.
- Understand the HRD framework and its impact on organizational success.
- **Improve group interaction and team dynamics** for better collaboration and performance.
- Understand the Fundamentals of Project Management and Project Networks
- Implement appropriate management strategies tailored to specific challenges in different project types.

UNIT –I: HRM: Nature, Scope, Concept of HRM, Functions of HRM, Role of HR manager, emerging trends in HRM, E-HRM, HR audit models, ethical aspects of HRM. HR Planning, Demand and Supply forecasting of HR, Job Design, Recruitment, Sources of recruitment, Selection-Selection Procedure.

UNIT –II: HRD, HR accounting, Models, Concept of Training and Development, Methods of Training. Performance Appraisal: Importance Methods of performance appraisal, Career Development and Counseling, group interaction.

UNIT –III: Basics of Project Management, Concept, resource management, Project environment, Types of Projects, project networks-DPR, Project life cycle, Project proposals, Monitoring project progress, Project appraisal and Project selection, 80-20 rules, production technology, communication matrix

UNIT-IV: Identify various project types and their unique management challenges and apply appropriate management strategies for each. Project Implementation and Review: Forms of project organization, project planning, project control, human aspects of project management, prerequisites for successful project implementation, project review, performance evaluation, abandonment analysis

UNIT-V: Project Implementation and Review: Forms of project organization, project planning, project control, human aspects of project management, prerequisites for successful project implementation, project review, performance evaluation, abandonment analysis



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Text Books:

1. Robert L. Mathis, John H. Jackson, Manas Ranjan Tripathy, Human Resource Management, Cengage Learning 2016.
2. Sharon Pande and Swapnalekha Basak, Human Resource Management, Text and Cases, Vikas Publishing, 2e, 2016.
3. Stewart R. Clegg, Torgeir Skyttermoen, Anne Live Vaagaasar, Project Management, Sage Publications, 1e, 2021.
4. K. Nagarajan, Project Management, New Age International Publishers, 8e, 2017

Reference Books:

1. Subba Rao P, "Personnel and Human Resource Management-Text and Cases", Himalaya Publications, Mumbai, 2013.
2. K Aswathappa, "Human Resource and Personnel Management", Tata McGraw Hill, New Delhi, 2013.
3. Prasanna Chandra, "Projects, Planning, Analysis, Selection, Financing, Implementation and Review", Tata McGraw Hill Company Pvt. Ltd., New Delhi, 1998.
4. Vasanth Desai, "Project Management", 4th edition, Himalaya Publications, 2018.
5. Lalitha Balakrishnan, Gowri, "Project Management", Himalaya publishing house, New Delhi, 2022.



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COURSE STRUCTURE & SYLLABUS

IV B. Tech I Semester	RESPONSIBLE AI	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand AI basics, misconceptions, responsible AI principles, and challenges in implementation.
- To understand and analyse biases in AI, fairness metrics, and mitigation techniques.
- To understand explainability, challenges, methods, and evaluation for interpretable machine learning models.
- To understand AI safety, security, privacy, and resilience, including model and data protection.
- To explore ethical issues and implications of AI in various real-world applications.

Course Outcomes:

CO1. State the aspects of Responsible AI, such as fairness, bias, privacy etc.

CO2. Enforce fairness in models and mitigate bias in data.

CO3. Understand the importance of explain ability and interpretability in AI systems.

CO4. Implement strategies to manage safety, security and privacy in AI systems.

CO5. Evaluate the societal impact of AI applications.

UNIT-I: INTRODUCTION TO RESPONSIBLE AI: Overview of AI – Common

misconception of AI – Introduction to Responsible AI – Characteristics of Responsible AI – Key principles of responsible AI – Challenges in implementing responsible AI – EL SI Framework and AI – Safety and Alignment – Fairness and Privacy.

UNIT-II: FAIRNESS AND BIAS : Human Bias - Types of biases - Effects of biases on different demographics - Bias vs. Fairness - Sources of Biases - Exploratory data analysis - Bias Mitigation Techniques - Pre-processing techniques - In- processing techniques - Post-processing techniques - Bias detection tools - Overview of fairness in AI - Demographic parity - Equalized odds - Simpson's paradox and the risks of multiple testing - Group fairness and Individual fairness - Counterfactual fairness - Fairness metrics - Bias and disparity mitigation with Fairlearn.

UNIT-III: EXPLAINABILITY & INTERPRETABILITY: Importance of Explainability and Interpretability – Challenges - Interpretability through simplification and visualization - Intrinsic interpretable methods - Post Hoc interpretability – Interpretability Evaluation methods - Explainability through causality - Model agnostic Interpretation - LIME (Local Interpretable Model-agnostic Explanations) - SHAP (SHapley Additive exPlanations).

UNIT-IV: SAFETY, SECURITY, AND PRIVACY : Overview of safety – security – privacy - resilience - Taxonomy of AI safety and Security - Adversarial attacks and mitigation - Model and data security - The ML life cycle - Adopting an ML lifecycle MLOps and Model Ops - Model drift - Data drift - Concept drift - Privacy - preserving AI techniques - Differential privacy - Federated learning.



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UNIT-V: CASE STUDIES : COMPAS Algorithm - Google Photos Tagging Controversy - ProPublica's Analysis of Recidivism Predictions - Amazon's AI Recruiting Tool - Facial Recognition Technology Misidentification - AI in Healthcare: Predictive Analytics in Patient Care - Tesla Auto pilot and Ethical Implications of Autonomous Vehicles.

TEXT BOOKS:

1. Virginia Dignum, "Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way", 2019.
2. Adnan Masood, Heather Dawe, "Responsible AI in the Enterprise", 2023.
3. Beena Ammanath, "Trustworthy AI", O' Reilly, 2022.
4. **Christoph Molnar "Interpretable Machine Learning", 1st edition, 2019.**



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COURSE STRUCTURE & SYLLABUS

IV B. Tech I Semester	BLOCKCHAIN TECHNOLOGY	L	T	P	C
		3	0	0	3

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

- CO1: Discuss the Cryptographic primitives used in Block chain (K2)
- CO2: Discuss about various technologies borrowed in block chain (K2)
- CO3: Illustrate various models for block chain (K2)
- CO4: Discuss about Ethereum (K2)
- CO5: Discuss about Hyper ledger Fabric (K2)

UNIT I: INTRODUCTION TO BLOCKCHAIN: Introduction, history of Bitcoin and origins of Blockchain, Fundamentals of Blockchain and key components (Chapter 1-book1), Permission and Permission-less platforms (Chapter 1-book2), Introduction to Cryptography, SHA256 and ECDSA, Hashing and Encryption, Symmetric/ Asymmetric keys, Private and Public Keys (Chapter 3-book2).

UNIT II TECHNOLOGIES BORROWED IN BLOCKCHAIN: Technologies Borrowed in Blockchain –hash pointers--Digital cash etc.- Bitcoin blockchain -Wallet – Blocks Merkle Tree - hardness of mining - Transaction verifiability - Anonymity - forks-Double spending - Mathematical analysis of properties of Bitcoin - Bitcoin- the challenges and solutions. (Chapter 3-book2).

UNIT III: CONSENSUS MECHANISMS : Consensus Algorithms: Proof of Work (PoW) as random oracle - Formal treatment of consistency- Liveness and Fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS), Byzantine Models of fault tolerance. ((Chapter 1-book2))

UNIT IV ETHEREUM: Ethereum - Ethereum Virtual Machine (EVM) -Wallets for Ethereum - Solidity - Smart Contracts (**Chapter 5-book1**), - The Turing Completeness of Smart Contract Languages and verification challenges - Using smart contracts to enforce legal contracts - Comparing Bitcoin scripting vs. Ethereum Smart Contracts - Some attacks on smart contracts (**Chapter 6 and Chapter 7- book2**)

UNIT V HYPER LEDGER FABRIC: Hyper ledger fabric- the plug and play platform and mechanisms in permissioned blockchain - Beyond Crypto currency – applications of block chain in cyber security- integrity of information- E-Governance and other contract enforcement mechanisms - Limitations of blockchain as a technology and myths vs. reality of blockchain technology (**Chapter 16-book1**), (**Chapter 9 -book2**)

TEXT BOOKS:

1. Blockchain Technology Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, University Press, 2020.
2. Mastering Blockchain - Distributed ledger technology, decentralization, and smart contracts explained, Imran Bashir, 2nd ed. Edition, 2018, pakct publication



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REFERENCES:

1. S.Shukla, M.Dhawan, S.Sharma,S. Venkatesan “Blockchain Technology: Cryptocurrency and Applications”, Oxford University Press 2019 .
2. Cryptography and network security principles and practice, William Stallings, Pearson, 8th edition,

WEB REFERENCES:

1. <https://drive.google.com/file/d/1PtYaDmWYaqPVGjKDnMYGWO5eoI5wMPtJ/view>
2. <https://archive.nptel.ac.in/courses/106/104/106104220/>
3. <https://www.tutorialspoint.com/blockchain/index.htm>



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COURSE STRUCTURE & SYLLABUS

IV B. Tech I Semester	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

Course Objectives:

- To introduce the fundamentals of quantum computing, the problem-solving approach using finite dimensional mathematics

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:

- Nielsen M. A., Quantum Computation and Quantum Information, Cambridge

Reference Books:

- Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
- Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.I: Basic Concepts, Vol II
- Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms



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COURSE STRUCTURE & SYLLABUS

IV B. Tech I Semester	ROBOTIC PROCESS AUTOMATION	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the basics of Robotic Process Automation.
2. To demonstrate the use of sequence and control flow for a task.
3. To understand different mouse and keyboard activities
4. To design an Assistant bot on a keyboard event
5. To understand deploying and managing the bot.

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

1. Enumerate the benefits of Robotic Process Automation.
2. Make use of sequence and control flow for a task.
3. Apply different mouse and keyboard activities.
4. Design an Assistant bot on a keyboard event.
5. Create the bot for a workflow.

UNIT-I: INTRODUCTION TO ROBOTIC PROCESS AUTOMATION: Scope and techniques of automation, Robotic process automation, Benefits of RPA, Components of RPA, RPA platforms, UiPath studio, UiPath Robot, UiPath orchestrator, the future of automation.

UNIT-II: RECORD AND PLAY: Ui Path Stack, Types of Robots, the user interface, Quick Access Toolbar, Different panels, Task recorder, Step by step examples using recorder. Sequence, Activities, Control flow, various types of loops, decision making, step by step example using sequence and flow chart, step by step example using sequence and control flow.

UNIT-III: DATA MANIPULATION AND CONTROLS: Variables and Scope, Collections, Arguments, Data table usage, clipboard management, File operations, CSV/Excel to data table and viceversa. Finding and attaching windows, finding the control, techniques for waiting for a control, act on controls, mouse and keyboard activities, working with UiExplorer, Handling events, Screen scraping, OCR.

UNIT-IV: ASSISTANT BOTS, EXCEPTION HANDLING: Assistant bots, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger Monitoring image and element triggers, Example of monitoring email, Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event. Exception Handling, common exceptions, logging and taking screenshots, Debugging techniques, collecting crash dumps, error reporting.

UNIT-V: DEPLOYING AND MAINTAINING THE BOT: Publishing using publish utility, publish a workflow in UiPath, Overview of Orchestration server, using orchestration server to control bots, using orchestration server to deploy bots, license management, publishing and managing updates.



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TEXT BOOKS:

1. Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing, 2018.

REFERENCES:

1. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation, 1st Edition 2015.
2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant", Independently Published, 1st Edition 2018.
3. Srikanth Merianda," Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation", Consulting Opportunity Holdings LLC, 1st Edition 2018.
4. Lim Mei Ying, "Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes", Packt Publishing, 1st Edition 2018.

WEB REFERENCES:

1. <https://www.uipath.com/rpa/robotic-process-automation>
2. <https://www.academy.uipath.com>



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COURSE STRUCTURE & SYLLABUS

IV B. Tech I Semester	AGILE METHODOLOGIES	L	T	P	C
		3	0	0	3

Course Objectives:

- The main objectives of this course are to introduce the important concepts of Agile software development Process, emphasize the role of stand-up meetings in software collaboration, impart the knowledge on values and principles in understanding agility

UNIT -I: Agile Methodology: Theories for Agile Management, Agile Software Development – Traditional Model vs. Agile Model, Classification of Agile Methods, Agile Manifesto and Principles, Agile Project Management, Agile Team Interactions, Ethics in Agile Teams, Agility in Design, Testing, Agile Documentations, Agile Drivers, Capabilities and Values.

UNIT-II: Agile Process: Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT-III: Agile Knowledge Sharing–Role of Story - Cards–Story-Card Maturity Model (SMM).

UNIT-IV: Agility and Requirements Engineering: Impact of Agile Processes in RE, Current Agile Practices, Variance, Overview of RE Using Agile, Managing Unstable Requirements, Requirements Elicitation, Agile Requirements Abstraction Model, Requirements Management in Agile Environment, Agile Requirements Prioritization, Agile Requirements Modelling, Generation – Concurrency in Agile Requirements Generation.

UNIT-V: Agility and Quality Assurance: Agile Product Development, Agile Metrics, Feature Driven Development (FDD), Financial and Production Metrics in FDD, Agile Approach to Quality Assurance, Test Driven Development, Agile Approach in Global Software Development.

Text Books:

- Andrew Stellman, Jill Alison Hart, Learning Agile, O'Reilly, 2015.

Reference Books:

- Andrew stellman, Jennifer Green, Head first Agile, O'Reilly, 2017.
- Rubin K ,Essential Scrum : A practical guide to the most popular Agile process, Addison-Wesley, 2013



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COURSE STRUCTURE & SYLLABUS

IV B. Tech I Semester	AUGMENTED REALITY & VIRTUAL REALITY	L	T	P	C
		3	0	0	3

Objectives:

- Provide a foundation to the fast growing field of AR and make the students aware of the various AR concepts.
- To give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

UNIT – I: Introduction to Augmented Reality: Augmented Reality- Defining augmented reality, history of augmented reality, Examples, Related fields

Displays: Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model, Visual Displays

Tracking: Tracking, Calibration, and Registration, Coordinate Systems, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors

UNIT–II: Computer Vision for Augmented Reality: Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Outdoor Tracking.

Interaction: Output Modalities, Input Modalities, Tangible Interfaces, Virtual User Interfaces on Real Surfaces, Augmented Paper, Multi-view Interfaces, Haptic Interaction

Software Architectures: AR Application Requirements, Software Engineering Requirements, Distributed Object Systems, Dataflow, Scene Graphs

UNIT–III: Introduction to Virtual Reality: Defining Virtual Reality, History of VR, Human Physiology and Perception

The Geometry of Virtual Worlds: Geometric Models, Axis-Angle Representations of Rotation, Viewing Transformations

Light and Optics: Basic Behavior of Light, Lenses, Optical Aberrations, The Human Eye, Cameras, Displays

UNIT – IV: The Physiology of Human Vision: From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR

Visual Perception: Visual Perception - Perception of Depth, Perception of Motion, **Perception of Color**

Visual Rendering: Visual Rendering - Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates, Immersive Photos and Videos

UNIT–V: Motion in Real and Virtual Worlds: Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion andvection

Interaction: Motor Programs and Remapping, Locomotion, Social Interaction

Audio: The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering



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Text Books:

1. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016), ISBN-10: 9332578494
2. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016

Reference Books:

1. Allan Fowler-AR Game Development II, 1st Edition, Apress Publications, 2018, ISBN 978-1484236178
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009
4. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381
5. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0
6. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005



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COURSE STRUCTURE & SYLLABUS

IV B. Tech I Semester	HIGH PERFORMANCE COMPUTING	L	T	P	C
		3	0	0	3

Course Objectives:

- The main objectives of the course is to study parallel computing hardware and programming models, performance analysis and modeling of parallel programs

Course Outcomes: On completion of the course, student will be able to–

- Describe different parallel architectures, inter-connect networks, programming Models
- Develop an efficient parallel algorithm to solve given problem
- Analyze and measure performance of modern parallel computing systems
- Build the logic to parallelize the programming task

UNIT I INTRODUCTION: Motivating Parallelism, Scope of Parallel Computing, Parallel Programming Platforms: Implicit Parallelism, Trends in Microprocessor and Architectures, Limitations of Memory, System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Scalable design principles, Architectures: N-wide superscalar architectures, Multi-core architecture.

UNIT II PARALLEL PROGRAMMING: Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models, The Age of Parallel Processing, the Rise of GPU Computing, A Brief History of GPUs, Early GPU.

UNIT III BASIC COMMUNICATION: Operations - One - to - All Broadcast and All - to - One Reduction, All-to-All Broadcast and Reduction, All - Reduce and Prefix - Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations. Programming shared address space platforms: threads- basics, synchronization, Open MP programming

UNIT IV: ANALYTICAL MODELS: Sources of overhead in Parallel Programs, Performance Metrics for Parallel Systems, and The effect of Granularity on Performance, Scalability of Parallel Systems, Minimum execution time and minimum cost, optimal execution time. **Dense Matrix Algorithms:** Matrix Vector Multiplication, Matrix-Matrix Multiplication.

UNIT V: PARALLEL ALGORITHMS - SORTING AND GRAPH: Issues in Sorting on Parallel Computers, Bubble Sort and its Variants, Parallelizing Quick sort, All-Pairs Shortest Paths, Algorithm for sparse graph, Parallel Depth-First Search, Parallel Best First Search. **CUDA Architecture:** CUDA Architecture, Using the CUDA Architecture, Applications of CUDA Introduction to CUDA C-Write and launch CUDA C kernels, Manage GPU memory, Manage communication and synchronization, Parallel programming in CUDA- C.



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Text Books:

1. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction to Parallel Computing", 2nd edition, Addison-Wesley, 2003, ISBN: 0-201-64865-2
2. Jason Sanders, Edward Kandrot, "CUDA by Example", Addison-Wesley, ISBN-13: 978-0-13-138768-3

Reference Books:

1. Kai Hwang, "Scalable Parallel Computing", McGraw Hill 1998, ISBN: 0070317984
2. Shane Cook, "CUDA Programming: A Developer's Guide to Parallel Computing with GPUs", Morgan Kaufmann Publishers Inc. San Francisco, CA, USA 2013 ISBN: 9780124159884
3. David Culler, Jaswinder Pal Singh, "Parallel Computer Architecture: A Hardware/ Software Approach", Morgan Kaufmann, 1999, ISBN 978-1-55860-343-1
4. Rod Stephens, "Essential Algorithms", Wiley, ISBN: 978-1-118-61210-1



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COURSE STRUCTURE & SYLLABUS

IV B. Tech I Semester	BIGDATA ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Optimize business decisions and create a competitive advantage with Big Data Analytics.
- Introduce Java concepts required for developing MapReduce programs.
- Derive business benefits from unstructured data.
- Impart the architectural concepts of Hadoop and introduce the Map Reduce paradigm.
- Introduce programming tools Pig and Hive in the Hadoop ecosystem.

COURSE OUTCOMES : At the end of the course, students will be able to:

CO1: Prepare data for summarization, querying, and analysis.

CO2: Apply data modeling techniques to large datasets.

CO3: Create applications for Big Data Analytics.

CO4: Build a complete business data analytics solution.

CO5: Demonstrate and develop Pig Latin scripts.

UNIT-I: Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

UNIT-II: Working with BigData: Google File System, Hadoop Distributed File System (HDFS) Building blocks of Hadoop (Name node, Data node, Secondary Name node, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-III: Writing Map Reduce Programs : A Weather Dataset, Understanding Hadoop API for Map Reduce Framework (Old and New), Basic programs of Hadoop Map Reduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Practitioner

UNIT-IV: Stream Memory and Spark: Introduction to Streams Concepts– Stream Data Model and Architecture, Stream computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream , Introduction to Spark Concept ,Spark Architecture and components, Spark installation, Spark RDD (Resilient Distributed Dataset) – Spark RDD operations.

UNIT-V: Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analysing data.



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COURSE STRUCTURE & SYLLABUS

TEXT BOOKS:

1. Wiley & Big Java 4th Edition, CayHorstmann, Wiley JohnSons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly

REFERENCEBOOKS:

1. Hadoop in Action by ChuckLam, MANNING Publ .
2. Hadoop for Dummies by Dirkde Roos, Paul C.Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael Coss
3. Hadoop in Practice by Alex Holmes, MANNING Publ.
4. Big Data Analytics by Dr.A.Krishna Mohan and Dr. E.Laxmi Lydia
5. Hadoop MapReduce Cookbook, Srinath Perera, Thilina Gunarathne

Software Links:

1. Hadoop:<http://hadoop.apache.org/>
2. Hive:<https://cwiki.apache.org/confluence/display/Hive/Home>
3. Piglatin:<http://pig.apache.org/docs/r0.7.0/tutorial.html>



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COURSE STRUCTURE & SYLLABUS

IV B. Tech I Semester	IOT BASED SMART SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

COURSE OBJECTIVES

1. To study Internet of Things (IoT) technologies and their role in real-time applications.
2. To introduce the infrastructure required for IoT.
3. To familiarize students with IoT accessories and communication techniques.
4. To provide insight into the embedded processors and sensors required for IoT.
5. To familiarize students with different IoT platforms and attributes.

COURSE OUT COMES: At the end of this course, the students will have the ability to

CO1: Analyze the concepts of Internet of Things (IoT) and its present developments.

CO2: Compare and contrast different platforms and infrastructures available for IoT.

CO3: Explain different protocols and communication technologies used in IoT.

CO4: Analyze Big Data analytics and programming aspects of IoT.

CO5: Implement IoT solutions for smart applications.

UNIT I : INTRODUCTION TO INTERNET OF THINGS : Overview, Hardware and software requirements for IOT, Sensor and actuators, Technology drivers, Business drivers, Typical IoT applications, Trends and implications.

UNIT II : IOT ARCHITECTURE : IoT reference model and architecture - Node Structure – Sensing, Processing, Communication, Powering, Networking – Topologies, Layer/Stack architecture, IoT standards, Cloud computing for IoT, Bluetooth, Bluetooth Low Energy beacons.

UNIT III: PROTOCOLS AND WIRELESS TECHNOLOGIES FOR IOT PROTOCOLS:

NFC, SCADA and RFID, Zigbee, MIPI, M-PHY, UniPro, SPMI, SPI, M-PCIe, GSM, CDMA, LTE, GPRS, small cell.

Wireless technologies for IoT: Wi-Fi (IEEE 802.11), Bluetooth/Bluetooth Smart, ZigBee Smart, UWB (IEEE 802.15.4), 6LoWPAN, Proprietary systems-Recent trends.

UNIT IV: IOT PROCESSORS Services/Attributes: Big-Data Analytics for IOT, Dependability, Interoperability, Security, Maintainability.

Embedded processors for IOT: Introduction to Python programming - Building IOT with RASPBERRY PI and Arduino.

UNIT V: CASE STUDIES: Industrial IoT, Home Automation, smart cities, Smart Grid, connected vehicles, electric vehicle charging, Environment, Agriculture, Productivity Applications, IOT Defense



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REFERENCES:

1. Arshdeep Bahga and Vijai Madisetti: A Hands-on Approach "Internet of Things", Universities Press 2015.
2. Oliver Hersent, David Boswarthick and Omar Elloumi "The Internet of Things", Wiley, 2016.
3. Samuel Greengard, "The Internet of Things", The MITpress, 2015.
4. Adrian McEwen and Hakim Cassimally "Designing the Internet of Things "Wiley,2014.
5. Jean- Philippe Vasseur, Adam Dunkels, "Interconnecting Smart Objects with IP: The Next Internet" Morgan Kuffmann Publishers, 2010.
6. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", John Wiley and sons, 2014.
7. LingyangSong/ DusitNiyato /ZhuHan /EkramHossain, "Wireless Device - to - Device Communications and Networks, CAMBRIDGE UNIVERSITY PRESS,2015.
8. OvidiuVermesan and Peter Friess (Editors), "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers Series in Communication, 2013.
9. Vijay Madisetti , Arshdeep Bahga, "Internet of Things (AHandson-Approach)", 2014.
10. ZachShelby,CarstenBormann,"6LoWPAN:The Wireless Embedded Internet",JohnWiley and sons, 2009.
11. LarsT.BergerandKrzysztofIniewski,"SmartGridapplications,communicationsandsecurity", Wiley, 2015.
12. JanakaEkanayake,KithsiriLiyanage,JianzhongWu,AkihikoYokoyamaandNickJenkins," Smart Grid Technology and Applications", Wiley, 2015.
13. UpenaDalal,"WirelessCommunications&Networks,Oxford,2015.



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COURSE STRUCTURE & SYLLABUS

IV B. TECH I SEMESTER	PROMPT ENGINEERING (SKILL ENHANCEMENT COURSE)	L	T	P	C
		0	1	2	2

Course Objectives: The main objectives of the course are to:

- Apply iterative prompting techniques for clarity and context.
- Create varied prompts to steer model outputs effectively.
- Construct chain-of-thought and structured prompts.
- Develop retrieval-augmented pipelines to ground outputs with relevant information.
- Evaluate LLM agents and multimodal applications for ethics, reliability, and robustness.

Unit I: Foundations of Prompt Engineering: Definition of prompt engineering, Distinction between prompt engineering and model fine - tuning, Motivation and benefits of prompt engineering, Core principles of effective prompt design, Anatomy of a prompt, Setting up the Python environment for LLM interaction, Iterative prompting lifecycle, Common prompt pitfalls and remediation

Lab Experiments:

1. Environment & Connectivity: Install required packages (e.g., transformers, openai); securely configure the API key; run a simple “Hello, world” prompt to verify model access.
2. Baselinevs. Enhanced Prompts: Execute a naïve prompt (“Write a one -paragraph bio of AdaLovelace.”) and an enhanced prompt that adds role framing, specificity, and explicit format instructions; compare both outputs for relevance, completeness, and style.
3. Iterative Refinement on a Simple Task: Summarize the plot of the Shakespeare an play Romeo and Juliet in two sentences through three rounds of prompt tweaking:
 - a. Minimal instruction.
 - b. Addition of length and style constraints
 - c. Specification of key content elements (setting and theme) Document how each iteration changes and improves the result.
4. Diagnosing Prompt Failures & Edge Cases: Craft a vague or contradictory prompt; analyze the failure mode (ambiguity, missing context, or format errors); refine the prompt by adding examples or clarifying instructions.

Unit II: Advanced Prompt Patterns & Techniques: Enhanced prompt anatomy: contextual detail and explicit out put specifications, Few - shot in -context prompting, Prompt structuring and template design, Role-based prompting to establish person as or system behavior, Negative prompting to filter or suppress undesired content, Constraint specification and instruction enforcement (e.g., length, format), Iterative prompt refinement and optimization

Lab Experiments:

1. Few-Shotvs. Zero- Shot Comparison: Design and execute a zero-shot prompt and a few-shot prompt (with 2–3 exemplar input-output pairs) for a chosen text task (e.g., sentiment classification or translation); compare outputs for accuracy, consistency, and adherence to examples.
2. Role-Based & Negative Prompting: Craft a role-based prompt to establish a specific persona (e.g., “You are a financial advisor...”); then create a negative prompt to suppress undesired content (e.g., “Do not mention any brand names”); evaluate how each influences the model’s response.



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3. Constraint Specification & Iterative Refinement: Select an open-ended task (e.g., summarizing a technical article); issue a basic prompt; identify failures in length or format; refine the prompt by adding explicit constraints (word count, bullet format, etc.); document improvements over two refinement cycles.

Unit III: Structured Output & Reasoning Techniques: Importance of structured outputs for real-world applications, Prompting for specific formats (lists, tables, Markdown), Generating valid JSON and YAML via explicit instructions, Eliciting chain-of-thought reasoning in zero-shot prompts, Decomposing complex tasks into manageable sub-tasks

Lab Experiments:

1. Structured Format Prompting: Instruct the model to output information as bullet lists and Markdown tables (e.g., “List three benefits of daily exercise in a Markdown table with columns ‘Benefit’ and ‘Description.’”); verify the output matches the requested structure.
2. JSON / YAML Generation: Provide a brief dataset description (e.g., three books with title, author, publication year) and prompt the model to produce valid JSON or YAML; use a parser to validate syntax and refine the prompt if errors occur.
3. Chain - of - Thought & Task Decomposition: Present a multi-step problem (e.g., a logic puzzle) and apply zero-shot CoT prompting (e.g., “Let’s think step by step. Explain your reasoning before the final answer.”); separately, decompose the problem into sequential sub-questions, collect partial answers, combine them, and compare accuracy against a direct-answer baseline.

Unit IV: Retrieval - Augmented Generation & Lang Chain Workflows : Limitations of LLM internal knowledge, Need for external data sources, Introduction to Retrieval - Augmented Generation (RAG), Overview of RAG architecture (indexing vs. retrieval + generation), Getting started with Lang Chain for LLM applications, Basics of Lang Chain Expression Language (LCEL), Simplified indexing pipeline: document loading & text splitting, Fundamentals of embeddings and vector stores, Building a basic retrieval-generation pipeline with an LCEL chain

Lab Experiments:

1. Building a Simple LCEL Chain: Create a minimal LCEL script that accepts a fixed instruction (e.g., “Summarize this text:...”), passes it to an LLM, and prints the result; verify end-to-end execution.
2. Basic Data Indexing for RAG: Load a small collection of documents; split into uniform chunks (e.g., 200 tokens); generate embeddings for each chunk; store them in an in-memory vector store; inspect for consistency.
3. Constructing & Running a Basic RAG Chain: Build a pipeline that:
 - a. Receives a user query
 - b. Retrieves the top-k relevant chunks
 - c. Constructs a combined prompt with context + query
 - d. Send it to the LLM
 - e. Returns the answer

Test with sample queries and compare factual accuracy against a prompt without retrieval.



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Unit V: Agents, Multimodal AI & Ethical Evaluation: Introduction to LLM agents and their basic architecture, Overview of multimodal AI models (VLMs), Prompting for text-to-image generation and image understanding, Importance of prompt evaluation beyond subjective judgment, Manual evaluation techniques (heuristic checks for accuracy, relevance, format), Introduction to “LLM-as-Judge” for automated evaluation, Security considerations (prompt injection, sensitive-information risks), Prompt-based mitigation strategies for safety and robustness, Ethical concerns (bias, misinformation, data privacy), Brief exploration of UI frameworks (Streamlit/Gradio) for deploying prompt-driven apps, Adapting to the evolving nature of prompt engineering through continuous learning

Lab Experiments:

1. Building a Simple LLM Agent :Register a tool (e.g., a calculator function) and craft prompts that instruct the agent to invoke it when required; implement using LangChain or a function-calling API; test on queries requiring tool execution.
2. Multimodal Prompting Exploration: Generate images from detailed text prompts; feed one generated image into an image-understanding model or API with an appropriate prompt; compare the returned caption to the original prompt to evaluate alignment.
3. Prompt Evaluation & Ethics Workshop:
 - a. Select two existing prompts and generate multiple outputs; apply manual heuristic checks for accuracy, relevance, and format compliance.
 - b. Use an “LLM-as-Judge” prompt (e.g., “Rate these outputs on a scale of 1–5 for clarity and correctness.”) to automate evaluation.
 - c. Design a prompt- injection test (e.g., “Ignore previous instructions...”), observe the response, then refine system prompts to mitigate the vulnerability.



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COURSE STRUCTURE & SYLLABUS

IV B. Tech I Semester	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	-

Course Objectives:

- 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.

UNIT-I: History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution - Preamble, Salient Features

UNIT-II: Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

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

UNIT-V: 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.

Text Books:

1. The Constitution of India, 1st Edition, (Bare Act), Government Publication, 1950
2. Framing of Indian Constitution, 1st Edition, Dr. S.N. Busi, Dr. B.R. Ambedkar 2015

Reference Books:

1. Indian Constitution Law, 7th Edition, M.P. Jain, LexisNexis, 2014



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COURSE STRUCTURE & SYLLABUS

B.Tech. –IV Year II Semester

S.No.	Category	Title	L	T	P	Credits
1	Internship & Project Work	Full semester Internship & Project Work	0	0	24	12



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COURSE STRUCTURE & SYLLABUS

IV B. Tech I Semester	AGENTIC AI	L	T	P	C
		3	0	0	3

Course Outcomes:

- CO1:** Explain the fundamental concepts, characteristics, and architectures of Agentic AI systems, and differentiate them from traditional, reactive, and generative AI models.
- CO2:** Apply decision-making, planning, and reinforcement learning techniques to design autonomous agents capable of goal-directed behavior in deterministic and uncertain environments.
- CO3:** Analyze the role of Large Language Models (LLMs) in Agentic AI systems and implement prompt-driven reasoning, memory, and tool-use mechanisms to enable intelligent agent behavior.
- CO4:** Design and develop single-agent and multi-agent systems using contemporary Agentic AI frameworks, incorporating coordination, communication, and workflow orchestration.
- CO5:** Evaluate real-world applications of Agentic AI with respect to ethics, safety, responsibility, and societal impact, and propose value-aligned and secure Agentic AI solutions.

UNIT- I — Foundations of Agentic Intelligence: Understand what Agentic AI is, how it differs from traditional and generative AI, and learn its core theoretical building blocks.

What is AgenticAI vs. Generative/ReactiveAI; Autonomy, Proactivity, and Goal-Directed Behavior; Components of an intelligent agent: Perception, Reasoning, Learning, Action; Agent architectures: Reactive, Deliberative, Hybrid; Rationality and decision models; Real-world use cases and motivation for agentic systems

Unit II — Decision Making, Planning & Learning: Teach how agents make decisions, plan under uncertainty, and adapt through learning. Decision processes: utility theory, Markov Decision Processes (MDPs); Planning under uncertainty; Reinforcement learning fundamentals (MDP, policy, reward shaping); Deep RL essentials (PPO, DQN, A3C — as applicable); Meta-cognition and adaptation in agents; Ethical and value-aligned decision making

Unit III — Large Language Models & Prompt-Driven Agent Behavior: Cover how modern agentic systems leverage large language models and advanced prompt techniques. Transformer architecture and attention basics; Role of LLMs in agentic systems; Prompt engineering fundamentals (zero-shot, chain-of-thought, ReAct); Retrieval-Augmented Generation (RAG) and memory systems; Context management and embedding techniques; Tool-usage and action invocation via prompts



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UNIT-IV — Tools, Frameworks & System Design: Introduce hands-on frame works used to build agentic AI and how to compose multiple agents into workflows. Overview of agent frameworks: LangChain, LangGraph, AutoGen, CrewAI (documentation & practice); Memory, embedding databases (e.g., FAISS, Pinecone, ChromaDB); Workflow orchestration and multi-agent coordination; Agent-to-agent communication; Deployment patterns and APIs; Monitoring, scalability, and production concerns

UNIT- V — Responsible & Applied Agentic AI: Address real-world applications, ethical considerations, safety, and career perspectives. Responsible agentic AI design and risk mitigation; Bias, fairness, and interpretability in autonomous systems; Privacy, transparency, and accountability. Safety and alignment challenges; Case studies: Healthcare, cyber security, business automation

Textbooks:

1. Stuart J.Russell and PeterNorvig, Artificial Intelligence: A Modern Approach (4thEd.), Pearson.
2. Michael Wooldridge, An Introduction to Multi Agent Systems(2nded.)
3. Richard S.Sutton & AndrewG. Barto—Reinforcement Learning: An Introduction

References:

1. David L.Poole & Alan K.Mackworth—Artificial Intelligence :Foundations of Computational Agents
2. KenHuang(Ed.)—Agentic AI: Theories and Practices(Springer,2025)



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COURSE STRUCTURE & SYLLABUS

HONORS	ADVERSARIAL MACHINE LEARNING	L	T	P	C
		3	0	0	3

Course Objectives

- To provide a strong foundation in the security vulnerabilities of machine learning systems.
- To study the theoretical and practical aspects of adversarial attacks.
- To design and evaluate robust defense mechanisms.
- To analyze privacy risks and emerging threats in modern AI systems.
- To examine ethical and societal challenges related to Adversarial AI.

Course Outcomes (COs)

After successful completion of the course, students will be able to

CO1: Explain security principles, threat models, and vulnerabilities in machine learning systems.

CO2: Implement and evaluate adversarial attack algorithms on deep learning models.

CO3: Design robust defense mechanisms to improve model resilience.

CO4: Analyze privacy risks, backdoor threats, and poisoning attacks in machine learning systems.

CO5: Assess adversarial robustness in real-world AI applications and recommend appropriate mitigation strategies.

UNIT-I: Foundations of Adversarial Machine Learning: Review of Machine Learning and Deep Learning fundamentals, Security principles in AI systems, Threat modeling in ML: adversary goals, capabilities, and knowledge; White-box, black-box, and gray-box attack models; Attack surface in ML pipeline (data collection, training, deployment); Risk assessment in AI-enabled systems; Case studies: adversarial examples in image recognition, speech systems, spam detection

UNIT-II: Adversarial Attack Techniques: Mathematical formulation of adversarial perturbations; Evasion attacks: Fast Gradient Sign Method (FGSM), Basic Iterative Method (BIM), Projected Gradient Descent (PGD); Optimization-based attacks: Carlini & Wagner (C&W) attack; Decision-based and score-based black-box attacks; Transferability of adversarial examples; Physical adversarial attacks (adversarial patches, 3D object attacks); Adversarial attacks in NLP and sequential models

UNIT-III: Defense Mechanisms and Robust Learning: Adversarial training and robust optimization; Regularization techniques for robustness; Defensive distillation; Gradient masking: benefits and pitfalls; Detection-based defenses; Input transformation methods (feature squeezing, denoising auto encoders); Certified robustness approaches; Randomized smoothing and Lipschitz continuity

UNIT-IV: Privacy Attacks and Backdoor Threats: Data poisoning and label flipping attacks; Backdoor/Trojan attacks in deep neural networks; Supply chain vulnerabilities in pretrained models; Membership inference attacks; Model inversion attacks; Property inference attacks; Federated learning security risks; Differential privacy fundamentals

UNIT-V: Advanced Topics and Real-World Applications: Generative Adversarial Networks (GANs): adversarial perspective; Robustness vs. accuracy trade-off; Interpretability and explainability in adversarial settings; Adversarial ML in: Autonomous vehicles, Healthcare diagnostics, Biometric authentication, Malware detection and cyber security; AI governance, ethics, and legal considerations; Emerging research trends in adversarial AI



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Textbooks:

1. Adversarial Machine Learning, Ling Huang, Anthony D. Joseph, Blaine Nelson, and Benjamin I.P.Rubinstein.(Foundational concepts and classical adversarial ML theory.)
2. Adversarial Machine Learning: Attack Surfaces, Defence Mechanisms, Learning Theories in Artificial Intelligence, Springer, 2024
3. Deep Learning, IanGoodfellow, YoshuaBengio, Aaron Courville.

Reference Books

1. Machine Learning: A Probabilistic Perspective – Kevin P.Murphy.
2. Pattern Recognition and Machine Learning –Christopher M.Bishop.
3. Security and Machine Learning – ClarenceChio & DavidFreeman.