ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

CYBER SECURITY

COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)

for

B.TECH FOUR YEAR DEGREE PROGRAMME

(Applicable for the batches admitted from 2025-2026

AR - 25

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(An Autonomous Institution)

Approved by AICTE,

Recognized Under 2(f) & 12(b) of UGC
PermanentlyAffiliated to JNTUGV, Vizianagaram

K.Kotturu, Tekkali, Srikakulam -532201, Andhra Pradesh.

www.adityatekkali.edu.in

INSTITUTE VISION

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

INSTITUTE MISSION

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that the efficiency for employability increases on a continued basis.

VISION & MISSION

DEPARTMENT VISION

To develop into a recognized department in cyber security by advancing knowledge, encouraging innovation, and producing skilled professionals capable of addressing the evolving challenges in digital and information security.

DEPARTMENT MISSION

M1 : Delivering rigorous knowledge of cyber security principles, enabling students to effectively analyze, design, and implement secure digital systems.

M2 Developing critical employment skills through hands-on training, industry collaboration, and real-world exposure, preparing graduates to excel as competent cyber security professionals.

M3: Emphasis on ethical conduct, the department promotes integrity, accountability, and professionalism in all cyber operations.

M4: Inspire students to uphold social responsibility by using their expertise to protect individuals, organizations, and society from cyber threats, while advancing digital safety, privacy, and trust.

PROGRAM EDUCATION OBJECTIVES

PEO 1: Graduates will build a solid foundation in cyber security concepts, tools, and techniques to effectively solve real-world problems.

PEO 2: Graduates will be capable of pursuing successful careers in industry, academia, or government by adapting to fast-changing technological landscapes.

PEO 3: Graduates will demonstrate professional ethics, legal awareness, and social responsibility in all aspects of their work.

PEO 4: Graduates will continue to expand their knowledge through higher education, certifications, and self-learning to stay current in the cyber security domain.

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PROGRAM OUTCOMES

PO 1 (ENGINEERING KNOWLEDGE): Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2 (PROBLEM ANALYSIS): Identify, formulate, review research literature, and analyze complex engineering problem searching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3 (DESIGN/DEVELOPMENT OF SOLUTIONS): Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4 (CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS): Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5 (MODERN TOOL USAGE): Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6 (THE ENGINEER AND SOCIETY): Apply reasoning in formed by the context acknowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7 (ENVIRONMENT AND SUSTAINABILITY): Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8 (ETHICS): Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9 (INDIVIDUAL AND TEAM WORK): Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10 (COMMUNICATION): Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 (PROJECT MANAGEMENT AND FINANCE):Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12 (LIFE-LONG LEARNING): Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO 1: Apply knowledge of cryptography, secure coding, and network defense techniques in cyber security to develop secure systems and infrastructures

PSO 2: Conduct ethical hacking and penetration testing to evaluate system security and recommend effective mitigation measures.

PSO 3: Demonstrate awareness of legal standards, ethical practices, and compliance requirements related to data privacy and cyber laws in system design and administration

Aditya Institute of Technology and Management, Tekkali
AR – 25 COURSE STRUCTURE (1st B.Tech)
(Proposed for CSC)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B.Tech (I st Sem)	MC	25MCS101	Induction Program	3 Weeks			0
	BH	25BHT102	Linear Algebra & Calculus	2	1	0	3
	BH	25BHT104	Engineering Physics	3	0	0	3
	ES	25EST102	Basic Electrical and Electronics Engineering	3	0	0	3
	ES	25EST106	Computer Programming	3	0	0	3
	ES	25ESL106	IT Workshop	1	0	4	3
	BH	25BHL102	Engineering Physics Lab	0	0	3	1.5
	ES	25ESL102	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
	ES	25ESL105	Computer Programming Lab	0	0	3	1.5
	MC	25MCS102	NSS/NCC/ Scouts & Guides/ Community Services	0	0	1	0.5
			Total	**12**	**1**	**14**	**20**

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B.Tech (II nd Sem)	BH	25BHT101	Communicative English	3	0	0	3
	BH	25BHT103	Differential Equations and Vector Calculus	2	1	0	3
	PC	25BHT106	Chemistry	3	0	0	3
	ES	25CST101	Data Structures	3	0	0	3
	ES	25ESL103	CAED Lab	0	0	3	1.5
	PC	25CSL101	Data Structures Lab	0	0	3	1.5
	BH	25CSL102	AI Tools Lab	0	0	3	1.5
	PC	25BHL101	Communicative English Lab	0	0	3	1.5
	ES	25BHL104	Chemistry Laboratory	0	0	3	1.5
	MC	25MCS103	Health and Wellness, Yoga and Sports	0	0	1	0.5
	BH	25BHS104	Design Thinking and Sustainable Development	1	0	2	2
			Total	**12**	**1**	**18**	**22**
Mandatory Socially Relevant Internship using Design Thinking and Sustainable Development of 02 weeks duration							

INDUCTION PROGRAMME

S.No.	Course Name	Category	L	T	P	C
1.	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0	0	6	0
2.	Career Counselling	MC	2	0	2	0
3.	Orientation to all branches -- career options, tools, etc.	MC	3	0	0	0
4.	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2	0	3	0
5.	Proficiency Modules & Productivity Tools	ES	2	1	2	0
6.	Assessment on basic aptitude and mathematical skills	MC	2	0	3	0
7.	Remedial Training in Foundation Courses	MC	2	1	2	0
8.	Human Values & Professional Ethics	MC	3	0	0	0
9.	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2	1	2	0
10.	Concepts of Programming	ES	2	0	2	0

I YEAR I SEMESTER

L	T	P	C
2	1	0	3

Code: 25BHT102

LINEAR ALGEBRA & CALCULUS

(Common to All Branches)

Course Objectives:

The objectives of this course are to:

1. Understand and apply fundamental concepts of matrices, including rank, inverse, and solutions of linear systems using direct and iterative methods.
2. Explore linear and orthogonal transformations, eigenvalues, eigenvectors, and apply the Cayley-Hamilton theorem and canonical forms.
3. Gain proficiency in calculus through the application of Mean Value Theorems and function approximations using Taylor's and Maclaurin's series.
4. Analyze and apply techniques in multi variable calculus including partial differentiation, Jacobian and optimization using Lagrange multipliers.
5. Apply double and triple integration techniques for calculating areas, volumes and other applications in engineering contexts.

Course Outcomes:

On successful completion of this course, students will be able to:

- **CO1:** solve systems of linear equations and analyze matrices using rank, inverse, and elimination methods.
- **CO2:** analyze and simplify matrices using eigenvalues, eigenvectors and the Cayley-Hamilton theorem.
- **CO3:** apply mean value theorems and function expansions to approximate and interpret real-valued functions.
- **CO4:** use multi-variable calculus to find partial derivatives and solve optimization problems.
- **CO5:** compute and apply double and triple integrals to evaluate areas and volumes in engineering contexts**.**

UNIT–I: Matrices:

Rank of a matrix by echelon form and normal form; inverse of non-singular matrices using Gauss-Jordan method. **System of linear equations**: Solving homogeneous and non-homogeneous systems using Gauss elimination method and Gauss-Seidel iteration method.

UNIT–II: Linear Transformation and Orthogonal Transformation:

Eigenvalues and eigenvectors and their properties (without proof); diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding the inverse and powers of a matrix using the Cayley-Hamilton Theorem.
Quadratic forms: Nature of quadratic forms; reduction of quadratic forms to canonical form using orthogonal transformation.

UNIT–III: Calculus:

Mean Value Theorems: Rolle's Theorem, Lagrange's Mean Value Theorem and Cauchy's Mean Value Theorem with geometrical interpretations.
Taylor's and Maclaurin's Theorems with remainders (without proof); problems and applications based on the above theorems.

UNIT–IV: Partial Differentiation and Applications (Multivariable Calculus):

Partial derivatives, total derivatives, chain rule, change of variables; Taylor's and Maclaurin's series expansion for functions of two variables; Jacobians; maxima and minima of functions of two variables; method of Lagrange multipliers.

UNIT–V: Multiple Integrals (Multivariable Calculus):

Double integrals – change of variables (Cartesian and Polar coordinates); change of order of integration. Triple integrals – cylindrical and spherical coordinates.
Applications of double integrals (Area) and triple integrals (Volumes).

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, JohnWiley & Sons, 2018.

3. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 2018.

Reference Books:

1. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham & M.V.S.S.N.Prasad, Engineering Mathematics-I, S.Chand Publisher, 2020.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, 5/Ed, Alpha Science International Ltd., 2021 (9^{th} reprint).
3. Michael Greenberg, Advanced Engineering Mathematics, 9^{th} edition, Pearson edn.

Code: 25BHT104

L	T	P	C
3	0	0	3

ENGINEERING PHYSICS

(Common for all branches)

Course Objectives

To introduce the basic concepts of physical optics phenomena, such as interference and diffraction. Understanding of the concepts of quantum mechanics and semiconductor physics, as well as dielectric and magnetic materials, that lead to potential applications in emerging microdevices.

Course Outcomes: The students will be able to

CO-1: Understand the phenomenon of interference and diffraction of light, enabling precise analysis of optical instruments.

CO-2: Acquire foundational insight into the quantum nature of the particles and electronic properties of the semiconductors.

CO-3: Develop insight into the dielectric and magnetic properties of materials

CO-4: Analyze the crystal structures by X-ray diffraction techniques.

CO-5: Apply the basic knowledge of lasers and fiber optics to analyze their construction.

UNIT-I: WAVE OPTICS **10 hrs**

Interference: Introduction **-** Principle of superposition and its Analytical treatment - Interference of light - Interference in thin films (Reflection Geometry) - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction – difference between interference and diffraction – difference between Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & Diffraction Grating (N-slit) – Maximum number of orders possible – determination of wavelength of laser.

Unit-II: QUANTUM MECHANICS AND SEMICONDUCTORS **10 hrs**

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

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors and Extrinsic semiconductors - Drift and diffusion currents – Einstein's equation - Hall effect and its Applications.

UNIT-III: DIELECTRICS AND MAGNETIC MATERIALS **8 hrs**

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius-Mossotti equation.

Magnetic Materials: Introduction - Magnetic dipole moment – Magnetization - Magnetic susceptibility and permeability - Classification of magnetic materials: Dia, Para, Ferro, Antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT IV: CRYSTALLOGRAPHY & X-RAY DIFFRACTION **10 hrs**

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC
X-ray diffraction: Miller indices – separation between successive (h k l) planes - Bragg's law - X-ray Diffractometer – crystal structure determination by Laue method and Powder method.

Unit – V: LASERS & OPTICAL FIBER **10 hrs**

LASERS: Introduction - Characteristics of Lasers - Principles of Laser: Absorption, Spontaneous emission, stimulated emission, principle of lasing action, population inversion, pumping, Types of Lasers: Helium-Neon Laser [Four Level System] – semiconductor laser - Applications of Lasers.
OPTICAL FIBER: Introduction - Construction of Optical Fiber - Principle of Optical Fiber: Total Internal Reflection - Numerical Aperture and Acceptance Angle - Classification of optical fibers based on refractive index profile - Applications of Optical Fibers in Communication.

Text Books

1. "A Text book of Engineering Physics" - M. N. Avadhanulu, P.G.Kshirsagar & TVS
2. ArunMurthy, S.Chand Publications, 11th Edition 2019.
3. "Engineering Physics" - D. K. Bhattacharya and Poonam Tandon, Oxford press (2015).
4. "Engineering Physics" - P. K. Palanisamy SciTech publications.

Reference Books

1. "Fundamentals of Physics" - Halliday, Resnick and Walker, John Wiley &Sons.
2. "Engineering Physics" - M.R. Srinivasan, New Age international publishers (2009).
3. "Engineering Physics" - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
4. "Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
5. "Semiconductor physics and devices:Basic principle" - A. Donald, Neamen, Mc GrawHill.
6. "Engineering Physics" - B.K. Pandey and S. Chaturvedi, Cengage Learning
7. "Solid state physics" – A.J.Dekker ,Pan Macmillan publishers
8. "Introduction to Solid State Physics" - Charles Kittel ,Wiley

Basic Electrical and Electronics Engineering

(Common to CSE/CSM/CSD/CSC/IT/MECH/CIVIL)

Subject Code: 25EST102

L	T	P	C
3	0	0	3

Course Objectives

- To introduce the basic knowledge of electric circuits.
- To analyze AC circuits.
- To provide knowledge on DC Machines.
- To understand the working and characteristics of PN Junction diode and Zener diode.
- To explain the working of Rectifiers and characteristics of transistor in Common Base Configuration.

Course Outcomes

At the end of this course, the student will be able to:

1. Summarize different electrical circuits.
2. Summarize the behavior of AC circuits.
3. Examine the operation of DC Machines.
4. Describe the working of PN Junction diode and Zener diode.
5. Describe the working of Rectifiers and the behavior of transistor (BJT) in Common Base Configuration.

Unit – I : Introduction to Electric Circuits

Basic definitions, Electrical circuit elements (R, L, and C), Voltage and current sources – Independent and dependent sources, Ohm's Law, Series & Parallel circuits, Voltage and current division rules, Source transformation, Kirchhoff's Laws, Faraday's Laws of Electromagnetic Induction, Simple problems.

Unit – II : AC Circuits

Basic definitions, Representation of sinusoidal waveforms, Peak and RMS values, Phasor representation, Analysis of single-phase AC circuits (R, L, C, RL, RC, RLC series only), Real power, Reactive power, Apparent power, Power factor, Simple problems.

Unit – III : DC Machines

DC Generator – Principle of operation, Construction, EMF equation, Classification, DC Motor – Principle of operation, Torque equation, Classification, Speed control methods, Operation of three-point starter.

Unit – IV : Diode Characteristics

Formation of PN junction diode, V–I characteristics of diode, Diode as a switch, Zener diode characteristics, Zener diode as voltage regulator, Rectifiers – Half-wave rectifier, Full-wave rectifier (midpoint and center-tapped connection, diode only).

Unit – V : Transistor Characteristics

Bipolar Junction Transistors (BJT), Input & output characteristics of transistor in CB configuration, Relationship between α, β, and γ.

Text Books

1. D.P. Kothari and I.J. Nagrath, *Basic Electrical Engineering*, Tata McGraw-Hill, 2010.
2. Jacob Millman and Christos C. Halkias, *Integrated Electronics*, Tata McGraw-Hill, 2009.

Reference Books

1. R.L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuits*, Pearson/Prentice Hall, 9th Edition, 2006.
2. V.K. Mehta, *Principles of Electrical and Electronics Engineering*, S. Chand & Co.

COMPUTER PROGRAMMING

(Common to All Branches)

L	T	P	C
3	0	0	3

Subject Code: 25EST106

Course Objectives

- To provide a strong foundation in problem solving and programming is using the C language.
- This course introduces number systems, core programming concepts, control structures, arrays, functions, pointers, structures, and file handling.
- Emphasis is on writing efficient, modular, and error-free programs suitable for real-world applications.

Course Outcomes:

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

1. Explore number systems and develop basic C programs using algorithms, flowcharts, and simple I/O operations.
2. Apply decision-making, looping, and branching statements to solve conditional and repetitive problems.
3. Use arrays and strings for data storage and manipulation.
4. Design modular programs using functions and apply pointer concepts for dynamic and memory optimized programs.
5. Devise programs to manage and store complex data using structures and files.

UNIT-I: Introduction

Introduction to Number System: Number Systems - Binary, Decimal, Octal, and Hexadecimal Systems, and Conversions

Introduction to Programming: Introduction to components of the Computer system, Algorithm, Flow chart, Program development steps, C Tokens, Data Types, Operator precedence and associativity, Expression Evaluation, Structure of C program, simple programs using formatted and unformatted I/O statements, preprocessor directives.

UNIT-II: Control Structures

Decision statements: if, if-else, nested if, if-else-if ladder, and switch case.

Iterative statements: while, do-while, for, nested loops.

Branching Statements: Break and continue.

UNIT-III: Arrays and Strings

Arrays: Definition, Types of Arrays, declaration, initialization, Operations on arrays.

Strings: Fundamentals, declaration, initialization, accessing string, String manipulation.

UNIT-IV: Functions and Pointers

Functions: Definition and use, Declaration, Types of Functions, Parameter passing (Call by value and call by reference), Passing Arrays, Recursion, Recursion vs Iteration, function Vs Macro, Storage classes.

Pointers: Definition, Declaration, Initialization, Pointer arithmetic, functions and pointers, Pointer to pointer, arrays and pointers, Pointers as Function Arguments, DMA

UNIT-V: Structures, Unions and File Handling

Structures: Definition, Declaration, Accessing the structure elements, Array of structures, Arrays within structures, pointer to structure, passing structure to function, nested structures, self-referential structures, bit fields.

File Handling: Purpose, Types of files, file opening modes, closing a file, file I/O, Error Handling, Random Access to Files, Command line arguments,

Text Books:

1. B. W. Kernighan and D. M. Ritchie, *The C Programming Language*, 2nd ed., Englewood Cliffs, NJ, USA: Prentice-Hall, 1988.
2. Y. Kanetkar, *Let Us C*, 20th ed., New Delhi, India: BPB Publications, 2024.
3. N. Kamthane, *Programming in C*, 3rd ed., New Delhi, India: Pearson Education, 2015.

References:

1. E. Balagurusamy, *Programming in ANSI C*, 9th ed., New Delhi, India: McGraw-Hill Education, 2024.
2. B. S. Gottfried, *Programming with C*, 2nd ed., New York, NY, USA: McGraw-Hill Education, 2006.

Web Links:

1. https://www.programiz.com/c-programming
2. https://www.geeksforgeeks.org/c/c-programming-language/
3. https://www.tutorialspoint.com/cprogramming/index.htm

IT WORKSHOP

(Common to CSE/CSM/CSD/CSC/IT)

Subject Code: 25ESL106

L	T	P	C
1	0	4	3

Course Objectives:

The objective of this course is to

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables.
- Demonstrate basic command line interface commands on Linux.
- Teach the usage of Internet for productivity and self-paced lifelong learning.
- Demonstrate Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes:

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

1. Exemplify Hardware components and their functionalities.
2. Demonstrate installation of OS.
3. Configure a PC securely into network.
4. Prepare documents with various text editing features.
5. Create spreadsheets for data processing and visualize using power point presentation.

Computer Hardware

Experiment 1: Identification of peripherals of a PC

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

Task 2: Demonstrate disassemble and assemble a PC.

Operating Systems

Experiment 2: Operating System installation MS Window

Task 1: Illustrate the installation process of MS- Windows

Experiment 3: Operating System installation Linux

Task 1: Install Linux on a Windows based system and facilitate dual booting.

Experiment 4: Linux Operating System commands

Task 1: Implement basic Linux commands like mkdir, rmdir, cat, touch, mv, cp, rm, cd, pwd, echo, date, cal, bc, ls, find, stat, grep, head, tail, ps, kill, ifconfig, ping.

Networking and Internet

Experiment 5:

Task 1: Create awareness on networking components and functionalities. Demonstrate the network connectivity and TCP/IP configuration

Task 2: Illustrate the customization of web browsers with the LAN proxy settings, bookmarks, search toolbars, pop up blockers, and plug-ins (Macromedia Flash and JRE).

Experiment 6:

Task 3: Create awareness on various threats on the internet and protection of the PC like blocking pop ups, blocking active x downloads, firewall configuration and installing anti-virus software.

MS–OFFICE

Experiment 7: MS–Word -Orientation

Task 1: Prepare a project certificate by applying the features:- Fonts Styles, Drop Cap, Text effects, Borders and Colors, Header and Footer, Date and Time.

Task 2: Design index page of a project by using the features:- Formatting Styles, Inserting table, Bullets, and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, and Paragraphs.

Task 3: Create a News letter: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, and Paragraphs.

Task 4: Develop a Feedback form that includes forms, Text Fields, Radio buttons, check boxes and Mail Merge.

Experiment 8: MS-Excel

Task 1: Describe various basic components of excel namely quick access toolbar, file tab, title bar, ribbon/toolbar, formula bar, cells, rows and columns bars, and status bar.
Task 2: Develop a student performance analysis sheet by covering the features:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

Task 3: Visualization of student performance using Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

Task4: Create Cricket Score Card-Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation.

Experiment 9: MS-Power Point

Task 1: Create a basic PowerPoint presentation covering, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting – Images, Clip Art, Tables, and Charts in PowerPoint.
Task 2: Create Power Point presentations includes:-Master Layouts (slide, template, and notes), Types of views (basic, presentation, Slideslotter, notes, etc), and Background textures, Design Templates, Hidden slides.

Text Books:

1. Vikas Gupta, "Comdex Information Technology course tool kit", 10th ed, WILEY Dream Tech, 2010.
2. Cheryl A Schmidt, "The Complete Computer upgrade and repair book", 3rd edition, WILEY Dream tech, 2002
3. **Simy Joy, Payal Anand, Priya Nair Rajeev**, Introduction to Information Technology, ITL Education Solutions limited, 3rd ed Pearson Education, 2012.
4. Kate J .Chase, "PC Hardware and A+ Handbook"–PHI(Microsoft), 2004

Reference Books:

1 Scott.Mueller,Upgradingand RepairingPCs,22/e, QUE, 2008.
2 Cheryl A Schmidt, The CompleteComputerupgradeandrepairbook,3/e, Dream tech, 2002
3 IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition, 2008

L	T	P	C
0	0	3	1.5

Subject Code: 25BHL102

ENGINEERING PHYSICS LAB
(Common for all branches)

Course Objectives

Applying the basic concepts of optical phenomena like interference and diffraction for verifying dimensions of thin objects, recognising the importance of the energy gap in the study of electrical properties of semiconductors, and investigating the parameters and applications of lasers and optical fibers through experiments.

Course Outcomes: The students will be able to

CO-1: Verify the microscopic dimensions of the objects by applying principles of interference and diffraction.
CO-2: Acquire a practical understanding of semiconductor physics by analyzing electronic properties of the semiconductors.
CO-3: Analyze the induced magnetic field in a current-carrying circular coil.
CO-4: Corroborate the mechanical properties of the materials
CO-5: Evaluate the characteristics of the lasers and fiber optics

List of Experiments

1. Determination of the radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of the thickness of a thin object using wedge shaped film.
3. Determination of wavelengths of different spectral lines in the mercury spectrum using a diffraction grating in normal incidence configuration.
4. Determination of the width of a slit using the diffraction phenomenon.
5. Determination of the temperature coefficient of a thermistor.
6. Determination of the energy bandgap of a given semiconductor
7. To study the V-I characteristics of a pn junction diode in forward and reverse biasing conditions.
8. Magnetic field along the axis of a current-carrying circular coil by Stewart Gee's Method.
9. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
10. Determination of the rigidity modulus of the material of the given wire using the Torsional pendulum
11. Determination of the wavelength of Laser light using a diffraction grating.
12. Determination of Numerical Aperture and Bending Loss of an Optical Fiber
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using the Hall effect.
14. Sonometer: Verification of laws of stretched string.
15. Determination of the Frequency of the electrically maintained tuning fork by Melde's experiment.
16. Determination of crystal structure and lattice parameter of a given crystal using powder diffraction data.
17. Determination of Young's modulus of the given beam by non-uniform bending.

18. Determination of dielectric constant using the resonance method.

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

References:

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

Web Resources

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

I YEAR I SEMESTER

L	T	P	C
0	0	3	1.5

Subject Code: 25ESL102

Basic Electrical and Electronics Engineering Lab

(Common to CSE/CSM/CSD/CSC/IT/MECH/CIVIL)

Course Objectives

- To introduce the basic laws related to electrical and electronics circuits.
- To provide knowledge on speed control methods of DC motors.
- To analyze V–I characteristics of P–N diode and Zener diode.
- To provide knowledge on transistor Common Base configuration.
- To provide knowledge on Half-wave and Full-wave rectifiers.

Course Outcomes

Students will be able to:

1. Demonstrate various basic electrical circuits.
2. Demonstrate speed control methods of DC motors.
3. Analyze the V–I characteristics of P–N diode and Zener diode.
4. Analyze the characteristics of transistor in Common Base configuration.
5. Demonstrate the performance of Half-wave and Full-wave rectifiers.

List of Experiments

1. Verification of Ohm's Law
2. Verification of Kirchhoff's Current Law (KCL)
3. Verification of Kirchhoff's Voltage Law (KVL)
4. Verification of total resistance of series and parallel connected circuits
5. Measurement of power factor of series RL circuit
6. Speed control methods of DC motor
7. V–I characteristics of P–N junction diode (forward and reverse bias)
8. Zener diode characteristics
9. Transistor CB configuration – input and output characteristics
10. Half-wave rectifier (with and without capacitor)

Additional Experiments

11. Full-wave rectifier (with and without capacitor)
12. Operation and working of three-point starter

COMPUTER PROGRAMMING LAB

(Common to All Branches)

Subject Code: 25ESL105

L	T	P	C
0	0	3	1.5

Course Objective

- To equip students with hands-on programming skills using the C language by solving a variety of real-life and algorithmic problems.
- The course emphasizes the use of control structures, arrays, functions, pointers, structures, and file handling through practical implementation.
- It aims to develop logical thinking and modular coding practices aligned with foundational computing principles.

Course Outcomes:

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

1. Apply basic C programming constructs such as variables, data types, operators, and input/output operations to solve simple problems.
2. Develop programs using control structures to implement decision making and iterative tasks.
3. Demonstrate the usage of arrays to solve problems related to lists of elements.
4. Implement modular and memory optimized programs using functions and pointers.
5. Design programs using structures and file handling techniques to manipulate stored data.

List of Experiments

1. Write the C programs to perform the following
   a) Simple and compound interest calculation
   b) Find the maximum of 3 values using the conditional operator.
   c) Interchanging values of two variables.

2. Write the C programs to perform the following
   a) Demonstrate the precedence and associativity among operators using single expression
   b) Demonstrate the type casting operations
   c) Demonstrate different format specifies on different data types

3. Write C programs for the following using decision making statements
   a) Find roots of quadratic equation.
   b) Find the max and min of three numbers using if-else.
   c) Determine type of character (vowel, consonant, digit, special character).

4. Write the C programs to perform the following
   a) Read a number and display in reverse.
   b) Check for Armstrong number property
   c) Convert a binary number (entered as an integer) into its decimal equivalent.

5. Write a menu-driven C program using switch-case and loops to display:
   a) Prime numbers in a given range
   b) Fibonacci series
   c) Different patterns like Pascal triangle

6. Implement the following using arrays
a) Largest and smallest from a list of elements.
b) Program for Linear Search.
c) Program for arranging elements.

7. Implement the following using arrays
   a) To count the total number of duplicate elements in an array.
   b) Matrix addition
   c) Matrix multiplication

8. Write a program in C using functions
   a) Implementation of strong number property.
   b) Implementation of call by value and call by reference
   c) Demonstrate the string operations with and without library functions (length, reverse, copy, concatenation, compare)

9. Write the C programs to perform the following
a) GCD using recursion and non-recursion.
b) Demonstrate working of macros vs functions.

10. Write the C programs to perform the following
a) Find the sum and average of the list of elements using DMA Functions
b) Demonstrate pointer arithmetic.

11. Write the C programs to perform the following
a) Passing structure as a parameter to a function
b) Nested structures.

12. Write the C programs to perform the following
a) Count the number of lines, words, and characters in a file using command line arguments.
b) Merging the contents of two files into a new file.

Text Books:

1. B. W. Kernighan and D. M. Ritchie, *The C Programming Language*, 2nd ed., Englewood Cliffs, NJ, USA: Prentice-Hall, 1988.
2. Y. Kanetkar, *Let Us C*, 20th ed., New Delhi, India: BPB Publications, 2024.
3. N. Kamthane, *Programming in C*, 3rd ed., New Delhi, India: Pearson Education, 2015.

References:

1. E. Balagurusamy, *Programming in ANSI C*, 9th ed., New Delhi, India: McGraw-Hill Education, 2024.

2. B. S. Gottfried, *Programming with C*, 2nd ed., New York, NY, USA: McGraw-Hill Education, 2006.

Web Links:

1. https://www.programiz.com/c-programming
2. https://www.geeksforgeeks.org/c/c-programming-language/
3. https://www.tutorialspoint.com/cprogramming/index.htm

I YEAR I SEMESTER

L	T	P	C
0	0	1	0.5

Subject Code: 25MCS102

NSS/NCC/ Scouts & Guides/ Community Services
(Common for all branches)

Course Objective

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

Course Outcomes

After successful completion of this course, the student will be able to:

1. Understand the importance of discipline, character, and service motto.
2. Solve societal issues by applying acquired knowledge, facts, and techniques.
3. Explore human relationships by analyzing social problems.
4. Extend help to fellow beings and downtrodden people.
5. Develop leadership skills and civic responsibilities.

Unit I: Orientation

General orientation on NSS/NCC/Scouts & Guides/Community Service activities, Career guidance.

Activities:

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

Unit II: Nature & Care

Activities:

Best out of waste competition, Poster and sign-making competition to spread environmental awareness, Recycling and environmental pollution article writing competition, Organising zero-waste day, Digital environmental awareness activity via social media platforms, Virtual demonstration of eco-friendly approaches for sustainable living, Writing a summary on any book related to environmental issues.

Unit III: Community Service

Activities:

Conducting one-day special camp in a village – contacting local leaders – survey – identifying problems – solving with help of media/authorities/experts, Conducting awareness programs on health-related issues such as general health, mental health, spiritual health, HIV/AIDS, Conducting consumer awareness programs and explaining legal provisions, Women empowerment programmes – sexual abuse, adolescent health, population education, Any other programmes in collaboration with local charities, NGOs etc.

Reference Books

1. Nirmalya Kumar Sinha & Surajit Majumder – *A Text Book of National Service Scheme, Vol I*, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book – National Cadet Corps Standing Instructions Vol I & II*, Directorate General of NCC, Ministry of Defence, New Delhi
3. Hill – *New York 4/e*, 2008
4. Ram Ahuja – *Social Problems in India*, Rawat Publications, New Delhi

L	T	P	C
3	0	0	3

Subject Code: 25BHT101

COMMUNICATIVE ENGLISH

(Common to All Branches)

Course Objectives:

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

Course Outcomes (COs):

By the end of this course, learners will be able to:

1. **Identify and comprehend** the main ideas, supporting details, and context from literary texts and audio materials. *(Remembering, Understanding)*
2. **Demonstrate** the ability to participate in conversations and discussions by expressing ideas clearly on familiar and academic topics. *(Applying, Analyzing)*
3. **Compose** grammatically accurate sentences, paragraphs, and emails using appropriate structure and punctuation. *(Applying, Creating)*
4. **Apply** reading strategies such as skimming, scanning, and inference to analyze written texts effectively. *(Applying, Analyzing)*
5. **Use** a range of vocabulary, including synonyms, antonyms, and technical terms, to enhance both spoken and written communication. *(Understanding, Applying)*

Instructions for Faculty

1. Texts can be given as **podcasts** to enhance listening skills.
2. **Homework**: Students listen and read texts; **Classwork**: discussions and critical evaluation of texts (context, purpose, author's vs. reader's perspective).
3. Encourage **reading habits** (academic & non-academic). Train students in intensive and extensive reading strategies.
4. **Writing** practice should cover academic tasks (assignments, exams, reports, emails/letters).
5. Writing tasks should be **self and peer evaluated** before final grading.
6. Activities for developing language skills must be **integrated and interconnected** across all units.
7. Texts are **contexts for teaching skills**—not the end goals. The objective is **language use** beyond textbooks.

Course Units

UNIT – I: Human Values

Lesson: *Luck* – Mark Twain (Short Story)

- **Listening**: Identifying topic, context, and information from short audio texts; answering questions.
- **Speaking**: Asking/answering general questions on familiar topics (home, family, work, studies, interests); self and peer introductions.

- **Reading**: Skimming for main ideas; scanning for specific information.
- **Writing**: Capital letters, punctuation, and commonly misspelled words *(Bridge Course: 2 weeks before academic program)*.
- **Grammar**: Verbs; Tenses; Types of Sentences.
- **Vocabulary**: Synonyms, Antonyms, Affixes (prefixes/suffixes), Root words, One-word substitutes.

UNIT – II: Nature

Lesson: *Ode to the West Wind* – P. B. Shelley (Poem)

- **Listening**: Answering questions on main and supporting ideas from audio texts.
- **Speaking**: Pair/group discussions on specific topics; short structured talks.
- **Reading**: Recognizing sequence of ideas and linking techniques in paragraphs.
- **Writing**: Paragraph writing – structure and coherence.
- **Grammar**: Articles; Prepositions; Active & Passive Voice.
- **Vocabulary**: Homonyms, Homophones, Homographs.

UNIT – III: Biography

Lesson: *The Knowledge Society* – A. P. J. Abdul Kalam

- **Listening**: Listening for global comprehension and summarizing.
- **Speaking**: Group discussions on specific topics and reporting outcomes.
- **Reading**: Detailed reading with inferences and context clues.
- **Writing**: Structured essay writing.
- **Grammar**: Adjectives; Degrees of Comparison; Clauses & Phrases.
- **Vocabulary**: Compound words, Collocations.

UNIT – IV: Inspiration

Lesson: *Like a Tree, Unbowed* – Wangari Maathai

- **Listening**: Making predictions while listening; academic conversations (with and without video).
- **Speaking**: Role plays – academic conversations (formal/informal), asking & giving information/directions.
- **Reading**: Understanding graphic elements in texts (trends, processes, data visualization).
- **Writing**: Official letters, Emails.
- **Grammar**: Direct & Indirect Speech; Cohesive devices (linkers); Sentence formation (Simple, Compound, Complex).
- **Vocabulary**: Commonly confused words; Jargon.

UNIT – V: Motivation

Lesson: *The Secret of Work* – Swami Vivekananda

- **Listening**: Identifying key terms, concepts, and answering relevant questions.
- **Speaking**: Formal presentations on academic topics.
- **Reading**: Reading comprehension practice.
- **Writing**: Summarizing, Product description, Paraphrasing.
- **Grammar**: Editing short texts (articles, prepositions, tenses, subject-verb agreement).
- **Vocabulary**: Technical jargon.

Textbook

1. *Pathfinder: Communicative English for Undergraduate Students* (1st Edition). Orient BlackSwan, 2023. *(Units 1, 2 & 3)*

Reference Books

1. *Professional Communicative English*, Maruti Publications, 2019.
2. *Epitome of Wisdom*, Maruti Publications, 2013.
3. *Infotech English*, Maruti Publications, 2021.
4. *English Essentials*, Maruti Publications, 2014.
5. Bailey, Stephen. *Academic Writing: A Handbook for International Students*. Routledge, 2014.
6. Murphy, Raymond. *English Grammar in Use* (4th Edition). Cambridge University Press, 2019.
7. Lewis, Norman. *Word Power Made Easy*. Anchor, 2014.

Web Resources:

Grammar

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

Vocabulary

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

L	T	P	C
2	1	0	3

Code: 25BHT103

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches)

Course Objectives:

The objectives of this course are to:

1. Develop understanding of first-order and first-degree differential equations and their real-world applications.
2. Introduce methods to solve higher-order linear differential equations with constant coefficients and apply them to engineering systems.
3. Equip students with techniques for forming and solving partial differential equations relevant to physical processes.
4. Provide knowledge of vector differentiation operators—gradient, divergence and curl—and their physical interpretations.
5. Enable students to evaluate vector integrals and apply the fundamental vector theorems (Green's, Stoke's and Divergence) in practical scenarios.

Course Outcomes:

On successful completion of this course, students will be able to:

- **CO1:** apply first-order differential equations to model and solve problems in growth and electric circuits.
- **CO2:** solve higher-order linear differential equations.
- **CO3:** use Lagrange's method to solve partial differential equations arising from physical and engineering problems.
- **CO4:** calculate and interpret the gradient, divergence and curl of vector fields and verify standard identities.
- **CO5:** evaluate line and surface integrals and apply vector calculus theorems to real-world applications

UNIT–I: Differential Equations of First Order and First Degree:

Exact differential equations and equations reducible to exact form; linear differential equations; Bernoulli's equations.

Applications: Newton's Law of Cooling, Law of Natural Growth and Decay and Electrical Circuits.

UNIT–II: Linear Differential Equations of Higher Order (with Constant Coefficients):

Definitions of homogeneous and non-homogeneous equations; complementary function; general and particular integrals; method of variation of parameters.

Application: L–C–R Circuit.

UNIT-III: Partial Differential Equations:

Introduction and formation of partial differential equations by eliminating arbitrary constants and arbitrary functions; solutions of first-order linear equations using Lagrange's method.

UNIT-IV: Vector Differentiation:

Scalar and vector point functions; vector operator Del; Del applied to scalar point functions – Gradient; Del applied to vector point functions – Divergence and Curl; vector identities.

UNIT–V: Vector Integration:

Line integral -Work done, surface integral- Flux. Integral theorems- Green's Theorem, Stoke's Theorem and Divergence Theorem (without proof).

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2018.
2. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers,2017.
3. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 2017.

Reference Books:

1. Dennis G.Zill and Warren S.Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2018.
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn.
3. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham & M.V.S.S.N.Prasad, Engineering Mathematics-I, S.Chand Publisher, 2020.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd., 2021 (9th reprint).

I YEAR II SEMESTER

L	T	P	C
3	0	0	3

Subject Code: 25BHT106

CHEMISTRY

(Common to CSE, CSM, CSD, IT, CSC, ECE and EEE)

C**ourse Objectives:**

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods and spectroscopic techniques.

Course Outcomes: At the end of the course, the students will be able to:
CO1: Demonstrate the importance of water for society and industrial needs.
CO2: Summarize the concepts of Instrumental methods and distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
CO3: Compare the materials of construction for battery and electrochemical sensors.
CO4: Demonstrate the preparation, properties, and applications of thermoplastics, thermosetting, elastomers, conducting polymers and bio-degradable polymers.
CO5: Apply the principle of Band diagrams in the application of conductors and semiconductors.

UNIT I Water Technology
Soft and hard water, Estimation of hardness of water by EDTA Method, Numerical Problems on Temporary and Permanent Hardness - Disadvantages of Hard Water**,** Boiler troubles –Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment –Ion-exchange processes, Desalination of brackish water- Reverse osmosis (RO) and electrodialysis. Wastewater treatment-Block diagram (primary, secondary, tertiary).

UNIT II Instrumental Methods and Applications
Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law-Statements. UV-Visible Spectroscopy, Instrumentation, electronic transition, Definition of Chromophore – Definition of Auxochrome – Absorption and Intensity Shifts, IR spectroscopy- Instrumentation fundamental modes and Fingerprint Region. NMR – Principle - Equivalent and Non-Equivalent Protons - Chemical Shift- Splitting – Coupling Constant.

UNIT III Electrochemistry and Applications:
Electrodes - Electrochemical cell, Nernst equation, cell potential (EMF) calculations and numerical problems (EMF), potentiometry- potentiometric titrations (redox titrations), conductometric titrations (acid-base titrations). Electrochemical sensors (definition and working principle), reference electrodes – calomel electrode – NHE (or) SHE.
Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries - working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell, Polymer Electrolyte Membrane Fuel cells (PEMFC)- working of the cells.

UNIT IV Polymer Chemistry:
Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, Tacticity in polymers, Coordination polymerization.

Plastics –Thermoplastics and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, Polyester resin(PET).
Elastomers–Buna-S, Buna-N–preparation, properties and applications.
Conducting polymers – Polyacetylene, polyaniline – mechanism of conduction and applications.
Biodegradable polymers - Introduction- Polyl Lactic Acid (PLA)-Applications.

UNIT V Modern Engineering materials:
Semiconductors –Introduction**,** Basic concepts (Salient features of band theory-Definition semiconductor-Elemental semiconductors **-**intrinsic semiconductor and extrinsic semiconductors), applications.
Superconductors – Introduction- Basic Concept (Preparation of $YBa_2Cu_3O_{7-y}$ by ceramic method), Properties- applications.
Supercapacitors: Introduction, Principle & Mechanism of Supercapacitors - Applications.
Nanomaterials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

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

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

DATA STRUCTURES
(Common to CSE/CSM/CSD/CSC/IT)

Subject Code: 25CST101

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Be familiar with basic techniques of algorithm analysis and writing recursive methods
- Master the implementation of linked data structures such as linked lists and binary trees and balanced search trees.
- Be familiar with several sorting algorithms including selection-sort, bubble-sort.
- Be familiar with some graph algorithms such as shortest path and minimum spanning tree
- Master analyzing problems and writing program solutions to problems using the above techniques

COURSE OUTCOMES:

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

1. Explain the role of data structures in organizing and accessing data efficiently.
2. Design linked lists for dynamic data storage and manipulation.
3. Develop novel solutions to applications using linear data structures.
4. Apply stack and queue based algorithms for efficient task scheduling and traversals in graphs.
5. Explore different tree data structures and design hash-based solutions.

UNIT–I:

Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Types of data structures: Linear & Non-Linear. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort.

UNIT – II:

Linked-Lists: Definition, Types, arrays Vs linked lists, Merits and Demerits; Operations: Creation, Insert, Delete, Traversals on Singly LL, doubly LL, circular LL

UNIT – III:

STACKS: Definition, implementation of operations; QUEUES: Definition, types: Simple, Circular, Priority. Implementation of operations. Applications of Stacks & Queues: Conversion & Evaluation of expressions.

UNIT – IV:

GRAPHS: Basic Concepts, representation and storage of graphs: Adjacency Matrices and Adjacency Lists, graph traversals, DFS and BFS, Shortest-Path Algorithm: Dijkstra's Algorithm.

UNIT – V:

TREES: Basic concepts, Binary Tree traversals, Binary Search tree operations: insertion, deletion, traversals. HASHING: Introduction, hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations.

TEXT BOOKS

1. Fundamentals of Data Structures, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, 3rd Ed, Computer Science Press.
2. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Fourth edition, Thomson, 2023
3. Data Structures Using C - A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, 2nd Ed, PHI/Pearson education, 2015

REFERENCE BOOKS :

1. C & Data structures – P. Padmanabham, 3rd Ed, B.S. Publications, 2016
2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education, 1998.

CAED LAB

(Common for ECE, EEE, CSE, CSM, CSD, IT, and CSC)

Subject Code: 25ESL103

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To introduce students to AutoCAD tools for creating precise 2D and 3D drawings applicable across multiple engineering disciplines.
- To develop skills in editing, organizing, and annotating technical drawings as per standard drafting practices.
- To enable students to represent objects through projections, orthographic, and isometric techniques.

COURSE OUTCOMES:

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

CO1: Configure the AutoCAD environment by setting drawing units, limits, and scales, and develop precise 2D geometries using appropriate drawing and basic modify commands for accurate technical representation.

CO2: Apply advanced modify commands along with hatching techniques to create complex 2D layouts and incorporate dimensioning and annotations as per industry drafting standards

CO3: Organize technical drawings using multi-layer management and generate accurate projections of points and lines in simple positions to enhance clarity and readability

CO4: Produce orthographic projections of planes and 3D objects by applying correct projection methods to achieve precise multi-view drawings suitable for engineering documentation

CO5: Design simple 3D models and convert them into fully annotated 2D views, developing complete, domain specific technical drawings suitable for real-world engineering applications

Syllabus:

Introduction to AutoCAD Environment: Overview of CAD software, Configuring drawing units, limits, scales, and setting up templates for standardized work. Introduction to layers, line types, colors, and object properties.

Basic Drawing Commands: Creating fundamental 2D geometries using commands such as Line, Polyline, Circle, Arc etc. Methods of coordinate entry including absolute, relative, and polar coordinates.

Modify Commands – Basic & Advanced: Using modify tools such as Move, Copy, Rotate, Mirror, Trim, Extend, Fillet, Chamfer, Scale, and Offset to refine drawings. Advanced editing

using Array (rectangular and polar), Break, Stretch, and other productivity-enhancing commands.

Hatching, Dimensioning, and Annotation: Applying hatch patterns and gradients for sectional views. Dimensioning techniques including linear, aligned, angular, radial, and ordinate dimensions. Adding text annotationsusing standard drafting conventions as per BIS/ISO standards.

Layer Management & Drawing Organization: Creating and managing multiple layers with appropriate line types, line weights, and colors for organizing complex technical drawings.

Projection of Points, Lines, and Planes: Representing points and lines in simple positions. Creating projections of planes in simple orientations.

Orthographic Projections of Solids: Creating front, top, and side views from given 3D objects. Converting pictorial representations into multi-view orthographic drawings with correct dimensions and annotations.

Basic 3D Modelling: Introduction to creating simple 3D objects such as blocks, cylinders, cubes, and cones. Viewing and visualizing 3D models from multiple perspectives. Generating orthographic views from 3D solids for engineering documentation.

Final Integrated CAD Design Project: Designing and developing a real-world object relevant to the specific engineering domain including complete annotations and dimensions.

List of experiments

1. Setting drawing units, limits, and scales and creating basic 2D geometries (lines, circles, polygons, arcs) using drawing commands. **CO1**
2. Creation of complex 2D geometries using modified commands (move, copy, rotate, mirror, trim, extend, fillet, chamfer, scale, offset). **CO1**
3. Creation of complex 2D geometries using advanced modified commands (array, break, stretch etc.) **CO2**
4. Creating hatch patterns and gradients for sectional views and apply dimensioning and annotating to a given drawing. **CO2**
5. Creating multi-layered drawings with assigned properties. **CO3**
6. Creating projection of points and lines in simple positions. **CO3**

7. Creating projection of planes in simple positions. **CO4**
8. Creating orthographic projection of given 3D objects (front, top, and side views). **CO4**
9. Creating a simple 3D object (e.g., block, cylinder, cube, cone) and generating its orthographic views. **CO5**
10. Drawing and dimensioning a real-world object relevant to the specific engineering domain (e.g., Basic device casing for ECE, Simple circuit layout for EEE, Network rack layout for CSE, etc.) **CO5**

Text Books

1. Tickoo, S. (2024). *AutoCAD 2025 for engineers & designers*. CADCIM Technologies.
2. Shih, R. H. (2024). *AutoCAD 2025 tutorial: First level 2D fundamentals*. SDC Publications.

DATA STRUCTURES LAB
(Common to CSE/CSM/CSD/CSC/IT)

Subject Code: 25CSL101

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- Be familiar with basic techniques of algorithm analysis and writing recursive methods
- Master the implementation of linked data structures such as linked lists and binary trees and balanced search trees.
- Be familiar with several sorting algorithms including selection-sort, bubble-sort.
- Be familiar with some graph algorithms such as shortest path and minimum spanning tree
- Master analyzing problems and writing program solutions to problems using the above techniques

COURSE OUTCOMES:

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

1. Demonstrate the role of linear data structures in organizing and accessing data efficiently in algorithms.
2. Implement dynamic data storage for demonstrating memory allocation in linked lists..
3. Develop programs for novel solutions by involving linear data structures Stacks and Queues to handle recursive algorithms, manage program states, and solve related problems.
4. Apply stack and queue based algorithms for efficient task scheduling and traversals in graphs.
5. Demonstrate scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

List of Experiments:

1] a) Write a C program to reverse the digits of a number using recursive function.
b) Write a C program to solve the Towers of Hanoi problem using recursive function.
c) Design & Develop a C program to perform linear search for a key value in a given list.

2] a) Design & Develop a C program to perform Binary search for a key value in a given list.
b) Develop a C program that implements Selection Sort to sort a given list of integers.
c) Develop a C program that implements Bubble Sort to sort a given list of integers.

3] a)Implement a singly linked list and perform insertion and deletion operations.
b) Develop a program to reverse a linked list iteratively and recursively.
c) Solve problems involving linked list traversal and manipulation.

4] a) Create a program to detect and remove duplicates from a linked list.
b) Implement a linked list to represent polynomials and perform addition.

5] Design, Develop and Implement a menu driven Program in C for the following operations on **STACK** of Integers (Array Implementation of Stack with maximum size **MAX**)

a. ***Push*** an Element onto Stack.
b. ***Pop*** an Element from Stack.
c. Display the status (No. of elements, Empty/Full/not) of Stack.
d. Exit
Support the program with appropriate functions for each of the above operations

6] Design, Develop and Implement a menu driven Program in C for the following operations on **QUEUE** of Characters (Array Implementation of Queue with maximum size **MAX**)

a. Insert an Element into QUEUE
b. Delete an Element from QUEUE
c. Display the status (No. of elements, Empty/Full/not) of QUEUE
d. Exit
Support the program with appropriate functions for each of the above operations

7] Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: **+, -, *, /, %(Remainder), ^(Power)** and **alphanumeric** operands**.**

8] a) Design, Develop and Implement a C program to implement Binary tree traversals using iterative functions.
b) Design, Develop and Implement a C program to implement Binary tree traversals using recursive functions.

9] Design, Develop and Implement a menu driven Program in C for the following operations on **Binary Search Tree (BST)** of Integers

a. Create a BST of **'n'** Integers:
b. Traverse the BST in In-order, Pre-order and Post-Order
c. Search the BST for a given element (**Key**) and report the appropriate message
e. Exit

10] Design & Develop a Program in C for the following operations on **Graph (G)** of Cities

a. Create a Graph of **'n'** cities using Adjacency Matrix.
b. Print all the nodes **reachable** from a given starting node in a digraph using **DFS or BFS** method.

11] Design & Develop a Program in C to find the shortest paths to all Cities from a given City using Dijkstra's Algorithm.

12] Given a File of **N** employee records with a set **K** of Keys(6-digit) which uniquely determine the records in file **F**. Assume that file **F** is maintained in memory by a Hash Table(HT) of **m** memory locations with **L** as the set of memory addresses (2-digit) of locations in HT. Let the keys in **K** and addresses in **L** are Integers.

Design and develop a Program in C that uses Hash function **H: K→L** as H(**K**)=**K** mod **m (remainder** method), and implement hashing technique to map a given key **K** to the address space **L.**

Resolve the collision (if any) using (a) **linear probing**.(b) Quadratic Probing

Text Books:

1. **Data Structures and Algorithm Analysis,** Mark Allen Weiss , Fourth Edition , Pearson, 2013
2. **Fundamentals of Data Structures**, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

References:

1. **Data Structures and Algorithm Analysis,** Michel T. Goodrich, Roberto Tamassia, David Mount, 2nd Edition, John Wiley & Sons, Inc, 2011
2. **Classic Data Structures,** Second Edition, Debasis Samanta, PHI, 2012, New Delhi, India.
3. **Computer science, A structured programming approach using C,** Third edition, B.A. Forouzan and R.F. Gilberg, 2011, Thomson, New Delhi, India.

Web resources:

1. https://www.geeksforgeeks.org/data-structures/

AI Tools LAB
(Common to CSE/CSM/CSD/CSC/IT)

Subject Code: 25CSL102

L	T	P	C
0	0	3	1.5

Course Objectives:

- To introduce foundational AI tools and techniques in a hands-on environment.
- To develop basic proficiency in using no-code/low-code AI platforms.
- To enable students to apply AI concepts in real-world mini-projects.
- To foster understanding of AI applications in NLP, vision, and automation.
- To encourage creativity and innovation through simple AI-driven experiments.

Course Outcomes:

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

1. Identify and apply basic AI tools across various domains.
2. Demonstrate use of no-code and visual AI platforms like Teachable Machine and Dialogflow.
3. Develop simple AI applications such as chatbots and text/image generators.
4. Analyze the role of AI in real-life tasks like speech recognition and content creation.
5. Collaborate and innovate using AI-powered platforms to solve basic problems.

List of Experiments

1. Understand Introduction to AI Tools
2. Apply Text Generation with ChatGPT
3. Analyze Image Recognition using Teachable Machine.
4. Create Text to Image Generation.
5. Understand Voice Recognition with Google Speech-to-Text.
6. Create AI-Based Presentation with Canva AI.
7. Create a Chatbot using Dialogflow
8. Analyze NLP Tool Exploration using MonkeyLearn.
9. Evaluate Automated Data Insights with Google Sheets + AI
10. Create AI-Powered Videos using Lumen5.

Textbooks:

1. "Artificial Intelligence: A Guide for Thinking Humans" by Melanie Mitchell, 2020
2. "Hands-On Artificial Intelligence for Beginners" by Patrick D. Smith, 2018
3. "Artificial Intelligence Basics: A Non-Technical Introduction" by Tom Taulli, 2019

Reference Books:

1. "Artificial Intelligence: A New Synthesis" by Nils J. Nilsson, 2011
2. "The Hundred-Page Machine Learning Book" by AndriyBurkov, 2019
3. "Designing Bots: Creating Conversational Experiences" by Amir Shevat (for chatbot-related experiments), 2017

I YEAR II SEMESTER

L	T	P	C
0	0	3	1.5

Subject Code: 25BHL101

COMMUNICATIVE ENGLISH LAB

(Common to All Branches)

Course Objectives

The course is designed to:

1. Develop a strong foundation in **phonetics and pronunciation** for effective verbal communication.
2. Enhance students' **listening comprehension skills** through exposure to varied audio materials.
3. Improve **speaking skills** in formal and informal contexts through interactive exercises.
4. Train students in **presentation techniques** to express ideas clearly and confidently.
5. Equip students with **interview skills, resume writing, and workplace communication essentials**.

Course Outcomes (COs)

By the end of this course, students will be able to:

1. Recognize and produce **English speech sounds** accurately using the phonetic alphabet, and demonstrate correct **stress, intonation, and rhythm**. *(Remembering, Applying)*
2. Develop **critical listening skills** by interpreting gist, details, and speaker attitudes from authentic audio materials. *(Understanding, Analyzing)*
3. Engage in **conversations and spoken interaction** through structured activities such as role plays, JAM sessions, and telephone etiquette. *(Applying, Creating)*
4. Plan, design, and deliver **effective presentations** using visual aids, PowerPoint slides, and public speaking strategies. *(Applying, Creating)*
5. Prepare for **professional interviews** by writing resumes and cover letters, and demonstrating appropriate verbal and non-verbal communication skills in **mock interviews**. *(Creating, Evaluating)*

Syllabus

Unit I – Introduction to Phonetics

- Introduction to the Phonetic Alphabet
- Speech Sounds: Vowels and Consonants
- Word Stress and Sentence Stress
- Intonation Patterns in Communication
- Accent and Rhythm in Connected Speech

Focus: Familiarizing students with correct pronunciation, phonetic transcription, and stress-timed features of English.

Unit II – Listening Skills

- Listening for gist and specific information
- Listening for note-taking and summarizing
- Interpreting opinions and attitudes through listening

- Exposure to speeches/talks (e.g., TED Talks)

  Focus: Enhancing listening comprehension and note-making through diverse audio inputs.

Unit III – Speaking Skills

- Self-introduction and peer introduction
- Everyday conversations (greetings, leave-taking, casual dialogue)
- Asking and giving information
- Role plays (real-life situations)
- JAM (Just A Minute) sessions for fluency
- Telephone etiquette and formal conversations

  Focus: Developing fluency, spontaneity, and interactive spoken English skills.

Unit IV – Presentation Skills

- Basics of public speaking and presentation techniques
- Planning and delivering poster presentations
- Designing and presenting with PowerPoint slides
- Using visual aids effectively

  Focus: Training students to design, organize, and deliver structured oral presentations with confidence.

Unit V – Interview & Career Skills

- Writing a professional resume and cover letter
- Preparation for job interviews (frequently asked questions)
- Participating in mock interviews with feedback
- Body language, tone, and confidence building

  Focus: Preparing students for placements and workplace communication.

Suggested Software

- Walden InfoTech
- Young India Films

Reference Books

1. Meenakshi Raman & Sangeeta Sharma – *Technical Communication*, Oxford University Press, 2018. *(For theory, not lab)*
2. Samson T. – *Innovate with English, Foundations*.
3. Grant Taylor – *English Conversation Practice*, Tata McGraw-Hill Education India, 2016.
4. Jayashree M. – *Let's Hear Them Speak: Developing Listening–Speaking Skills in English*, Sage Publications.
5. Hewings, Martin – *Cambridge Academic English (B2)*, CUP, 2012. *(For reading/writing – theory classes)*
6. T. Balasubramanyam – *A Textbook of English Phonetics for Indian Students* (3rd Ed.), Trinity Press. *(For advanced/theory use)*

Web Resources:

1. https://www.esl-lab.com
2. https://www.englishmedialab.com
3. http://www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com
6. https://www.youtube.com/c/mmmEnglish_Emma
7. https://www.youtube.com/c/AmelsEverydayEnglish
8. https://www.youtube.com/c/engvidAdam
9. https://www.youtube.com/c/EnglishClass101
10. https://www.youtube.com/c/SpeakEnglishWithTiffani
11. https://www.youtube.com/c/MrSteve007
12. https://www.linguahouse.com/en-GB
13. https://www.ted.com/watch/ted-ed

Voice & Accent

1. https://www.youtube.com/user/letstalkaccent
2. https://www.youtube.com/c/EngLanguageClub
3. https://www.youtube.com/c/MrSteve007
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_lA

CHEMISTRY LABORATORY

(Common to CSE, CSM, CSD, IT, CSC, ECE and EEE)

Subject Code: 25BHL104

L	T	P	C
0	0	3	1.5

Course Objectives: Verify the fundamental concepts with experiments.

Course Outcomes:

At the end of the course, the students will be able to

CO1: Determine the cell constant and conductance of solutions.

CO2: Measure molecular/system properties such as surface tension and viscosity and prepare advanced polymer Bakelite material.

CO3: Measure the strength of an acid present in secondary batteries by pH metry and strength of solutions by potentiometry.

CO4: Analyse the sample using spectroscopic techniques and Measure molecular/system property such as chloride content of water.

CO5: Measure molecular/system properties such as hardness of water and dissolved oxygen.

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method.
2. Conductometric titration of strong acid vs. strong base.
3. Conductometric titration of weak acid vs. strong base.
4. Determination of cell constant and conductance of solutions.
5. Potentiometry - determination of redox potentials and emfs.
6. Determination of Strength of an acid in Pb-Acid battery. (pHmetry)
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law.(Colurimetric estimation of iron)
9. Wavelength measurement of sample through UV-Visible Spectroscopy.
10. Identification of simple organic compounds by IR.
11. Preparation of nanomaterials by precipitation method.
12. Estimation of Ferrous Iron by Dichrometry.
13. Determination of surface tension and viscosity.
14. Determination of Hardness of water sample by EDTA Method
15. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method.
16. Determination of Chloride content present in given water sample

Reference:

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

HEALTH AND WELLNESS, YOGA AND SPORTS
(Common to All Branches)

Subject Code: 25BHL103

L	T	P	C
0	0	1	0.5

Course Objective

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

Course Outcomes

After successful completion of this course, the student will be able to:

1. Understand the importance of yoga and sports for physical fitness and sound health.
2. Demonstrate an understanding of health-related fitness components.
3. Compare and contrast various activities that help enhance health.
4. Assess current personal fitness levels.
5. Develop a positive personality.

Unit I: Health and Fitness

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

Activities:

- Organizing health awareness programmes in the community
- Preparation of health profile
- Preparation of balanced diet chart for all age groups

Unit II: Yoga

Concept of yoga, Need and importance of yoga, Origin and history of yoga in Indian context, Classification of yoga, Physiological effects of Asanas, Pranayama and Meditation, Stress management and yoga, Mental health and yoga practice.

Activities:

- Practice of Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

Unit III: Sports and Fitness

Concept of sports and fitness, Importance of fitness and its components, History of sports, Ancient and Modern Olympics, Asian Games, Commonwealth Games.

Activities:

- Participation in one major game and one individual sport (e.g., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-Kho, Table Tennis, Cricket, etc.)
- Practicing general and specific warm-up exercises, Aerobics
- Cardiorespiratory fitness activities: Treadmill, Run test, 9-minute walk, Skipping, Running

Reference Books

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

L	T	P	C
1	0	2	2

Subject Code: 25BHS104

Design Thinking and Sustainable Development

(Common for all branches)

Course Objectives

The course aims to:

- Understand the principles of creativity, innovation, and entrepreneurship in an engineering context.
- Apply the process of design thinking to real-life problems.
- Recognize and evaluate the importance of sustainable development and responsible engineering.
- Explore user pain points and identify real-world problems through empathy and market analysis.
- Apply ideation techniques to validate feasible and viable solutions for the identified problems.

Course Outcomes

Upon completion of this course, students will be able to:

- **CO1:** Describe innovation ecosystems and entrepreneurial processes.
- **CO2:** Analyze the global Sustainable Development Goals (SDGs) and connect them to engineering practices.
- **CO3:** Apply design thinking methodology to identify and solve real-world problems.
- **CO4:** Identify and validate user problem statements through empathy and market analysis.
- **CO5:** Generate ideas and assess their feasibility and viability for prototype development.

Unit I – Introduction to Innovation and Entrepreneurship

Innovation and its types — Incremental, Disruptive, Frugal, Social, Real-world examples of innovation — Indian and global, Introduction to entrepreneurial mindset, Journey of a startup — Idea to Market, Role of engineers in entrepreneurship

Activity: Conduct case studies on selected startups (e.g., Airbnb, Uber, etc.) and perform an in-depth sectoral analysis.

Unit II – Sustainable Development Goals (SDGs)

Introduction to UN Sustainable Development Goals, Link between engineering, sustainability, and society, Circular economy, Green technologies, Lifecycle thinking, Frugal innovation, Resource optimization

Activity: Analyze at least five SDGs, including their objectives, targets, and key performance indicators (KPIs).

Unit III – Design Thinking: A Human-Centred Approach

Introduction to Design Thinking, Practical case studies of Design Thinking, The 5 stages of Design Thinking — Empathize, Define, Ideate, Prototype, Test

Unit IV – Problem Statement Identification and Validation
Empathizing with user pain points, Tools and approaches for empathy mapping, Defining and confirming user problems, Market analysis — Market size, Competitor analysis

Activities:

1. Build empathy maps and create detailed user personas from surveys/interviews.
2. Determine total market size and perform competitor analysis to identify opportunities and gaps.
3. Define problem statements and formulate HMW (How Might We) statements.

Unit V – Ideation to Solve User Problems
Tools and approaches to generate ideas, Feasibility and viability assessment for prototype development

Activity: Apply brainstorming techniques to generate solutions and organize them using mind mapping.

Text Books

1. Eric Ries (2011). *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses.* Crown Business.
2. Anuja Agarwal (2023). *Design Thinking: A Framework for Applying Design Thinking in Problem Solving.* Cengage Learning India.
3. Akhilesh A. Waoo (2024). *Sustainable Development Goals.* Forever Shinings Publication.

References

1. Rob Fitzpatrick (2013). *The Mom Test: How to Talk to Customers and Learn If Your Business is a Good Idea When Everyone is Lying to You.*
2. Tim Brown (2009). *Change by Design: How Design Thinking Creates New Alternatives for Business and Society.*
3. Bill Aulet (2013). *Disciplined Entrepreneurship: 24 Steps to a Successful Startup.* Wiley.
4. Peter Thiel with Blake Masters (2014). *Zero to One: Notes on Startups, or How to Build the Future.* Crown Business.
5. Don Norman (2013). *The Design of Everyday Things: Revised and Expanded Edition.* Basic Books.
6. Lewrick, Michael, Patrick Link & Larry Leifer (2018). *The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems.* Wiley.