ESTD: 2009

CMR TECHNICAL CAMPUS

UGC AUTONOMOUS

Accredited by NBA & NAAC with 'A' Grade

Approved by AICTE, New Delhi and JNTU Hyderabad

Computer Science and Engineering (Artificial Intelligence and Machine Learning)

I SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	25MA101BS	Matrices and Calculus	3	1	0	4
2	25PH102BS	Advanced Engineering Physics	3	0	0	3
3	25EC103ES	Basic Electrical Engineering	3	0	0	3
4	25CS104ES	Programming for Problem Solving	3	0	0	3
5	25ME105ES	Computer Aided Engineering Graphics	0	1	2	2
6	25PH106BS	Advanced Engineering Physics Lab	0	0	2	1
7	25EC107ES	Basic Electrical and Electronics Engineering Lab	0	0	2	1
8	25CS108ES	Programming for Problem Solving Lab	0	0	2	1
9	25CS109ES	Python Programming Lab	0	0	2	1
10	25CS110ES	IT Workshop	0	0	2	1
11		Induction Program				
		Total Credits	**12**	**2**	**12**	**20**

II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	25MA201BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2	25CH202BS	Engineering Chemistry	3	0	0	3
3	25EN203HS	English for Skill Enhancement	3	0	0	3
4	25CS204ES	Data Structures	3	0	0	3
5	25EC205ES	Basic Electronics	3	0	0	3
6	25CH206BS	Engineering Chemistry Lab	0	0	2	1
7	25EN207HS	English Language and Communication Skills Lab	0	0	2	1
8	25CS208ES	Data Structures Lab	0	0	2	1
9	25EC209ES	Idea and Innovation Lab	0	0	2	1
		Total Credits	**15**	**1**	**8**	**20**

III SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	25MA301BS	Mathematical and Statistical Foundations	3	0	0	3
2	25AI302PC	Computer Organization and Architecture	3	0	0	3
3	25AI303PC	Object Oriented Programming through Java	3	0	0	3
4	25AI304PC	Software Engineering	3	0	0	3
5	25AI305PC	Database Management Systems	3	0	0	3
6	25MA306BS	Computational Mathematics Lab	0	0	2	1
7	25AI307PC	Object Oriented Programming through Java Lab	0	0	2	1
8	25AI308PC	Software Engineering Lab	0	0	2	1
9	25AI309PC	Database Management Systems Lab	0	0	2	1
10	25AI310SD	Node JS/ React JS/Django	0	0	2	1
11	25EN311VA	Gender Sensitization Lab	1	0	0	1
		Total	**16**	**0**	**10**	**21**

IV SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	25AI401PC	Discrete Mathematics	3	0	0	3
2	25AI402PC	Operating Systems	3	0	0	3
3	25AI403PC	Algorithms Design and Analysis	3	0	0	3
4	25AI404PC	Computer Networks	3	0	0	3
5	25AI405PC	Machine Learning	3	0	0	3
6	25MB406HS	Innovation and Entrepreneurship	1	0	0	1
7	25AI407PC	Operating Systems Lab	0	0	2	1
8	25AI408PC	Computer Networks Lab	0	0	2	1
9	25AI409PC	Machine Learning Lab	0	0	2	1
10	25AI410SD	Data Visualization- PowerBI	0	0	2	1
11	25CH411VA	Environmental Science	1	0	0	1
		Total	**17**	**0**	**8**	**21**

V SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	25AI501PC	Artificial Intelligence	3	0	0	3
2	25AI502PC	Natural Language Processing	3	0	0	3
3	25AI503PC	Automata Theory and Compiler Design	3	0	0	3
4	25AI51XPE	Professional Elective-I	3	0	0	3
5	25AI51XOE	Open Elective-I	2	0	0	2
6	25AI504PC	Artificial Intelligence Lab	0	0	2	1
7	25AI505PC	Natural Language Processing Lab	0	0	2	1
8	25AI506PC	Compiler Design Lab	0	0	2	1
9	25AI507PC	Field Based Research Project	0	0	4	2
10	25AI508SD	UI Design- Flutter/ Android Studio	0	0	2	1
11	25EN509VA	Human Values and Professional Ethics	1	0	0	1
		Total	**15**	**0**	**12**	**21**

VI SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	25AI601PC	Multi Agent Systems	3	1	0	4
2	25AI602PC	Deep Learning	3	0	0	3
3	25MB603HS	Business Economics and Financial Analysis	3	0	0	3
4	25AI62XPE	Professional Elective-II	3	0	0	3
5	25AI62XOE	Open Elective-II	2	0	0	2
6	25AI604PC	Multi Agent Systems Lab	0	0	2	1
7	25AI605PC	Deep Learning Lab	0	0	2	1
8	25EN606BS	English for Employability Skills Lab	0	0	2	1
9	25AI607PC	Chatbots Lab	0	0	2	1
10	25AI608SD	Prompt Engineering	0	0	2	1
11	25MB609VA	Indian Knowledge System	1	0	0	1
		Total	**15**	**1**	**10**	**21**

VII SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	25AI701PC	Reinforcement Learning	3	0	0	3
2	25AI702PC	Generative and Agentic AI	3	0	0	3
3	25MB703HS	Fundamentals of Management for Engineers	2	0	0	2
4	25AI73XPE	Professional Elective-III	3	0	0	3
5	25AI74XPE	Professional Elective-IV	3	0	0	3
6	25AI73XOE	Open Elective-III	2	0	0	2
7	25AI704PC	Reinforcement Learning Lab	0	0	2	1
8	25AI705PC	Generative and Agentic AI Lab	0	0	2	1
9	25AI706PC	Industry Oriented Mini Project/ Internship	0	0	4	2
		Total	**16**	**0**	**08**	**20**

VIII SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	25AI85XPE	Professional Elective-V	3	0	0	3
2	25AI86XPE	Professional Elective-VI	3	0	0	3
3	25AI801PC	Project Work	0	0	28	14
		Total	**6**	**0**	**28**	**20**

PROFESSIONAL ELECTIVES

Professional Elective-I

25AI511PE	Computer Graphics
25AI512PE	Introduction to Data Science
25AI513PE	Data Mining
25AI514PE	Web Programming
25AI515PE	Distributed Systems

Professional Elective-II

25AI621PE	Image Processing
25AI622PE	Blockchain Technology
25AI623PE	Mining Massive Datasets
25AI624PE	Full Stack Development
25AI625PE	DevOps

Professional Elective-III

25AI731PE	Computer Vision
25AI732PE	Cloud Computing
25AI733PE	Information Retrieval Systems
25AI734PE	Information Security
25AI735PE	Data Stream Mining

Professional Elective-IV

25AI741PE	Augmented Reality & Virtual Reality
25AI742PE	Big Data Analytics
25AI743PE	Quantum Computing
25AI744PE	Robotic Process Automation
25AI745PE	Cyber Forensics

Professional Elective-V

25AI851PE	Social Media Mining
25AI852PE	Internet of Things
25AI853PE	Game Theory
25AI854PE	Mobile Application Development
25AI855PE	Nature Inspired Computing

Professional Elective-VI

25AI861PE	High Performance Computing
25AI862PE	Edge Computing
25AI863PE	Graph Theory
25AI864PE	Sustainable Engineering
25AI865PE	Distributed Databases

OPEN ELECTIVES (For other branches)

Open Elective-I:

25AI511OE	Fundamentals of Artificial Intelligence
25AI512OE	Introduction to Data Analytics

Open Elective-II:

25AI621OE	Machine Learning Basics
25AI622OE	Introduction to Cyber Security

Open Elective-III:

25AI731OE	Chatbots
25AI732OE	Generative AI Tools

Matrices and Calculus

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

Subject Code: 25MA101BS **3 1 0 4**

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives:

1. Applying basic operations on matrices and their properties, concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
2. Concept of eigen values and eigen vectors and to reduce the quadratic form to canonical form
3. Mean value theorems and their application to the mathematical problems
4. Finding maxima and minima of functions of two and three variables.
5. Evaluation of multiple integrals and their applications.

Course outcomes: After completion of this course, The Students will be able to:

1. Apply the matrix representation of a set of linear equations and to analyse the solution of the system of equations
2. Find the Eigen values and Eigen vectors, Reduce the quadratic form to canonical form using orthogonal transformations.
3. Solve the applications of the mean value theorems.
4. Examine the extreme values of functions of two variables with/ without constraints.
5. Evaluate the multiple integrals and apply the concept to find areas, volumes.

UNIT-I: Matrices **[8 Lectures]**

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

UNIT-II: Eigen values and Eigen vectors **[10 Lectures]**

Linear Transformation and Orthogonal Transformation: Eigen values – Eigen vectors 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 form by Orthogonal Transformation.

UNIT-III: Single Variable Calculus **[10 Lectures]**

Limit and Continuous of functions and its properties.

Mean value theorems: Rolle's theorem – Lagrange's Mean value theorem – Cauchy's Mean value Theorem – Taylor's Series for single variable, Taylor's Series for function of two variables(All the theorems without proof).

UNIT-IV: Multivariable Calculus (Partial Differentiation and applications) [10 Lectures]

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

UNIT-V: Multivariable Calculus (Integration) [10 Lectures]

Evaluation of Double Integrals (Cartesian and polar coordinates) – change of order of integration (only Cartesian form) – Change of variables for double integrals (Cartesian to polar). Evaluation of Triple Integrals. Applications: Areas by double integrals and volume by Triple integrals.(simple examples)

TEXT BOOKS:

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

REFERENCE BOOKS:

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

ADVANCED ENGINEERING PHYSICS

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

Subject Code:25PH102BS **3 0 0 3**

Pre-requisites: 10+2 Physics

Course Objectives:

1. To understand fundamental concepts of quantum mechanics and their applications in solids.
2. To understand the working principle of semiconductor devices LED Solar cell and Material characterization techniques like XRD and SEM.
3. To introduce quantum computing principles and quantum gates.
4. To learn the properties and applications of magnetic and dielectric materials.
5. To explore the working and applications of lasers and fibre optics in modern technology.

Course Outcomes: After completion of this course, The Students will be able to:

1. Apply quantum mechanical principles to explain particle behaviour and energy band formation in solids.
2. Analyze the characteristics of semiconductor devices and apply XRD & SEM techniques for material characterization in nanomaterials.
3. Understand quantum computing concepts and explain basic quantum gates.
4. Classify magnetic and dielectric materials and explain their properties, synthesis, and applications.
5. Explain the principles of lasers and fibre optics and their applications in communication and sensing.

UNIT - I: Quantum Mechanics

Introduction, de-Broglie hypothesis, Heisenberg uncertainty principle, physical significance of wave function, postulates of quantum mechanics: operators in quantum mechanics, eigen values and eigen functions, expectation value; Schrödinger's time independent wave equation, particle in a 1D box, Bloch's theorem (qualitative), Kronig-Penney model (qualitative): E-k diagram, effective mass of electron, classification of solids.

UNIT - II: Semiconductor Physics & Nanotechnology

Introduction to Semiconductors: Intrinsic and extrinsic semiconductor (qualitative), Hall effect, Direct and indirect band gap semiconductors, Construction, principle of operation and characteristics of P-N junction diode, structure, materials and working principle of LED & Solar cell. Concept of Nanomaterials: Introduction to nanoscience and nanotechnology, surface to volume ratio, quantum confinement, Synthesis of Nanomaterials - Ball milling method (Top-down approach), Sol-Gel method (Bottom-up approach), Characterization Techniques - X -ray diffraction: Bragg's law, calculation of average crystallite size using Debye Scherrer's formula, scanning electron microscopy (SEM): block diagram, working principle.

UNIT - III: Quantum Computing

Introduction, linear algebra for quantum computation, Dirac's Bra and Ket notation and their properties, Hilbert space, Bloch's sphere, concept of quantum computer, classical bits, Qubits, multiple Qubit system, entanglement, quantum gates - Pauli-X gate, Hadamard gate, CNOT gate, challenges and advantages of quantum computing over classical computation.

UNIT - IV: Magnetic and Dielectric Materials

Introduction to magnetic materials, Basic definitions, classification of magnetic materials, hysteresis, soft and hard magnetic materials, magneto resistance and magnetostriction effect, applications of magnetic materials and magnets for EV.

Introduction to dielectric materials, types of polarization: electronics, ionic & orientation(qualitative); ferroelectric, piezoelectric, pyroelectric materials and their applications: Load Cell and Fire sensor.

UNIT - V: Laser and Fibre Optics

Introduction to laser, characteristics of laser, Einstein coefficients and their relations, metastable state, population inversion, pumping, lasing action, Ruby laser, He-Ne laser, semiconductor diode laser, applications of Laser: Bar code scanner, LIDAR for autonomous vehicle.

Introduction to fibre optics, total internal reflection, construction of optical fibre, acceptance angle, numerical aperture, classification of optical fibres, losses in optical fibre, applications: optical fibre for communication system.

TEXT BOOKS:

1. Walter Borchardt-Ott, Crystallography: An Introduction, Springer.
2. Charles Kittel, Introduction to Solid State Physics, John Wiley & Sons, Inc.
3. Thomas G. Wong, Introduction to Classical and Quantum Computing, Rooted Grove

REFERENCE BOOKS:

1. Jozef Gruska, Quantum Computing, McGraw Hill
2. Michael A. Nielsen & Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press.
3. John M. Senior, Optical Fiber Communications Principles and Practice, Pearson Education Limited.

Basic Electrical Engineering

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

Subject Code: 25EC103ES **3 0 0 3**

Prerequisites: Fundamentals in physics and Mathematics

Course Objectives:

1. To introduce the concepts of electrical circuits and its components.
2. To study and understand the different types of single phase AC circuits.
3. To study and understand the different types of Transformers.
4. To introduce the concepts of DC and AC machines.
5. To import the knowledge of various electrical installations and the concept of power, power factor and its improvement.

Course Outcomes: After completion of this course, The Students will be able to:

1. Identify the basic DC electrical circuits.
2. Evaluate the basic single phase AC circuits.
3. Analyze the concepts of single phase transformers
4. Classify the concepts of Electrical Machines.
5. Explore components of Low Voltage Electrical Installations.

UNIT- I :

D.C. CIRCUITS: Introduction, Types of elements, Definitions, Ohm's law and its limitations, R-L-C parameters, Energy sources-Ideal and practical voltage and current sources(Independent only), Series and Parallel combination of Resistances, Inductances and Capacitances, current division and voltage division principles, Delta to Star and Star to Delta Transformation, Kirchhoff's Laws, Mesh analysis, Nodal analysis.

UNIT-II :

A.C. CIRCUITS: Representation of sinusoidal waveforms, Instantaneous value, Peak value, Average and RMS value, Form factor and Peak factor for sinewave, Saw tooth and Square Waveforms, Phasor representation, Real power, Reactive power, Apparent power, Power factor, Analysis of single- phase ac circuits consisting of R,L,C, RL, RC, RLC series combination**.**

UNIT – III :

Transformers: Construction, Types, Working principle of Single-phase transformer, EMF equation, problems on emf equation, transformation ratio, Equivalent circuit, Losses in transformers, regulation, Efficiency and Condition for maximum efficiency.

UNIT – IV :

Electrical Machines: Construction, Working Principle of single loop DC generator, EMF equation, problems on emf equation, Types of dc generators, Working principle of DC motor, types of motors, Torque equation, Three phase induction motor construction and working, Slip and Rotor current frequency, problems on slip and rotor frequency.

UNIT – V :

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

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.
3. M. S. Sukhija, T. K. Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1st Edition, 2012.
4. V.K. Mehta, Rohit Mehta, Principles of Electrical Engineering and Electronics – S.Chand Publications, 2nd Edition,2014.

REFERENCE BOOKS:

1. R. L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits – PEI/PHI, 9th Ed, 2006.
2. J. Millman and C. C. Halkias, SatyabrataJit, Electronic Devices and Circuits – TMH, 2/e, 1998.
3. William Hayt and Jack E. Kemmerly, Engineering circuit analysis- McGraw Hill Company, 6th edition,2012.
4. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
5. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.

PROGRAMMING FOR PROBLEM SOLVING

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

Subject Code: 25CS104ES **3 0 0 3**

Prerequisites: Basic Knowledge on Mathematics and Problem Solving Skills

Course Objectives:

1. To learn the fundamentals of C, conditional and loop statements.
2. To Practice functions and arrays for problemsolving.
3. To work on various strings, pointers and modular programmings.
4. To understand recursion, structures and union programming.
5. To analyze various searching and sorting techniques.

Course Outcomes: After completion of this course, The Students will be able to:

1. Describe C fundamentals, conditional and loop statements.
2. Demonstrate functions and arrays to solve various problems
3. Analyze various strings, pointers and modular programmings.
4. Use Recursive functions, structures and unions.
5. Develop various searching and sorting techniques.

UNIT – I: **[11 Lectures]**

Overview of C:C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Operators, Arithmetic Expressions, Formatting Numbers in Program Output.

Selection Structures: Control Structures, Conditions, if Statement, if Statements with Compound Statements, Decision Steps in Algorithms.

Repetition and Loop Statements: Repetition in Programs, Counting Loops and the while Statement, Computing a Sum or Product in a Loop, for Statement, Conditional Loops, Loop Design, Nested Loops, do-while Statement.

Jump statements: break, continue, goto, Return.

UNIT – II: **[9 Lectures]**

Top-Down Design with Functions: Building Programs from Existing Information, Library Functions, Top-Down Design and Structure Charts, Functions without Arguments, Functions with Input Arguments.

Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Searching and Sorting an Array, Parallel Arrays and Enumerated Types, Multidimensional Arrays.

UNIT – III: **[9 Lectures]**

Pointers and Modular Programming: Pointers and the Indirection Operator, Functions with Output Parameters, Multiple Calls to a Function with Input/ Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments, Dynamic Memory Allocation Functions.

Strings: String Basics, String Library Functions: Assignment and Substrings, Longer Strings: Concatenation and Whole-Line Input, String Comparison, Arrays of Pointers.

UNIT – IV: **[8 Lectures]**

Recursion: The Nature of Recursion, Tracing a Recursive Function, Recursive Mathematical Functions, Recursive Functions with Array and String Parameters

Structure and Union Types: User-Defined Structure Types, Structure Type Data as Input and Output

Parameters, Functions with Structured Result Values, Union Types.

UNIT – V: **[8 Lectures]**

Text and Binary File Pointers: Input/ Output Files – Review and Further Study, Binary Files, Searching a Database.

Searching and Sorting: Basic searching in an array of elements (Linear and Binary search Techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms).

TEXT BOOKS:

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

REFERENCE BOOKS:

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

COMPUTER AIDED ENGINEERING GRAPHICS

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

Subject Code: 25ME105ES **0 1 2 2**

Course Objectives:

1. To provide basic concepts in engineering drawing. To develop the ability of visualization of objects through technical drawings
2. To impart knowledge about standard principles of orthographic projection of objects.
3. To draw projections of solids and pictorial views of solids and to draw surfaces development of solid for prisms, pyramids, cone and cylinder.
4. To draw isometric views of solids and orthographic projections of solids.
5. To acquire computer drafting skill for communication of concepts, ideas in the design of engineering Products.

Course Outcomes: After completion of this course, The Students will be able to:

1. Apply computer aided drafting tools to sketch the conventions and the methods of drawings , engineering curves and scales .
2. Understand and draw the projections of points, lines, planes in different types of projections. manually and by using computer aided drafting tools.
3. Appreciate the need of projections of solids (prisms, pyramids, cone and cylinder) manually and by using computer aided drafting tools.
4. Interpret engineering drawings for development of surfaces to Right Regular Solids-prism, manually and by using computer aided drafting tool.
5. Convert of orthographic projection into isometric view and vice versa manually and by using computer aided drafting tool.

UNIT- I: INTRODUCTION TO ENGINEERING GRAPHICS:

Principles of Engineering Graphics and their Significance, Geometrical Constructions, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid. Scales – Plain and Diagonal. Introduction to CAD Software commands and practice.

UNIT – II: ORTHOGRAPHIC PROJECTIONS:

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections, points, lines and planes. Introduction to Computer aided drafting, views, commands and conics. Conventional and by using computer aided drafting.

UNIT –III: PROJECTIONS OF REGULAR SOLIDS

Projections of Regular Solids – Prism, Cylinder, Pyramid and Cone. Auxiliary Views, Sections or Sectional views Conventional and by using computer aided drafting.

UNIT- IV: DEVELOPMENT OF SURFACE

Development of Surfaces of Regular Solids – Prism, Cylinder, Pyramid and Cone. Conventional and by using computer aided drafting.

UNIT –V: ISOMETRIC PROJECTIONS

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

TEXTBOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar .
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

REFERENCE BOOKS:

1. Engineering Drawing / Basant Agrawal and McAgrawal/ McGraw Hill
2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson.
3. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

ADVANCED ENGINEERING PHYSICS LAB

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

Subject Code: 25PH106BS **0 0 2 1**

Course Objectives:

1. To provide practical exposure to advanced concepts in electrical, solid-state and modern physics.
2. To study the physical properties of materials like semiconductors and ferroelectric substances.
3. To perform semiconductor characterization using Hall effect and band gap experiments.
4. To explore the working principles of lasers and optical fibers through hands-on experiments.
5. To develop skills in data analysis, interpretation, and scientific reporting.

Course Outcomes: After completion of this course, The Students will be able to:

1. Understanding the concept of impedance, resonant frequency, bandwidth and perform calculations.
2. Determine key electrical, magnetic, and optical properties of semiconductors and other functional materials.
3. Analyze semiconductors using Hall effect and energy gap measurement techniques.
4. Demonstrate working knowledge of laser systems and optical fiber parameters through experimental study.
5. Apply scientific methods for accurate data collection, analysis, and technical report writing.

1. To study the resonant frequency, band width and quality factor of LCR circuit.
2. Determination of energy gap of a semiconductor.
3. .a. To study the V-I characteristics of solar cell.
   b. To study the V-I characteristics of LED.
4. Determination of Hall coefficient and carrier concertation of a given semiconductor.
5. To determine work function and Planck's constant using photoelectric effect.
6. To study the V-I characteristics of a p-n junction diode. 7.Determination of dielectric constant of a given material.
7. Determination of magnetic moment of a bar magnet and horizontal earth magnetic field.
8. a. Determination of wavelength of a laser using diffraction grating.
   b. Study of V-I characteristics of a given laser diode.
9. a. Determination of numerical aperture of a given optical fibre.
   b. Determination of bending losses of a given optical fibre.

Note: Any 8 experiments are to be performed.

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

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

Subject Code: 25EC107ES **0 0 2 1**

Course Objectives:

1. To introduce the concepts of diodes and transistors.
2. To impart the knowledge of various types of Rectifiers.
3. To Analyze a given network by applying various electrical laws.
4. To Analyze the performance of single phase transformers.
5. To Analyze the performance of transformers, DC and AC machines.

Course Outcomes: After completion of this course, The Students will be able to:

1. Compare the characteristics of different types of diodes and transistors.
2. Evaluate the performance of Rectifiers with and without filters.
3. Inspect the Ohms law, KCL, KVL with practical approach.
4. Estimate the performance calculations of single phase transformers.
5. Analyze the Performance characteristics of DC and AC machines through various testing methods.

LIST OF EXPERIMENTS/DEMONSTRATIONS

SECTION A : ELECTRONICS ENGINEERING:

1. Study and operation of
   (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies iv) CRO
2. PN Junction Diode Characteristics A)Forward bias B) Reverse bias
3. Zener Diode Characteristics A)Forward bias B) Reverse bias
4. Input and Output characteristics of BJT in CE Configuration.
5. Half wave Rectifier without and with Filters.
6. Full wave Rectifier without and with Filters.

SECTION B: ELECTRICAL ENGINEERING:

1. Verification of Ohm's law.
2. Verification of KCL and KVL.
3. Brake test on DC Shunt motor.
4. Brake test on 3-phase Induction motor.
5. Load Test on Single-Phase Transformer.
6. Measurement of Voltage, Current and Real Power in Primary and Secondary circuits of a Single Phase Transformer.
7. No Load Characteristics of 3 phase Alternator.

Note: Total 10 experiments are to be conducted.
(Minimum Five experiments from PART-A and Five experiments from PART-B)

PROGRAMMING FOR PROBLEM SOLVING LAB

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

Subject Code: 25CS108ES **0 0 2 1**

[Note:The programs may be executed using any available Open Source/ Freely available IDE Some of the Tools available are:
CodeLite: https://codelite.org/
Code::Blocks:
http://www.codeblocks.org/ DevCpp :
http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

Co-requisites: A Course on Programming for Problem Solving.

Prerequisites: Basic Knowledge on Mathematics and Problem Solving Skills.

Course Objectives:

1. To learn the basics of C Programming
2. To understand basic concepts like operators, control structures and loop statements etc.
3. To practice various file handling techniques.
4. To Explore various string manipulation techniques
5. To analyze various searching and sorting algorithms .

Course Outcomes: After completion of this course, The Students will be able to:

1. Demonstrate the basics concepts of C programming.
2. Analyze arrays, pointers and functions to solve problems.
3. Apply the file handing techniques to manage data in the files.
4. Experiment on various String manipulation techniques
5. Develop various sorting and searching techniques

PRACTICE SESSIONS: Simple numeric problems:

a) Write a program for finding the max and min from the three numbers. b) Write the program for the simple, compound interest.

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

5 x 1
= 5
5 x 2 = 10
5 x 3 = 15

d) Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

b) Write a program that finds if a given number is a prime number.
c) Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
d) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

Arrays, Pointers and Functions:

a) Write a C program to find the minimum, maximum and average in an array of integers.
b) Write a C program that uses functions to perform the following:
   I. Addition of Two Matrices
   II. Multiplication of Two Matrices
c) Write a program for reading elements using a pointer into an array and display the values using the array.
d) Write a program for display values reverse order from an array using a pointer.

Files:

a) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Strings:

a) Write a C program that uses functions to perform the following operations:
   I. To insert a sub-string into a given main string from a given position.
   II. To delete n Characters from a given position in a given string
b) Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
c) Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
d) Write a C program to count the lines, words and characters in a given text.

Sorting and Searching:

a) Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search method.
b) Write a C program that uses non-recursive function to search for a Key value in a given sorted list of integers using binary search method.
c) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

d) Write a C program that sorts the given array of integers using selection sort in descending order
e) Write a C program that sorts the given array of integers using insertion sort in ascending order
f) Write a C program that sorts a given array of names.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

PYTHON PROGRAMMING LAB

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

Subject Code: 25CS109ES **0 0 2 1**

Prerequisites: Basic knowledge on C Programming and students should install Python

Course Objectives:

1. To learn basic data types, operators, use of procedural statements like assignments, conditional statements, loops and function calls.
2. To make use of functions and string operations.
3. To work with the data structures like lists, set, dictionaries and tuples in python.
4. To acquire knowledge on object-oriented programming concepts in python.
5. To implement file handling and error handling mechanisms

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

1. Practice the basic concepts of python programming.
2. Apply functions to design modular programming and perform string operations.
3. Analyze various data structures like lists, set, dictionaries and tuples in python.
4. Implement object-oriented programming concepts using python.
5. Build applications using file handling and error handling techniques.

List of Experiments:

1.
   I. Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   II. Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3. Write a program to calculate compound interest when principal, rate and number of periods are given.
4. Read the name, address, email and phone number of a person through the keyboard and print the details.
5. Print the below triangle using for loop.

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

6. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character(use 'if-else-if' ladder)
7. Python program to print all prime numbers in a given interval (use break)
8. Write a program to convert a list and tuple into arrays.
9. Write a program to find common values between two arrays.
10. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

11. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
12. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
13. Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
14. The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
15. Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.
16. Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
17. Remove the given word in all the places in a string?
18. Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
19. Writes a recursive function that generates all binary strings of n-bit length
20. Write a python program that defines a matrix and prints
21. Write a python program to perform multiplication of two square matrices
22. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
23. Use the structure of exception handling all general-purpose exceptions.
24. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
25. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.
26. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.
27. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.
28. Write a python code to read a phone number and email-id from the user and validate it for correctness.
29. Write a Python code to merge two given file contents into a third file.
30. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
31. Write a Python code to Read text from a text file, find the word with most number of occurrences
32. Write a function that reads a file *file1*and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.
33. Import numpy, Plotpy and Scipy and explore their functionalities.
34. Install NumPypackage with pip and explore it.
35. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
36. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
3. Introduction to Python Programming, Gowrishakar S, Veena A, CRC Press
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Python for Data Science, Dr. Mohd Abdul Hameed, Wiley publications
6. Core Python Programming, Dr. R. Nageswara Rao, Dreamtech press
7. Introduction to Python, Gowrishankar S, Veena A., CRC Press

IT WORKSHOP

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

Subject Code: 25CS110ES **0 0 2 1**

Course Objectives:

1. Understanding and working with PC hardware components.
2. Configuring and troubleshooting operating systems such as Windows and Linux.
3. Gaining basic networking skills and knowledge of Internet protocols.
4. Using productivity tools like MS Word, Excel, PowerPoint, and LaTeX for documentation and presentation.
5. Developing awareness of cybersecurity practices to ensure safe use of computer systems and the Internet.

Course Outcomes: After completion of this course, The Students will be able to:

1. Explore Assemble, disassemble, and troubleshoot PC hardware components effectively.
2. Demonstrate Install and configure multiple operating systems (Windows/Linux) on a single machine.
3. Relate a network connection, configure TCP/IP settings, and access web resources.
4. Construct technical documents and presentations using tools like MS Office and LaTeX.
5. Apply basic cybersecurity measures to protect systems from viruses, worms, and other threats.

PC Hardware

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

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

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

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

Internet & World Wide Web

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

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

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

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

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

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

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

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

Excel

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

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

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

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

PowerPoint

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

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

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

REFERENCE BOOKS:

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

Ordinary Differential Equations and Vector Calculus

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

Subject Code: 25MA201BS **3 1 0 4**

Pre-requisites: Mathematical Knowledge at pre-university level

COURSE OBJECTIVES:

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

COURSE OUTCOMES: After completion of this course, The Students will be able to:

1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real world problems.
3. Use the Laplace Transforms techniques for solving Ordinary Differential Equations.
4. Evaluate Gradient, Divergence and Curl of a vector differential operator.
5. Interpret the Line, Surface and Volume integrals and converting them from one to another

UNIT-I: First Order Ordinary Differential Equations [8 Lectures]

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

UNIT-II: Ordinary Differential Equations of Higher Order [10 Lectures]

Higher order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x, $e^{ax}V(x)$ and $x\ V(x)$ – Method of variation of parameters.

UNIT-III: Laplace Transforms [10 Lectures]

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

UNIT-IV: Vector Differentiation [10 Lectures]

Vector point functions and scalar point functions – Gradient – Divergence and Curl – Directional derivatives – Vector Operators-Scalar potential functions – Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration **[10 Lectures]**

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

TEXT BOOKS:

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

REFERENCES

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

ENGINEERING CHEMISTRY

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

Subject Code: 25CH202BS **3 0 0 3**

Course Objectives:

1. To develop adaptability to new advances in Engineering Chemistry and acquire the essential skills to become a competent engineering professional.
2. To understand the industrial significance of water treatment, fundamental principles of battery chemistry, and the impact of corrosion along with its control methods for structural protection.
3. To impart foundational knowledge of various energy sources and their practical applications in engineering.
4. To understand the fundamentals synthesis, general properties of polymers and other engineeringmaterials.
5. To equip students with an understanding of smart materials and analytical techniques applicable in engineering, industrial, environmental, and biomedical fields.

Course Outcomes: After completion of this course, The Students will be able to:

1. Understand the fundamental properties of water and its applications in both domestic and industrial purposes.
2. Analyze basic knowledge of electrochemical processes and their relevance to corrosion and its control methods.
3. Explore the significance and practical applications of batteries and various energy sources, enhancing their potential as future engineers and entrepreneurs.
4. Describe the basic concepts and properties of polymers and other engineering materials.
5. Apply the principles of UV-Visible, IR spectroscopy and Raman spectroscopy in analyzing pollutants in dye industries and biomedical applications.

UNIT-I: Water and its treatment: **[8 Lectures]**

Introduction- Hardness, types, degree of hardness and units. Estimation of hardness of water by complexometric method - Numerical problems. Boiler troubles: Scales, Sludges and Caustic embrittlement. Internal treatment of boiler feed water - Calgon conditioning, Phosphate conditioning, Colloidal conditioning. External treatment methods - Softening of water by ion- exchange processes.

Desalination of brackish water – Reverse osmosis. Potable water and its specifications (WHO) - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break-point chlorination. Defluoridation - Nalgonda technique.

Unit-II: Electrochemistry and Corrosion: **[8 Lectures]**

Introduction- Electrode potential, standard electrode potential, Nernst equation- derivation, electrochemical cell - Galvanic cell, cell representation, EMF of cell. Types of electrodes, reference electrodes - Primary reference electrode - Standard Hydrogen Electrode (SHE), Secondary reference electrode - Calomel electrode. Construction, working and determination of pH of unknown solution using SHE and Calomel electrode.

Corrosion: Introduction- Definition, causes and effects of corrosion – Theories of corrosion, chemical and electrochemical theories of corrosion, Types of corrosion: galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion - Nature of the metal, Nature of the

corroding environment. Corrosion control methods - Cathodic protection Methods - Sacrificial anode and impressed current methods.

UNIT–III: Energy sources: [8 Lectures]

Batteries: Introduction – Classification of batteries - Primary, secondary and reserve batteries with examples. Construction, working and applications of lithium, Lithium-ion and Zn-air battery. Fuel Cells – Differences between a battery and a fuel cell, Construction and applications of Direct Methanol Fuel Cell (DMFC).

Fuels: Introduction and characteristics of a good fuel, Calorific value – Units - HCV, LCV-Dulongs formula, Numerical problems.

Fossil fuels: Introduction, Classification, Petroleum - Refining of Crude oil, Cracking - Types of cracking - Moving bed catalytic cracking.

Synthetic Fuels: Fischer-Tropsch process, Introduction and applications of Hythane and Green Hydrogen.

UNIT - IV: Polymers: [8 Lectures]

Definition - Classification of polymers: Based on origin and tacticity with examples – Types of polymerizations - Addition (free radical addition mechanism) and condensation polymerization.

Plastics, Elastomers and Fibers: Definition and applications (PVC, Bakelite, Buna-S, Nylon-6,6,). Differences between thermoplastics and thermo setting plastics.

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

Biodegradable polymers: Polylactic acid and its applications.

UNIT-V- Advanced Functional Materials: [8 Lectures]

Smart materials: Introduction, Classification with examples - Shape Memory Alloys – Nitinol, Piezoelectric materials – quartz and their engineering applications.

Biosensor - Definition, Amperometric Glucose monitor sensor.

Interpretative spectroscopic applications of UV-Visible spectroscopy for Analysis of pollutants in dye industry, IR spectroscopy in night vision-security, Pollution Under Control-CO sensor (Passive Infrared detection), Raman spectroscopy (application) - Tumour detection in medical applications.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
2. .Engineering Chemistry by Rama Devi, Dr. P. Aparna and Rath, Cengage learning, 2025.
3. 3.Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS:

1. Engineering Chemistry: by Thirumala Chary Laxminarayana & Shashikala, Pearson Publications (2020)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi 2011. 3.Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi 2015.
3. Engineering Analysis of Smart Material Systems by Donald J. Leo, Wiley, 2007.

4. Challenges and Opportunities in Green Hydrogen by Editors: Paramvir Singh, Avinash Kumar Agarwal, Anupma Thakur, R.K Sinha.
5. Raman Spectroscopy in Human Health and Biomedicine, https://www.worldscientific.com/ doi/epdf/10.1142/13094

English for Skill Enhancement

B. Tech. II Semester **L T P C**
Subject Code: 25EN203HS **3 0 0 3**

National Education Policy-2020 aims at preparing students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. It also emphasizes language study and promotion of languages through understanding and proper interpretation. English language is central to the educational eco system. The importance of language as medium of communication for personal, social, official and professional needs to be emphasized for clear and concise expression. Teaching and learning of receptive and productive skills viz., Listening, Speaking, Reading and Writing (LSRW) are to be taught and learnt effectively in the undergraduate Engineering programs. Learners should be encouraged to engage in a rigorous process of learning to become proficient users of English language by adopting a deeply focused and yet flexible approach as opposed to rote learning.

In this connection, suitable syllabus, effective pedagogy, continuous assessments and students' involvement result in productive learning. This course supports the latest knowledge and skill requirements and shall meet specified learning outcomes. The main objectives of English language teaching and learning as medium of communication and for promotion of cultural values are embedded in this syllabus. Efforts are being made in providing a holistic approach towards value- based language learning which equips the learner with receptive as well as productive skills.

The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed textbook for detailed study. The students should be encouraged to read the texts leading to reading comprehension. The time should be utilized for

working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material.

COURSE OBJECTIVES: This course will enable the students to:

1. Improve their vocabulary, grammar and use appropriate sentence structures.
2. Develop reading strategies and guessing the meaning from context.
3. Enhance their writing skills, drafting letters, e-mails and resume.
4. Equip the students in comprehending and generating appropriate prompts.
5. Acquire skills for Technical report writing.

COURSE OUTCOMES: After completion of this course, The Students will be able to:

1. Identify Choose appropriate vocabulary, grammar and sentence structures in their oral and written communication.
2. Demonstrate their understanding of reading strategies and guessing the meaning from the context.
3. Describe paragraphs, essays, précis, draft letters e-mails and resume.
4. Comprehend and generate appropriate prompts.
5. Use abstracts and reports in various contexts.

SYLLABUS

The course content / study material is divided into Five Units.

UNIT –I

Theme: Perspectives

Lesson on 'The Generation Gap' by Benjamin M. Spock from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Words Often Misspelt - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Parts of Speech Particularly Articles and Prepositions – Degrees of Comparison

Reading: Reading and Its Importance- Sub Skills of Reading – Skimming and Scanning.

Writing: Sentence Structures and Types -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely –Nature and Style of Formal Writing.

UNIT –II

Theme: Digital Transformation

Lesson on 'Emerging Technologies' from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

Vocabulary: Homophones, Homonyms and Homographs

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

Reading: Reading Strategies-Guessing Meaning from Context – Identifying Main Ideas – Exercises for Practice

Writing: Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence – Linkers and Connectives - Organizing Principles in a Paragraph – Defining- Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence - Essay Writing - Writing Introduction and Conclusion.

UNIT –III

Theme: Attitude and Gratitude

Poems on 'Leisure' by William Henry Davies and 'Be Thankful' - Unknown Author from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

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

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

Reading: Sub-Skills of Reading – Identifying Topic Sentence and Providing Supporting Ideas - Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Job Application with CV/Resume –Difference between Writing a Letter and an Email - Email Etiquette.

UNIT –IV

Theme: Entrepreneurship

Lesson on 'Why a Start-Up Needs to Find its Customers First' by Pranav Jain from the prescribed textbook titled English for the Young in the Digital World published by Orient

Black Swan Pvt. Ltd.

Vocabulary: Standard Abbreviations in English – Inferring Meanings of Words through Context – Phrasal Verbs – Idioms.

Grammar: Redundancies and Clichés in Written Communication – Converting Passive to Active Voice and Vice-Versa.

Reading: Prompt Engineering Techniques– Comprehending and Generating Appropriate Prompts - Exercises for Practice

Writing: Writing Practices- Note Making-Précis Writing.

UNIT –V

Theme: Integrity and Professionalism

Lesson on 'Professional Ethics' from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

Vocabulary: Technical Vocabulary and their Usage– One Word Substitutes – Collocations.

Grammar: Direct and Indirect Speech - Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) – Inferring the Meaning and Evaluating a Text- Exercises for Practice

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

Note: Listening and Speaking skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.

➢ (Note: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is Open-ended, besides following the prescribed textbook, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.)

TEXTBOOK

1. Board of Editors. 2025. English for the Young in the Digital World. Orient BlackSwan Pvt. Ltd.

REFERENCE BOOK

1. Swan, Michael. (2016). Practical English Usage. Oxford University Press. New Edition.
2. Karal, Rajeevan. 2023. English Grammar Just for You. Oxford University Press. New Delhi, 2024.
3. Empowering with Language: Communicative English for Undergraduates. Cengage Learning India Pvt. Ltd. New Delhi
4. Sanjay Kumar & Pushp Lata. 2022. Communication Skills – A Workbook. Oxford Univeristy Press. New Delhi
5. Wood,F.T. (2007). Remedial English Grammar. Macmillan.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.

DATA STRUCTURES

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

Subject Code: 25CS204ES **3 0 0 3**

Prerequisites: A course on "Programming for Problem Solving

Course Objectives

1. To Understand the fundamentals of Various Data Structures.
2. To Implement various binary tree structures and their applications.
3. To learn Advanced tree structures and apply efficient searching techniques.
4. To Find graph representation and apply efficient sorting algorithms
5. To Explore hashing techniques and file organization methods for efficient data management

Course Outcomes After completion of this course, The Students will be able to:

1. Apply basic data structures like stacks,listed list and queues.
2. Analyze various search tree .
3. Develop advanced trees ,heaps and its applications.
4. Demonstrate graphs and Sorting Techniques
5. Design various Hashing and file organization techniques.

UNIT – I **[10 Lectures]**

Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operation on Data Structures, abstract data types, selecting a Data Structure, Linear list – Introduction, singly linked list, Circular Linked Lists, Doubly Linked List, Stacks- Operations, Stack algorithm, Stack ADT, Stack applications, Queues- operations, Queue Algorithm, Queue ADT, Queue Applications.

UNIT – II **[10 Lectures]**

Trees: Introduction, Types of Trees, creating a Binary Tree from a General Tree, traversing a Binary Tree, Binary Search Trees (BST), BST Operations- Searching, Insertion and Deletion, BST ADT, BST Applications, Threaded Binary Trees, AVL Trees, Red –Black Trees, Splay Trees

UNIT – III **[9 Lectures]**

Multi way Search Trees: Introduction, B Trees, B Trees ADT, 2-3 Trees, B* Tree, B+ Trees

Heaps: Binary Heaps, Binomial heaps, Fibonacci heaps, Comparison of Various Heaps.

Applications Searching: Introduction, Interpolation Search, Jump search

UNIT – IV **[8 Lectures]**

Graphs: Introduction, Directed Graphs, Bi connected Components, Representation of Graphs, Graph Traversal Algorithms, Graph ADT, Applications of Graphs

Sorting: Radix Sort, Heap sort, Shell Sort, Tree Sort,

UNIT – V **[9 Lectures]**

Hashing and Collision: Introduction, Hash Tables, Hash Functions, Different Hash Functions: Division Method, Multiplication Method, Mid-square Method, Folding Method; collisions: Collision Resolution by Open Addressing, Collision Resolution by Chaining

Files and their Organization: Introduction, Data hierarchy, File Attributes, Text and Binary Files, Basic File Operations, File Organization, Indexing

TEXT BOOKS:

1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning
2. Data Structure using C– Reema Thareja, 3rd Edition, Oxford University Press.

REFERENCE BOOKS:

1. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

BASIC ELECTRONICS

B. Tech. II Semester **L T P C**
Subject Code: 25EC205ES **3 0 0 3**

Prerequisites: Basic knowledge of electricity and magnetism, circuit components, fundamental mathematics and physics of materials.

Course Objectives:

1. To understand the fundamental properties of conductors, semiconductors, and diodes.
2. To study diode applications in rectifiers, filters, and regulated power supplies.
3. To analyze the construction, characteristics, and applications of BJTs.
4. To learn the operation and characteristics of JFETs and MOSFETs with comparisons.
5. To explore special semiconductor devices and their practical applications.

Course Outcomes: After completion of this course, The Students will be able to:

1. Differentiate conductors, semiconductors, and insulators and explain diode operation.
2. Analyze and design rectifier circuits with filters for dc power supply applications. 3 Evaluate transistor configurations and use bjts as switches and amplifiers.
3. Demonstrate the operation of fets and mosfets in various modes and applications.
4. Apply knowledge of special semiconductor devices like zener, scr, ujt, and leds in electronic circuits.

UNIT- I

Basics of Semiconductors and Diodes: Conductors, Semiconductors, and Insulators, Intrinsic and Extrinsic Semiconductors, N-Type and P-Type Semiconductors, Drift Current & Diffusion Current, Operation of PN Junction Diode-No Bias, Forward Bias and Reverse Bias, Volt-Ampere (V-I) Characteristics, Diode Current Equation (Qualitative Treatment), Ideal Versus Practical Diode, Static and Dynamic Resistances, Diode Equivalent Circuits, Breakdown Mechanisms in Semiconductor Diodes.

UNIT- II

Applications of Diode: Block Diagram of Regulated Power Supply, Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, L- section Filters, π- section Filters.

UNIT- III

Bipolar Junction Transistor: NPN and PNP Transistor Construction, Operation, Symbol, Transistor Current Components, Input & Output Characteristics of a Transistor in CB, CE and CC Configurations, Comparison of CB, CE and CC Configurations, Transistor as a Switch, Transistor Switching Times, Transistor as an Amplifier.

UNIT- IV

Field Effect Transistors: JFET: Structure, operation, and characteristics, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET: Enhancement and Depletion modes – Structure, operation, and characteristics, Comparison of JFET and MOSFET

UNIT V

Special Purpose Semiconductor Devices: Zener Diode - Characteristics, Zener Diode as Voltage Regulator, Principle of Operation - SCR, Tunnel Diode, UJT, Varactor Diode, Photo Diode, Solar Cell, LED.

TEXTBOOKS:

1. Millman, Jacob, and Christos C. Halkias. Electronic Devices and Circuits. Tata McGraw- Hill, 1991.
2. Boylestad, Robert L., and Louis Nashelsky. Electronic Devices and Circuit Theory. Pearson, 11th ed., 2013.
3. Sedra, Adel S., and Kenneth C. Smith. Microelectronic Circuits. Oxford University Press, 7th ed., 2014.

REFERENCE BOOKS:

1. 1.Bell, David A. Electronic Devices and Circuits. Oxford University Press, 5th ed., 2008.
2. Neamen, Donald A. Electronic Circuit Analysis and Design. McGraw-Hill, 2nd ed., 2001
3. .Salivahanan, S., and N. Suresh Kumar. Electronic Devices and Circuits. McGraw-Hill Education, 4th ed., 2017.
4. Razavi, Behzad. Fundamentals of Microelectronics. Wiley, 2nd ed., 2013.

ENGINEERING CHEMISTRY LAB

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

Subject Code: 25CH206BS **0 0 2 1**

Course Description:

The course includes experiments based on fundamental principles of chemistry essential for engineering students, aiming to develop practical skills and reinforce theoretical concepts.

Course Objectives

1. To understand and perform experiments based on core chemical principles relevant to engineering applications.
2. To estimate the hardness of water to assess its suitability for drinking purposes.
3. To acquire the ability to perform acid-base titrations using instrumental methods such as conductometry, potentiometry.
4. To gain hands-on experience in synthesizing polymers like Bakelite and Nylon – 6, 6 in the laboratory.
5. To learn to determine the unknown concentration of potassium permanganate (KMnO4) using a calibration curve.

Course Outcomes: After completion of this course, The Students will be able to:

1. Develop practical skills through hands-on chemistry experiments relevant to engineering.
2. Determine important parameters such as water hardness and the corrosion rate of mild steel under various conditions.
3. Apply techniques like conductometry, potentiometry to determine concentrations or equivalence points in acid-base reactions.
4. Use experience in synthesizing polymers such as Bakelite and Nylon-6,6.
5. Explore the working principle of colorimetry and the relationship between absorbance and concentration (Beer-Lambert Law).

List of Experiments:

I. Volumetric Analysis:

1. Estimation of Hardness of water by EDTA Complexometry method.
2. Determination of alkalinity in sample of water

II. Conductometry:

1. Estimation of the concentration of strong acid by Conductometry.
2. Estimation of the concentration of strong and weak acid in an acid mixture by Conductometry.

III. Potentiometry:

1. Estimation of concentration of Fe+2ion by Potentiometry using KMnO4.
2. Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone

IV. Colorimetry: Verification of Lambert-Beer's law using KMnO4.

V. Preparations:

1. Preparation of Bakelite.
2. Preparation Nylon – 6, 6.

VI. Corrosion: Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VII. Virtual lab experiments:

1. Construction of Fuel cell and it's working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

REFERENCE BOOKS:

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

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

B.Tech. II Semester **L T P C**
Subject Code: 25EN207HS **0 0 2 1**

The English Language and Communication Skills (ELCS) Lab focuses on listening and speaking skills, particularly on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:

1. To sensitize the students to the nuances of English speech sounds.
2. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
3. To improve the fluency of students in spoken English and neutralize the impact of dialects.
4. To improve the students creative skills in story telling and to differentiate the literal and implied meanings.
5. To train students to use appropriate language in presentations.

Course Outcomes: After completion of this course, The Students will be able to:

1. Identify and practice English sounds according to standard pronunciation.
2. Interpret the nuances of the English language using audio-visual resources and practice sessions.
3. Apply strategies to neutralize their accent and enhance intelligibility.
4. Differentiate the literal and implied meanings and their usage.
5. Demonstrate effective and confident participation in presentations.

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

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

The following course content is prescribed for the English Language and Communication Skills Lab.

Listening Skills:

Objectives

1. To enable students to develop their active listening skills
2. To equip students with necessary training in listening, so that they can comprehend the speech of people from different linguistic backgrounds

Speaking Skills:

1. To improve their pronunciation and neutralize accent
2. To enable students express themselves fluently and appropriately
3. To practice speaking in social and professional contexts

The following course content is prescribed for the English Language and Communication Skills Lab.

Exercise – I CALL Lab:

Instruction: Speech Sounds-Listening Skill - Importance – Purpose - Types- Barriers- Active Listening

Practice: Listening to Distinguish Speech Sounds (Minimal Pairs) - Testing Exercises
ICS Lab:

Diagnostic Test – Activity titled 'Express Your View'
Instruction: Spoken and Written language - Formal and Informal English - Greetings - Introducing Oneself and Others
Practice: Any Ice-Breaking Activity

Exercise – II CALL Lab:
Instruction: Listening vs. Hearing - Barriers to Listening
Practice: Listening for General Information - Multiple Choice Questions - Listening Comprehension Exercises (It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:
Instruction: Features of Good Conversation – Strategies for Effective Communication
Practice: Role Play Activity - Situational Dialogues –Expressions used in Various Situations –Making Requests and Seeking Permissions – Taking Leave - Telephone Etiquette

Exercise - III CALL Lab:
Instruction: Errors in Pronunciation – Tips for Neutralizing Mother Tongue Influence (MTI)
Practice: Differences between British and American Pronunciation –Listening Comprehension Exercises

ICS Lab:
Instruction: Describing Objects, Situations, Places, People and Events
Practice: Picture Description Activity – Looking at a Picture and Describing Objects, Situations, Places, People and Events (A wide range of Materials / Handouts are to be made available in the lab.)

Exercise – IV CALL Lab:
Instruction: Techniques for Effective Listening
Practice: Listening for Specific Details - Listening - Gap Fill Exercises - Listening Comprehension Exercises
(It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:
Instruction: How to Tell a Good Story - Story Star- Sequencing-Creativity
Practice: Activity on Telling and Retelling Stories - Collage

Exercise – V CALL Lab:
Instruction: Identifying the literal and implied meaning
Practice: Listening for Evaluation - Write the Summary – Listening Comprehension Exercises
(It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:
Instruction: Understanding Non-Verbal Communication, Presentation Skills
Practice: Silent Speech - Dumb Charades Activity, Making a Presentation.
Post-Assessment Test on 'Express Your View'

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i. Computers with Suitable Configuration
ii. High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo – audio & video system and camcorder etc.

Note: English Language Teachers are requested to prepare Materials / Handouts for each Activity for the Use of those Materials in CALL & ICS Labs.

Suggested Software:

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

REFERENCES BOOKS:

1. Shobha, KN & Rayen, J. Lourdes. (2019). Communicative English – A workbook. Cambridge University Press
2. Board of Editors. (2016). ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.
3. Orient BlackSwan Pvt. Ltd.
4. Mishra, Veerendra et al. (2020). English Language Skills: A Practical Approach. Cambridge University Press
5. (2022). English Language Communication Skills – Lab Manual cum Workbook. Cengage Learning India Pvt. Ltd.
6. Ur, Penny and Wright, Andrew. 2022. Five Minute Activities – A Resource Book for Language Teachers. Cambridge University Press

DATA STRUCTURES LAB

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

Subject Code: 25CS208ES **0 0 2 1**

Prerequisites: A Course on "Programming for Problem Solving".
Co-Requisites: A Course on Data Structures.

Course Objectives:

1. To understand and develop concepts of various Data Structures.
2. To understand various Sorting Methods
3. To provide and understanding of different Tree traversal techniques.
4. To provide and understanding of Graph Traversal methods.
5. To implement Hashing Techniques.

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

1. Use functions to perform Linear Data Structures with its operations.
2. Develop different Sorting methods.
3. Implement Tree Traversal Techniques using Recursive and Non Recursive.
4. Illustrate Graph Traversal Techniques BFS and DFS.
5. Demonstrate C Programs for Hash Functions.

List of Experiments

1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using i) Arrays ii) ADT
5. Write a program that implement Queue (its operations) using i) Arrays ii) ADT
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   I) Radix Sort, ii) Heap sort, iii) Shell Sort, iv) Tree Sort
7. Write a program to implement the tree traversal methods (Recursive and Non-Recursive).
8. Write a program to implement
   i) Binary Search tree ii) B Trees iii) B+ Trees iv) AVL trees v) Red – Black trees
9. Write a program to implement the graph traversal methods.
10. Write a program to implement the following Hash Functions: i) Division Method, ii) Multiplication Method, iii) Mid-square Method, iv) Folding Method

TEXT BOOKS:

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

REFERENCE BOOK:

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

IDEA AND INNOVATION LAB

B.Tech. II Semester **L T P C**
Subject Code: 25EC209ES **0 0 2 1**

Course Objectives: This course aims to:

1. To Exploring different engineering technologies and their applications.
2. To learn various 3d printing technologies.
3. To Knowledge towards Assembling and testing of robots.
4. To Understanding functionality of 3D printers and their application.
5. To Developing team work and in sight towards different disciplines of Engineering.

Course Outcomes: After completion of this course, The Students will be able to:

1. Demonstrate the knowledge of various engineering technologies
2. Apply different technologies and Setting up the Arduino.
3. Perform various operations for building and testing of robots.
4. Understand the fundamental concepts of Additive manufacturing and create awareness of its processes and applications.
5. Practice on techniques of fabrication, manufacturing and allied skills.

UNIT I: Internet of Things

Overview of IoT and Architecture: Brief History, evolution of IoT, Architecture, trends in the Adoption of IoT, Societal Benefits of IoT, Risks, Privacy, Security, Embedded Systems Components, Microcontroller Architecture and Properties and Installing and Setting up the Arduino and Raspberry Pi (RPi) development environment. Build Simple loT Applications by using Arduino or RPi.

UNIT II: Robotics

Introduction, Different types of robots, Components of a Robot, Working principle of robots, Applications of robots in various fields, Innovation challenges, Scope of robotics research & its current trends, assembling and testing of Robot.

UNIT III:3D Printing

Introduction, Product Design & Development, 3D Scanning & Printing using different types of materials. Components of 3D Printer, Applications of 3D printed products in various fields, Hands on Experience on 3D printing Machine.

UNIT IV: Software and Post Processing

Cura, Flash print, 3dslicer, Tinkercad, Meshmixer. 3d printing parameters, print Speed. Layer Height, Infill density.Acetone bathing, Support Structure Removing.

UNIT V: Case Studies

Students has to submit a report by doing a study on various Engineering applications related to Manufacturing, Retail, Automotive, Logistics, Healthcare, Entertainment and E-Governance.

REFERENCE BOOKS:

1. PC Hardware-A Handbook-KateJ. Chase PHI(Microsoft)
2. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinsonand Ken Quamme.- CISCO Press, Pearson Education.
3. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015,ISBN: 9788173719547.

MATHEMATICAL AND STATISTICAL FOUNDATIONS

	L	T	P	C
B.Tech. III Semester				
Subject Code: 25MA301BS	**3**	**0**	**0**	**3**

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

Course Objectives:

To learn

- The Probability distributions of Discrete Random variables.
- The Probability distributions of Continuous Random variables&sampling theory
- The Testing of hypothesis
- Making statistical inferences.
- The Number Theory basic concepts useful for cryptography etc

Course outcomes:

After learning the contents of this paper, the student must be able to

- Apply the concepts of Random variables.
- Analyse the concept of distributions to some case studies.
- Examine the given statistical Hypothesis.
- Fit the curve, correlation and regression for the given data.
- Apply the number theory concepts to cryptography domain.

UNIT-I: Random Variables and Probability Distributions 10L

Concept of a Random Variable – Discrete Probability Distributions – Continuous Probability Distributions – Mean of a Random Variable – Variance of a Random Variable

Discrete Probability Distributions: Binomial Distribution – Poisson distribution

UNIT-II: Continuous Distributions and Sampling 10 L

Normal Distribution – Areas under the Normal Curve – Applications of the Normal Distribution – Normal Approximation to the Binomial Distributions. **Fundamental Sampling Distributions:** Random Sampling – Some Important Statistics – Sampling Distributions – Sampling Distribution of Means – Central Limit Theorem.

UNIT-III: Tests of Hypotheses (Large and Small Samples) 10 L

Statistical Hypotheses: General Concepts – Testing a Statistical Hypothesis. Single sample: Tests concerning a single mean. Two samples: Tests on two mean (Unknown for equal variance). One sample: Test on a single proportion. Two samples: Tests on two proportions. Two- sample tests concerning variances: F-distribution

UNIT-IV: Applied Statistics 10 L

Curve fitting by the method of least squares – Fitting of straight lines – Second degree parabolas and more general curves – Correlation and Regression – Rank correlation.

UNIT-V: Basics of Number Theory **10 L**

Greatest Common Divisors and Prime Factorization: Greatest common divisors – The Euclidean algorithm – The fundamental theorem of arithmetic – Factorization of integers and the Fermat numbers.

Text Books

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.
3. Kenneth H. Rosen, Elementary Number Theory & its Applications, sixth edition, Addison Wesley, ISBN 978 0-321-50031-1.
4. Dr.T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and Dr.M.V.S.S.N.Prasad, Probability and statistics , S.Chand, EigthRevisesed edition ,2020.

References

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

COMPUTER ORGANIZATION AND ARCHITECTURE

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

Subject Code: 25AI302PC **3 0 0 3**

Prerequisites: A Course on "Digital Electronics".

Course Objectives:

1. To introduce principles of Computer Organization and the basic architectural concepts.
2. To understand logic gates and circuits.
3. To understand simple register transfer language to specify various computer operations.
4. To understand various Instruction formats and Addressing modes.
5. To introduce Data transfer and memory management in a basic computer.

Course Outcomes: After completion of this course, The Students will be able to:

1. Demonstrate and understanding of the design of the functional units of a digital computer system.
2. Design combinational & sequential circuits.
3. Analyse basics of Instruction set and their impact on processor design.
4. Implement various addressing modes depending on Instruction format.
5. Apply Memory hierarchy & Data transfer inside the computer.

UNIT - I: **[8 Lectures]**

Boolean Algebra and Logic Gates: Binary codes, Binary Storage and Registers, Binary logic.

Digital logic gates. Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

UNIT - II: **[12 Lectures]**

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

Sequential Logic: Sequential circuits, latches, Flip-Flops, Analysis of clocked sequential circuits, State Reduction and Assignment, Design Procedure**.** Registers, Shift Registers, Ripple counters, Synchronous counters, other counters.

UNIT III: **[8 Lectures]**

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT – IV: [8 Lectures]

Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

Computer Arithmetic: Addition and subtraction Algorithms, Multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT – V [8 Lectures]

Input-Output Organization: Input-Output Interface, Modes of Transfer, Asynchronous data transfer, Priority Interrupt, Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Switching and Finite Automata Theory, ZVI. Kohavi, Tata Mc Graw Hill.
2. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, 5th Edition, McGraw Hill.
3. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
4. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

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

Subject Code: 25AI303PC **3 0 0 3**

Prerequisites: Basic Knowledge on C Programming.

Course Objectives:

1. To Understand the basic object-oriented programming concepts and apply them in problem solving.
2. To Illustrate inheritance concepts for reusing the program.
3. To Demonstrate multitasking by using multiple threads and Exception handling
4. To Develop Data Structure applications using Collection Framework.
5. To Understand the basics of GUI based programming

Course Outcomes: After completion of this course, The Students will be able to:

1. Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
2. implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
3. Use multithreading concepts to develop inter process communication.
4. Analyze the uses of Collection Framework.
5. Design GUI based applications using swing components

UNIT – I **[10 Lectures]**

Object oriented thinking - Need for oop paradigm, summary of oop concepts, concepts of classes, objects, coping with complexity, abstraction mechanisms.

Java Basics- History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes.

UNIT – II **[8 Lectures]**

Inheritance– Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super keyword uses, using final keyword with inheritance, polymorphism- method overriding, abstract classes.

Packages and Interfaces- Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT – III **[8 Lectures]**

Exception handling- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws

and finally, built in exceptions, creating own exception subclasses.

Multithreading- Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads.

UNIT – IV **[10 Lectures]**

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes. Exploring String class, Object class, Exploring java.io package.

Event Handling- Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT – V **[10 Lectures]**

Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JFrame and JComponent, JLabel, ImageIcon, JTextField, JButton, JCheckBox, JRadioButton, JList, JComboBox, Tabbed Panes, Scroll Panes, Trees, and Tables.

Menu Basics, Menu related classes- JMenuBar, JMenu, JMenuItem, JCheckBoxMenuItem, JRadioButtonMenuItem, JSeperator. creating a popup menu

TEXT BOOKS:

1. Java the complete reference, 13th edition, Herbert schildt, Dr. Denny Coward, Mc Graw Hill.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

REFERENCE BOOKS:

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

SOFTWARE ENGINEERING

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

Subject Code: 25AI304PC **3 0 0 3**

Prerequisite: A course on "Programming for Problem Solving

Course Objectives:

1. To provide with the basics of Software Engineering concepts for developing reliable and efficient systems.
2. To acquaint with Software requirements engineering-classification, documentation and management for system models.
3. To understand Software design principles, architectural styles and UML modelling techniques for developing high quality systems.
4. To equip with knowledge of testing strategies and quality metrics to enhance software performance and reliability.
5. To Find risk management strategies and quality practices for delivering the high quality software systems.

Course Outcomes: After completion of this course, The Students will be able to:

1. Apply software process models to design effective real world solutions.
2. Construct the software requirement specifications with relevant use cases.
3. Design software architectures and UML models to represent system structures and behaviours.
4. Apply testing strategies and quality metrics to enhance software performance and reliability.
5. Explore matrices for process and products with the help of risk and quality management.

UNIT – I **[10 Lectures]**

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

Process models: The waterfall model, Spiral model, Incremental Process Models, Concurrent Models, Component based development and Agile Development.

UNIT – II **[9 Lectures]**

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT – III **[10 Lectures]**

Design Engineering: Design process and design quality, design concepts, the design model.

Creating an architectural design: software architecture, data design, architectural styles

and patterns, architectural design, conceptual model of UML, basic structural modeling, use case diagrams, class diagrams, sequence diagrams, collaboration diagrams, activity diagrams and component diagrams.

UNIT – IV **[10 Lectures]**

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT – V **[8 Lectures]**

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM.

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

REFERENCE BOOKS:

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.
4. Fundamentals of Software Engineering-Rajib Mall, PHI.

DATABASE MANAGEMENT SYSTEMS

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

Subject Code: 25AI305PC **3 0 0 3**

Prerequisites: Familiarity with data structures, elementary set theory, relations and functions."

Course Objectives:

1. Understand the basic concepts and the applications of database systems.
2. Introducing relational databases.
3. Develop Basics of SQL and construct queries using SQL.
4. Find Topics include transaction control and concurrency control.
5. Explore storage structures and access techniques.

Course Outcomes: After completion of this course, The Students will be able to:

1. Analyse the fundamental and logical design concepts of the database.
2. Design an efficient database schema using ER and Relational Model.
3. Develop and manipulate Databases using SQL and Apply normalization techniques to Improve database design.
4. Demonstrate understanding of transaction processing and concurrency control.
5. Examine different indexing mechanisms and database storage access.

UNIT – I: **[10 Lectures]**

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT – II **[8 Lectures]**

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

Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT – III **[8 Lectures]**

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multivalued dependencies, FOURTH normal form, FIFTH normal form.

UNIT – IV **[8 Lectures]**

Transaction Management: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability.

Protocols: Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT – V **[8 Lectures]**

Data on External Storage- File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations,

Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 2002
2. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition, 1980

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition. 1993
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education, 2011
3. Introduction to Database Systems, C. J. Date, Pearson Education, 2004
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD, 2008
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI, 2004
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition, 2011

Computational Mathematics Lab

B.Tech III Semester **L T P C**
Subject Code:25MA306BS **0 0 2 1**

Pre-requisites: Matrices, Iterative methods and ordinary differential equations

Course Objectives:

1. To Solve problems of Eigen values and Eigen Vectors using Python/MATLAB.
2. To Solution of Algebraic and Transcendental Equations using Python/MATLAB
3. To understand problems of Linear system of equations
4. To find problems of First-Order ODEs Higher order linear differential equations with constant coefficients
5. To Visualize all solutions Graphically through programmes

Course Outcomes: After completion of this course, The Students will be able to:

1. Develop the code to find the Eigen values and Eigen Vectors using Python/MATLAB.
2. Implement the code find solution of Algebraic and Transcendental Equations and Linear system of equations using Python/MATLAB
3. Write the code to solve problems of First-Order ODEs Higher order linear differential equations with constant coefficients.
4. Illustrate theFirst-Order ODEs
5. Evaluate the Higher order linear differential equations with constant coefficients

UNIT-I: Eigen values and Eigenvectors: **6P**

Programs:

- Finding real and complex Eigen values.
- Finding Eigen vectors.

UNIT-II: Solution of Algebraic and Transcendental Equations **6P**

Bisection method, Newton Raphson Method

Programs:

- Root of a given equation using Bisection method.
- Root of a given equation Newton Raphson Method.

UNIT-III: Linear system of equations: **6P**

Jacobi's iteration method and Gauss-Seidal iteration method

Programs:

- Solution of given system of linear equations using Jacobi's method
- Solution of given system of linear equations using Gauss-Seidal method

UNIT-IV: First-Order ODEs **8P**

Exact and non-exact equations, Applications: exponential growth/decay, Newton's law of cooling.

Programs:

- Solving exact and non-exact equations
- Solving exponential growth/decay and Newton's law of cooling problems

UNIT-V: Higher order linear differential equations with constant coefficients 6P

Programs:

- Solving homogeneous ODEs
- Solving non homogeneous ODEs

TEXT BOOKS

1. MATLAB and its Applications in Engineering, Rajkumar Basal, Ashok Kumar Geo, Manoj Kumar Sharama, Pearson publication.
2. Kenneth A. Lambert, The fundamentals of Python: First Programs, 2011, Cengage Learnings.
3. Think Python First Edition, by Allen B. Downey, Orielly publishing.
4. Introduction to Python Programming, William Mitchell, Povel Solin, Martin Novak et al., NCLab Public Computing, 2012.
5. Introduction to Python Programming, ©Jacob Fredslund, 2007.

REFERENCES

1. An Introduction to Python, John C. Lusth, The University of Alabama, 2011.
2. Introduction to Python, ©Dave Kuhlman, 2008.

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

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

Subject Code: 25AI307PC **0 0 2 1**

Prerequisites: Basic Knowledge on C Programming.
Corequisites: Course on "Object Oriented Programming Through Java"

Course Objectives:

1. To introduce java compiler and eclipse platform and hands-on experience with java programming.
2. To understand programs using abstract classes.
3. To develop multithreaded programs.
4. To write programs for solving real world problems using the java collection framework.
5. To Design GUI programs using swing controls in Java.

Course Outcomes: After completion of this course, The Students will be able to:

1. Implement the real world applications using eclipse.
2. Develop programs using abstract classes.
3. Demonstrate multithreaded programs.
4. Experiment real world problems using the java collection framework.
5. Design GUI programs using swing controls in Java.

List of Experiments:

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.

2. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

3. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in the selected color. Initially, there is no message shown.

4. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.

5. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 isdisplayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.

6. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

7. Write a Java program that correctly implements the producer – consumer problem using the concept of inter thread communication.

8. Write a Java program for the following: Create a doubly linked list of elements. Delete a given element from the above list. Display the contents of the list after deletion.

9. Write a Java program to list all the files in a directory including the files present in all its subdirectories.

10. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).

11. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.

9. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

TEXT BOOKS:

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.

REFERENCE BOOKS

1. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
2. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

SOFTWARE ENGINEERING LAB

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

Subject Code: 25AI308PC **0 0 2 1**

Prerequisites: A course on "Programming for Problem Solving".
Co-requisite: A Course on "Software Engineering".

Course Objectives:

1. To understand problem statements for real world software systems.
2. To Enable students to prepare standard project documents such as SRS, Design, Testing.
3. To Familiarize students with the use of case tools for design and development activities.
4. To Design and execute Unit and Integration test cases using Blackbox and Whitebox techniques.
5. To apply Software Engineering principles in development of Software projects that address real world applications.

Course Outcomes: After completion of this course, The Students will be able to:

1. Formulate problem statements and define the scope of a Software project.
2. Prepare and maintain professional software documents including SRS, Design, Testing and Risk management artifacts.
3. Apply case tools to perform software design and analyse models effectively.
4. Develop and execute unit, Integration, Blackbox and Whitebox test cases to validate software functionalities.
5. Analyse and manage software configuration and risks in software projects.

List of Experiments

Do the following seven exercises for any two projects given in the list of sample projects or any other Projects:

1. Development of problem statements.
2. Preparation of Software Requirement Specification Document, Design Documents And Testing Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related documents.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

Sample Projects:

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System

1. Online course reservation system
2. E-ticketing
3. Software Personnel Management System
4. Credit Card Processing
5. E-book management System.
6. Recruitment system

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

REFERENCE BOOKS:

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The McGraw- Hill

DATABASE MANAGEMENT SYSTEMS LAB

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

Subject Code: 25AI309PC **0 0 2 1**

Prerequisites:

1. Familiarity with data structures, elementary set theory, relations and functions.
2. Students should install MySql.

Co-requisites: Course on "Database Management Systems".

Course Objectives:

1. To Introduce ER data model, database design and normalization.
2. To Learn SQL basics for data definition and data manipulation.
3. To introduce various procedures in SQL.
4. To practice different triggers in SQL.
5. To introduce cursors in SQL.

Course Outcomes: After completion of this course, The Students will be able to:

1. Demonstrate the database design using ER Diagrams.
2. Develop SQL Queries to manipulate the data in the database.
3. Apply Procedural Language constructs to execute a block of SQL statements.
4. Design various triggers for different data using SQL.
5. Implement cursors using SQL

List of Experiments:

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

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition, 2002
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition, 1990

REFERENCES BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Co 7th Edition, 1993
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education, 2011

3. Introduction to Database Systems, C.J. Date, Pearson Education, 2004
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD, 2008
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI, 2004
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition, 2011

NODE JS/ REACT JS/ DJANGO

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

Subject Code: 25AI310SD **0 0 2 1**

Prerequisites: Object Oriented Programming through Java, HTML Basics.

Course Objectives:

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

Course Outcomes: After completion of this course, The Students will be able to:

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

Exercises:

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

CRUD operations on student data. (Use Postman)

12. For the above application create authorized end points using JWT (JSON Web Token).
13. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
14. Create a service in react that fetches the weather information from open weather map.org and the display the current and historical weather information using graphical representation using chart.js
15. Create a TODO application in react with necessary components and deploy it into GitHub.

REFERENCE BOOKS:

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

GENDER SENSITIZATION LAB

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

Subject Code: 25EN311VA **1 0 0 1**

Course Description

The course on 'Gender Sensitization' offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines - such as literature, history, economics, psychology, sociology, philosophy and media studies - to examine cultural assumptions about sex, gender, and sexuality.

Course Objectives

1. To develop students' sensibility with regard to issues of gender
2. To provide a critical perspective on the socialization
3. To bring awareness on gender-based violence and sensitize students towards gender and labour
4. To educate students about Sustainable Development Goals (SDGs) and their importance
5. To sensitize students about gender and electronic media, gender-biased language

Course Outcomes:

Students will be able to:

1. Develop a better understanding of important issues related to gender
2. Understand various aspects of socialization and gender discrimination
3. Realise the consequences of gender-based violence and sexual harassment and also acquire insights into gender division of labour
4. Understand the objectives of Sustainable Development Goals (SDGs) and their importance
5. Students acquire insights into gender and electronic media and be able to use gender-neutral language

Unit – I Understanding Gender Roles and Relations: Definition of Gender - Exploring Attitudes towards Gender - Transformation in Stereotypical Roles

Unit – II Socialization: Preparing for Womanhood - Growing up Male-Gender Roles and Just Relationships – Matrix - Missing Women-Sex Selection and its Consequences

Unit – III Gender & Labour and Gender-Based Violence: Housework- the Invisible Labor- "My Mother doesn't Work." "Share the Load."-Unrecognized and Unaccounted work - Types of Gender-based Violence - Sexual Harassment - Domestic Violence

Unit – IV Gender and Culture: Gender Development Issues-Gender, Governance and Sustainable Development Goals (SDGs)

Unit - V Gender and Electronic Media: Gender and Film - Gender and Advertisement-Electronic Media - Gender Sensitive Language

Essential Reading:

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

DISCRETE MATHEMATICS

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

Subject Code: 25AI401PC **3 0 0 3**

Prerequisites: An understanding of Mathematics in general is sufficient**.**

Course Objectives:

1. To understand and construct precise mathematical proofs.
2. To use logic and set theory to formulate precise statements.
3. To analyse and solve counting problems on finite and discrete structures.
4. To describe methods for basics of counting problems.
5. To apply graph theory in solving computing problems.

Course Outcomes: After completion of this course, The Students will be able to:

1. Construct precise mathematical proofs.
2. Use logic and set theory to formulate precise statements.
3. Analyse counting problems on finite and discrete structures.
4. Solve counting problems.
5. Apply graph theory in solving computing problems.

UNIT – I **[10 Lectures]**

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

UNIT – II **[8 Lectures]**

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

UNIT – III **[8 Lectures]**

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

UNIT – IV **[8 Lectures]**

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

UNIT – V **[9 Lectures]**

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

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.

2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE BOOKS:

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

OPERATING SYSTEMS

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

Subject Code: 25AI402PC **3 0 0 3**

Prerequisites:

1. A course on "Computer Programming and Data Structures".
2. A course on "Computer Organization and Architecture".

Course Objectives:

1. To Introduce the OS concepts and their services.
2. To Describe the process and its scheduling algorithms.
3. To Understand the deadlock, process communication and management systems.
4. To Design the memory management systems.
5. To Understand the file system and its operations.

Course Outcomes: After completion of this course, The Students will be able to:

1. Demonstrate the basic concepts of Operating Systems.
2. Implement various process scheduling algorithms and deadlock techniques.
3. Examine various process management concepts.
4. Apply memory management strategies and page replacement algorithms.
5. Analyze file management and disk management aspects of operating systems.

UNIT – I **[8 Lectures]**

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

Process – Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT – II **[10 Lectures]**

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

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

UNIT – III **[10 Lectures]**

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

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

UNIT – IV **[9 Lectures]**

Memory Management and Virtual Memory – Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT – V **[8 Lectures]**

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

ALGORITHMS DESIGN AND ANALYSIS

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

Subject Code: 25AI403PC **3 0 0 3**

Prerequisites: Programming for problem solving and Data Structures

Course Objectives

1. To analyse performance of algorithms.
2. To choose the divide and conquer, greedy algorithms design method for a specified application.
3. To understand how the choice of data structures and algorithm design methods impacts the performance of programs using dynamic programming strategies.
4. To solve problems using algorithm design methods such as backtracking and branch and bound.
5. To introduce P and NP classes.

Course Outcomes After completion of this course, The Students will be able to:

1. Analyse the algorithm with space and time.
2. Design the algorithm using the divide and conquer greedy approach.
3. Implement dynamic programming strategy.
4. Apply the backtracking technique and branch and bound.
5. Construct the algorithm using the non-deterministic algorithm

UNIT – I **[10 Lectures]**

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

Disjoint Sets: Disjoint set operations, union and find algorithms, Spanning Tree.

UNIT – II **[9 Lectures]**

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graph Traversals, Connected components, Biconnected components.

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

UNIT – III **[10 Lectures]**

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

Dynamic Programming: General method, applications- 0/1 knapsack problem, Single Source Shortest Path Problem, All pairs shortest path problem, Traveling salesperson problem, Optimal binary search tree, Reliability design.

UNIT – IV **[8 Lectures]**

Backtracking: General method, applications, n-queens problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

Branch and Bound: General method, applications – Travelling salesperson problem, 0/1

knapsack problem – LC Branch and Bound solution, FIFO Branch and Bound solution.

UNIT – V **[7 Lectures]**

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

TEXT BOOK:

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

REFERENCE BOOKS:

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

COMPUTER NETWORKS

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

Subject Code: 25AI404PC **3 0 0 3**

Prerequisites

1. A course on "Programming for problem solving".
2. A course on "Data Structures".

Course Objectives

1. To learn about the functionalities of layered models.
2. To gain knowledge about sliding window protocols and medium access sub layer.
3. To design a routing algorithm in a network.
4. To know the services of the transport layer.
5. To explore the knowledge of computer network applications

Course Outcomes After completion of this course, The Students will be able to:

1. Explore the basic concepts of reference models.
2. Apply sliding window protocols and multiple access protocols.
3. Design the routing algorithms, congestion control techniques.
4. Analyze TCP and UDP protocols and services of the Transport Layer.
5. Implement different protocols at the application layer.

UNIT – I **[9 Lectures]**

Introduction: The Internet, History, Protocol, Network Edge, Access Networks, Network Core, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol reference models: ISO-OSI, TCP/IP,

Physical Layer: Guided Transmission Media: Twisted Pairs, Coaxial Cable, Fiber Optics, Wireless Transmission, Packet Switching, Circuit Switching.

UNIT-II **[10 Lectures]**

Data Link Layer: Services, Error-Detection and Correction Techniques- Parity Checks, Checksum Methods, Cyclic Redundancy Check (CRC), Hamming code, Multiple Access Links and Protocols, Channel Partitioning Protocols, Random Access Protocols, Go-Back-N (GBN), Selective Repeat (SR), Taking-Turns Protocols.

DOCSIS: The Link-Layer Protocol for Cable Internet Access, Switched Local Area Networks, Link-Layer Addressing and ARP, Ethernet, Link-Layer Switches, Wireless network characteristics, Wireless LAN.

UNIT – III **[10 Lectures]**

Network Layer: Data and Control plane, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks, Router working, The Internet Protocol (IP): Forwarding and Addressing in the Internet, Datagram Format, Ipv4 Addressing, Internet Control Message Protocol (ICMP), Ipv6, IP Security.

Routing Algorithms- The Distance- Vector (DV) Routing Algorithm, The Link-State (LS)

Routing Algorithm, Hierarchical Routing, Routing in the Internet-Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter-AS Routing: BGP, Broadcast and Multicast Routing, Broadcast Routing Algorithms, Multicasting.

UNIT – IV [8 Lectures]

Transport Layer: Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols.

Connection-Oriented Transport: TCP, The TCP Connection, Segment Structure, Round-Trip Time Estimation and Timeout, TCP Connection Management, Principles of Congestion Control, TCP Congestion Control, Three-way Handshake Protocols, Quality of Services (QoS).

UNIT – V [9 Lectures]

Application Layer: Principles of Network Applications, Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols, The Web and HTTP.

File Transfer: FTP, Electronic Mail in the Internet, SMTP, DNS, Peer-to-Peer Applications, Socket Programming: Creating Network Applications.

TEXT BOOKS:

1. Computer Networks – Andrew S Tanenbaum, David. J. Wetherall, 5th Edition. Pearson/PHI
2. Computer Networking: A Top-Down Approach – James F.Kurose, Keith W. Ross, Pearson

REFERENCE BOOK:

1. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.
2. Computer Communication and Network Technologies-Michale A Gallo, Williams H. Hancock.

MACHINE LEARNING

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

Subject Code: 25AI405PC **3 0 0 3**

Prerequisites: Knowledge on DBMS and Probability and Statistics

Course Objectives:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To provide students with knowledge of Feature engineering techniques and Probabilistic foundations for building efficient Machine Learning models
3. To equip students with the knowledge of different supervised learning techniques.
4. To understand the students with the knowledge of different unsupervised learning techniques and clustering concepts.
5. To make the students to understand the concept of ANN and Deep Learning Techniques.

Course Outcomes: After completion of this course, The Students will be able to:

1. Describe the fundamentals of Machine Learning and Model evaluation techniques.
2. Apply Feature Engineering and probabilistic models for classification.
3. Implement Supervised learning algorithms for regression and classification.
4. Analyse Unsupervised methods for clustering and Pattern discovery.
5. Design Artificial Neural Networks using Back Propagation.

UNIT – I **[12 Lectures]**

Introduction to Machine Learning: Types of Human learning, machine learning process, Well-posed learning problem, Types of machine learning and comparison, applications of machine learning. Model Preparation, Evaluation and feature engineering: Machine learning activities, Types of data in machine learning, dataset understanding, plotting and exploration, checking data quality, remediation, data pre-processing, selecting a model, predictive and descriptive models, supervised learning model training, cross-validation and boot strapping, lazy vs eager learner.

Interpreting the model- underfitting, overfitting, bias-variance trade-off. Parameter for evaluating performance of classification, regression, and clustering model. Improving performance of a model.

UNIT – II **[10 Lectures]**

Feature Engineering: Feature transformation - feature construction, feature extraction by PCA, SVD, LDA. Feature subset selection – feature relevancy and redundancy measures. Feature selection process and approaches.

Review of Probability concepts: joint probability, conditional probability, bayes rule, Common discrete and continuous distributions, dealing with multiple random variables, central limit theorem. Bayes classifier, Multi-class Classification, Naïve Bayes classifier, Bayesian belief network.

UNIT – III **[10 Lectures]**

Supervised Learning - Introduction to supervised learning.

Regression: Introduction of regression, Regression algorithms: Simple linear regression, Multiple linear regression, Polynomial regression model, Logistic regression, Maximum likelihood estimation.

Classification: Classification model and learning steps, Classification algorithms: Naïve Bayes classifier, Distance measures, k-Nearest Neighbor (kNN), Decision tree, Support vector machines, Kernel trick, Random Forest.

UNIT – IV **[8 Lectures]**

Unsupervised Learning: Introduction to unsupervised learning, Unsupervised vs supervised learning, Application of unsupervised learning, Clustering and its types.

Partitioning method: k-Means and K- Medoids, Hierarchical clustering, Density-based methods – DBSCAN.

UNIT – V **[8 Lectures]**

Artificial Neural Network: Biological neuron, Artificial neuron, Activation functions, neural network architecture, perceptron, learning process in ANN, Back propagation.

Deep Learning: Introduction, overview of reinforcement learning, Representation learning, Evolutionary learning. Case-study of ML applications: Image recognition, Email spam filtering, Online fraud detection.

TEXT BOOKS:

1. Saikat Dutt, S. Chjandramouli, Das – Machine Learning, Frist Edition, Pearson
2. M N Murty, Anathanarayana V S – Machine Learning, First Edition, University Press
3. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.

REFERENCE BOOKS:

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

INNOVATION AND ENTREPRENEURSHIP

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

Subject Code: 25MB406HS **1 0 0 1**

Course Objectives:

1. To familiarize on the basic concepts of innovation, entrepreneurship and its importance.
2. To Identify and analyze the process of problem-opportunity identification, market segmentation, and idea generation techniques.
3. To initiate prototype development and understand minimum viable product.
4. To develop initial Business and financial planning and Go-to-Market strategies
5. To impart knowledge on establishing startups, venture pitching and IPR

Course Outcomes:

1. Understand the entrepreneurship and the entrepreneurial process and its significance in economic development.
2. Assess the problem from an industry perspective and generate solutions using the design thinking principles.
3. Evaluate market competition, estimate market size, and develop a prototype.
4. Analyze Business and financial planning models and Go-to-Market strategies.
5. Able to build a start-up, register IP and identify funding opportunities.

UNIT I: Fundamentals of Innovation and Entrepreneurship

Innovation: Introduction, need for innovation, Features, Types of innovations, innovations in manufacturing and service sectors, fostering a culture of innovation, planning for innovation.

Entrepreneurship: Introduction, types of entrepreneurship attributes, mindset of entrepreneurial and intrapreneurial leadership, Role of entrepreneurs in economic development. Woman Entrepreneurship, Importance of on-campus startups. Understanding to build entrepreneurial mindset, attributes and networks individuals while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity.

UNIT II: Problem and Customer Identification

Identification of gap, problem, analyzing the problem from a industry perspective, real-world problems**,** market and customer segmentation, validation of customer problem fit, Iterating problem-customer fit, Competition and Industry trends mapping and assessing initial opportunity, Porter's Five Force Model. Idea generation, Ideation techniques: Brainstorming, Brain writing, Round robin, and SCAMPER, Design thinking principles, Mapping of solution to problem.

Core Teaching Tool: Several types of activities including: Class, game, Gen AI, 'Get out of the Building' and Venture Activity.

UNIT III: Opportunity assessment and Prototype development

Identify and map global competitors, review industry trends, and understand market sizing: TAM, SAM, and SOM. Assessing scope and potential scale for the opportunity.

Understanding prototyping and Minimum Viable Product (MVP). Developing a prototype: Testing, and validation.

Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

UNIT IV: Business & Financial Models

Introduction to Business Model and types, Lean Canvas Approach: 9-block lean canvas model, building lean canvas for your startup. Business planning: components of Business plan- Sales plan, People plan and financial plan, Financial Planning: Types of costs, preparing a financial plan for profitability using a financial template, understanding the basics of Unit economics, Economies of Scale

and analyzing financial performance. Go-To-Market (GTM) approach – Selecting the Right Channel, creating digital presence, and building customer acquisition strategy.
Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

UNIT V: Startups and IPR

Startup requirements, building founding team members and mentors, pitch preparation, start-up registration process, funding opportunities and schemes, institutional support to entrepreneurs, startup lifecycle, documentation, legal aspects in startup, venture pitching readiness, National Innovation Startup Policy (NISP) and its features.

Patents, Designs, Patentability, Procedure for grants of patents. Indian Scenario of Patenting, International Scenario: International cooperation on Intellectual Property. Patent Rights: Scope of Patent Rights. Copyright, trademark, and GI. Licensing and transfer of technology.
Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

Suggested Readings:

1. John R Bessant, Joe Tidd, Innovation and Entrepreneurship, 4E, Wiley, Latest Edition.
2. Ajay Batra, The Stratup Launch Book- A Practical Guide for Launching Customer Centric Ventures, Wiley, 2020. (For Core Teaching Tool).
3. Entrepreneurship Development and Small Business Enterprises, Poornima M Charantimath, 3E, Pearson, 2018.
4. D.F. Kuratko and T.V. Rao, Entrepreneurship: A South-Asian Perspective, Cengage Learning, 2013.
5. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
6. NISP -Brochure inside pages - startup_policy_2019.pdf

OPERATING SYSTEMS LAB

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

Subject Code: 25AI407PC **0 0 2 1**

Prerequisites:

- A course on "Programming for Problem Solving".
- A course on "Computer Organization and Architecture".

Co-requisite: A course on "Operating Systems".

Course Objectives:

1. Impart practical Knowledge on the design and implementation of fundamental operating system concepts.
2. Enable students to utilize Unix/Linux system calls for effective process, file and device management.
3. Develop analytical and problem-solving skills by simulating operating system functionalities using C programming.
4. Familiarize students with synchronization and inter-process communication techniques for concurrent execution.
5. Strengthen the linkage between theoretical understanding of operating systems and their practical applications in real-time environments.

Course Outcomes: After completion of this course, The Students will be able to:

1. Implement and analyse various CPU scheduling algorithms to evaluate system performance.
2. Demonstrate proficiency in using Unix/Linux system calls for file handling, process management and communication.
3. Apply appropriate techniques for Deadlock avoidance and synchronization in classical OS problems
4. Evaluate memory management strategies and page replacement policies.
5. Acquire hands-on experience in applying Operating System principles for solving real-world competitional problems.

List of Experiments:

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

COMPUTER NETWORKS LAB

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

Subject Code: 25AI408PC **0 0 2 1**

Course Objectives:

1. To understand the working principle of various communication protocols.
2. To analyse the traffic flow and the contents of protocol frames.
3. To interpret various routing algorithms.
4. To explore the concepts of data encryption and decryption.
5. To know congestion control and network and operating functionalities.

Course Outcomes: After completion of this course, The Students will be able to:

1. Implement data link layer farming methods.
2. Analyse error detection and error correction using CRC codes.
3. Design and implement routing algorithms and congestion control techniques used in networks.
4. Develop Encoding and Decoding techniques used in presentation layer
5. Apply network tools for network scanning and security auditing.

List of Experiments

1. Implement the data link layer framing methods such as character, character- stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting techniques used in buffers.
10. Write a program to implement the Client Server application by using Socket.
11. Wireshark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
12. How to run Nmap scan
13. Operating System Detection using Nmap
14. Do the following using NS2 Simulator
    I. NS2 Simulator-Introduction
    II. Simulate to Find the Number of Packets Dropped
    III. Simulate to Find the Number of Packets Dropped by TCP/UDP
    IV. Simulate to Find the Number of Packets Dropped due to Congestion

V. Simulate to Compare Data Rate & Throughput.
VI. Simulate to Plot Congestion for Different Source/Destination
VII. Simulate to Determine the Performance with respect to Transmission of Packets

TEXT BOOK:

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

REFERENCES:

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

MACHINE LEARNING LAB

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

Subject Code: 25AI409PC **0 0 2 1**

Prerequisite: Knowledge on any programming language and Probability and Statistics.

Corequisite: A Course on "Machine Learning"

Course Objective:

1. To strengthen understanding of theorical concepts through practical implementation.
2. To provide hands on experience with Python libraries for Machine Learning.
3. To enable students to implement regression, classification and clustering algorithms.
4. To develop skills in model building, parameter tuning and performance evaluation
5. To apply Machine Learning techniques for solving real world data problems.

Course Outcomes: After completion of this course, The Students will be able to:

1. Apply Python libraries for implementing Machine Learning algorithms.
2. Develop regression models and evaluate their performance.
3. Implement classification algorithms.
4. Analyse clustering algorithms to discover patterns in the datasets.
5. Evaluate model performance using evaluation metrics.

List of Experiments:

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Implement a Python program to build Artificial Neural Networks.
11. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

TEXT BOOK:

1. Machine Learning – Tom M. Mitchell, - MGH.

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

DATA VISUALIZATION - POWER BI

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

Subject Code: 25AI410SD **0 0 2 1**

Course Objectives:

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

Course Outcomes: After completion of this course, The Students will be able to:

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

Lab Problems:

1. Understanding Data, what is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization in Power BI?
2. Getting started with Power BI Software using Data file formats, connecting your Data to Power BI, creating basic charts (line, bar charts, Tree maps).
3. Power BI Calculations, & Measures Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Power BI, Pivot/unpivot in Power Query.
6. Structuring your data, Sorting and filtering in Power BI.
7. Advanced Visualization Tools in Power BI: Using Filters and slicers, Using the Details and Size Fields Conditional Formatting customizing filters, Using and Customizing tooltips, Formatting your data with colours
8. Creating Dashboards Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing Publishing your Visualization.
9. Power BI file types, publish your report to Power BI Online, Sharing your visualizations, printing, And Exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

REFERENCES:

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

ENVIRONMENTAL SCIENCE

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

Subject Code: 25CH411VA **1 0 0 1**

Course Objectives:

1. Understand the components, structure, and functions of ecosystems and their relevance to human society.
2. Comprehend classification, sustainable management, and challenges of natural resources including water, minerals, land, forests, and energy.
3. Grasp the significance, value, and conservation approaches for biodiversity, including threats and legislative frameworks.
4. Analyze types, sources, and impacts of environmental pollution, and learn technological and policy measures for pollution prevention and control.
5. Develop awareness about global environmental challenges, international agreements, and the role of policy, law, and Environmental Impact Assessment (EIA) in sustainable development.

Course Outcomes:

1. Understand the structure, function, and significance of ecosystems, including energy flow, biogeochemical cycles, and biodiversity conservation through field experiences.
2. Analyze the classification, utilization, and sustainable management of natural resources, along with alternative energy options.
3. Evaluate biodiversity at genetic, species, and ecosystem levels, its values, threats, and conservation methods under national and international frameworks.
4. Identify types, sources, and impacts of environmental pollution, and apply suitable control technologies while assessing global environmental challenges and protocols.
5. Interpret environmental policies, legislation, and the EIA process to propose management plans addressing contemporary environmental and sustainability issues.

UNIT - I

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

UNIT – II

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

UNIT - III

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

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards.

Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan(EMP). Contemporary Environmental Issues Climate change; Sustainable development goals (SDGs); Global environmental challenges; Environmental policies and international agreements.

TEXT BOOKS:

1. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.
2. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
3. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

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