

COURSE STRUCTURE AND DETAILED SYLLABUS

B.Tech

in

MECHANICAL ENGINEERING

Academic Regulation – R25

Applicable for the batches admitted from 2025 - 2026



**AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)**

(Approved by A.I.C.T.E., New Delhi & Affiliated to J.N.T.U.H, Hyderabad)

NAAC “A” Accredited Institute

Gunthapally(V), Abdullapurmet(M), R.R(Dist), Near Ramoji film City, Hyderabad, Pin-
501512.

www.aietg.ac.in, principalavih@avanthi.edu.in



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DEPARTMENT OF MECHANICAL ENGINEERING

AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

Vision and Mission of the Institute

VISION

To develop highly skilled professionals with ethics & human values.

MISSION

1. To provide high – quality education along with professional training and exposure to the workplace.
2. To encourage a professional mindset that goes beyond academic achievement.
3. To promote holistic education among Department students by means of integrated pedagogy and scholarly mentoring for excellence in both personal and professional domains.
4. To consistently enhance the teaching and learning procedures in order to prepare students for successful careers in business or overseas or in further education.
5. To carefully prepare students to be globally employable professionals who will meet societal demands and contribute to the nation's technological advancement through their research and innovative talents.

QUALITY POLICY

AIET focuses a strong emphasis on the moral principles of delivering cutting edge skilling by establishing the best infrastructure through interactive & activity-based learning. It also strives for an ambitious & effective governance that is responsive in every aspect, and makes use of the latest developments in knowledge and communication technology to encourage students to adopt a global perspective



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DEPARTMENT OF MECHANICAL ENGINEERING

AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

Regulation: R25

Vision and Mission of the Department

DEPARTMENT VISION

To be globally recognized as a center of excellence in providing mechanical engineering education leading to well qualified engineers with techno managerial skills who are innovative, industry ready, successful in advanced studies & research and cater to the needs of the society.

DEPARTMENT MISSION

To educate, prepare, inspire, and mentor students to excel as professionals and to grow throughout their careers in the art, science and responsibilities of engineering. This is accomplished by:

1. Providing the facilities and environment conducive to a high quality value based education, well grounding the students in the fundamental principles of engineering and preparing them for diverse careers.
2. Providing impetus to industry institute relation, to imbibe social, ethical, managerial and entrepreneurial values in students.
3. Engaging in academic and scholarly activities, which strengthen the Department's regional, national, and international reputation.



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DEPARTMENT OF MECHANICAL ENGINEERING

Proposed Course Structure

Programme: B.Tech – Mechanical Engineering

Regulation - R25

(Applicable from the academic year 2025-2026 to 2027-2028)

Induction Programme

S.No	Course Title	Category	L-T-P-C
1	Physical Activities - Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counseling	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



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DEPARTMENT OF MECHANICAL ENGINEERING

Course Structure

Program – B.Tech Mechanical Engineering Regulation - R25

(Applicable from the academic year 2025-2026 to 2027-2028)

Program: **B. Tech Mechanical Engineering**

Regulation: R25

I Year I Semester - Course Structure

S.No	Category	Course Code	Course Title	Hours per Week			
				Lecture	Tutorial	Practical	Credits
1	BS	R25BS01	Matrices and Calculus	3	1	0	4
2	BS	R25BS02	Engineering Physics	3	0	0	3
3	ES	R25ES01	Problem solving and programming with C	3	0	0	3
4	HS	R25HS01	English for Skill Enhancement	2	0	0	2
5	ES	R25ES11	Engineering Mechanics	3	0	0	3
6	ES	R25ES09	Python Programming	2	0	0	2
7	BS	R25BS03	Engineering Physics Lab	0	0	2	1
8	ES	R25ES03	Problem solving and programming with C Lab	0	0	2	1
9	HS	R25HS02	English Language and Communication Skills Lab	0	0	2	1
10	ES	R25ES19	Python Programming Lab	0	0	2	1
Total				16	1	8	21

Category	Courses	Credits
BS-Basic Science courses	3	8
ES-Engineering Science courses	5	10
HS-Humanities Science and Management courses	2	3
MC-Mandatory courses	-	-
Total	10	21



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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech Mechanical Engineering

Regulation: R25

I Year II Semester- Course Structure

S.No	Category	Course Code	Course Title	Hours per Week			
				Lecture	Tutorial	Practical	Credits
1	BS	R25BS04	Differential Equations and Vector Calculus	3	1	0	3
2	BS	R25BS05	Engineering Chemistry	3	0	0	3
3	ES	R25ES12	Elements of Electrical and Electronics Engineering	3	0	0	3
4	ES	R25ES07	Computer Aided Engineering Drawing	2	0	2	3
5	ES	R25ES13	Material Science and Metallurgy	3	0	0	3
6	BS	R25BS06	Engineering Chemistry Lab	0	0	2	1
7	ES	R25ES14	Material Science and Metallurgy Lab	0	0	2	1
8	ES	R25ES15	Elements of Electrical and Electronics Engineering Lab	0	0	2	1
9	ES	R25HS03	Engineering Work shop &IT Skills Lab	0	0	2	1
10	MC	R25MC01	Employability Skills	0	0	2	1
Total				14	1	12	20

Category	Courses	Credits
BS-Basic Science courses	3	8
ES-Engineering Science courses	6	12
HM-Humanities Science and Management courses	-	-
MC-Mandatory courses	1	-
Total	10	20

**Chairperson
Board of Studies (ME)**

R25BS01**MATRICES AND CALCULUS****3 1 0 4****(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))****Course Objectives:**

1. Types of matrices and their properties. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
2. Concept of Eigen values and Eigen vectors and to reduce the quadratic form to canonical form. And Orthogonal Transformation.
3. Geometrical approach to the mean value theorems and their application to the mathematical problems, Evaluation of surface areas and volumes of revolutions of curves. & Evaluation of improper integrals using Beta and Gamma functions.
4. Partial differentiation, concept of total derivative and Finding maxima and minima of function of two and three variables.
5. Evaluation of multiple integrals and their applications. And change of order of integration.

Course Outcomes:

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

Course Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO2	PO3	
CO1	Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations.	3	3	3	L1,L2,L3
CO2	Find the Eigen values and Eigenvectors. And Reduce the quadratic form to canonical form using orthogonal transformations.	3	2	2	L1,,L3
CO3	Solve the applications on the mean value theorems. Tracing of the curve	3	3	2	L1,L2,L3
CO4	Find the extreme values of functions of two variables with/without constraints.	3	3	2	L3,L4
CO5	Evaluate the multiple integrals and apply the concept to find areas, volumes.	3	2	3	L4,L5

SYLLABUS**UNIT-I: Matrices****12 HOURS**

Rank of a matrix by Echelon form and Normal form, Inverse of Non singular matrices by Gauss Jordan method, System of Linear equations: Solving system of Homogeneous and Non

Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method, LU decomposition method

COs: CO1

Self-learning Topics: Evaluation of Rank of the Matrices

UNIT-II: Eigen values and Eigen vectors

13 HOURS

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

COs: CO2

Self-learning Topics: Finding the Inverse of the Matrices by Using Different Methods

UNIT-III: Single Variable Calculus

14 HOURS

Limit and Continuous of functions and its properties. Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series theorems (without proof).

Curve Tracing: Curve Tracing in Cartesian Coordinates

COs: CO3

Self-learning Topics: Tracing of the Curve and Evaluation of Limit point and continuous point

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

10

HOURS

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.

COs: CO4

Self-learning Topics: Evaluation of maxima and minima by two variables

UNIT-V: Multivariable Calculus (Integration)

12 HOURS

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

COs: CO5

Self-learning Topics: Finding the area by using double and triple integration

Textbooks:

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 Edition, 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, 9th Edition, Pearson, Reprint, 2002.

Web References / eBook Links

1. MIT Open Course Ware – Linear Algebra
2. <https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/>
 - a. Free lecture notes, assignments, and video lectures by Prof. Gilbert Strang.
3. Paul's Online Math Notes – Lamar University <https://tutorial.math.lamar.edu/>
 - a. Covers Calculus I, II, III, Linear Algebra with step-by-step notes and examples.
4. NPTEL Courses (IITs – Video Lectures) <https://nptel.ac.in/courses/111/106/111106100/>
 - a. Engineering Mathematics I: Video lectures on Matrices, Calculus, Multivariable Calculus.
5. K.A. Stroud – Engineering Mathematics (eBook) <https://archive.org/details/EngineeringMathematicsKA.Stroud>
 - a. A widely used textbook covering matrix algebra, calculus, and more (free on Internet Archive).
6. GeeksforGeeks – Engineering Mathematics Tutorials <https://www.geeksforgeeks.org/engineering-mathematics/>
 - a. Concept-wise explanations, coding implementations, and solved problems.

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	30%	10%
L2	30%	20%
L3	30%	30%
L4	10%	20%
L5	--	20%
Total (%)	100%	100%

Sample Short and Long Answers questions of Various Cognitive Levels

L1: Remembering

1. Define rank of a matrix. (*Short*)
2. State Rolle's theorem. (*Short*)
3. Write the formula for Euler's theorem on homogeneous functions. (*Short*)

4. What is a Jacobians? *(Short)*
5. What is the procedure to Trace the Curve *(Short)*

L2: Understanding

1. Explain Gauss elimination method with an example. *(Long)* □
2. Describe the geometrical interpretation of Lagrange's Mean Value Theorem. *(Short)*
3. Explain diagonalization of a matrix using eigenvalues and eigenvectors. *(Long)*
4. Describe the reduction of a quadratic form to canonical form. *(Short)*
5. Explain the method of Lagrange multipliers for finding maxima and minima. *(Long)*

L3: Applying

1. Solve the system of equations using Gauss-Seidel iteration method. *(Long)*
2. Find the eigenvalues and eigenvectors of a 3x3 symmetric matrix. *(Long)*
3. Apply Taylor's series to approximate $f(x)=1+x$ near $x = 0$. *(Short)*

L4: Analyzing

1. Compare LU decomposition with Gauss elimination in solving linear equations. *(Short)*
2. Analyze the nature of a quadratic form and classify it using eigenvalues. *(Long)*
3. Given a function $f(x,y)$, determine whether it has maximum or minimum using second-order partial derivatives. *(Short)*
4. Analyze the effect of changing the order of integration in a given double integral. *(Long)*
5. Discuss the implications of continuity and differentiability in multivariable functions. *(Short)*

L5: Evaluating

1. Justify why diagonalization is essential in solving systems of differential equations. *(Short)*
2. Critically evaluate the limitations of mean value theorems in non-differentiable functions. *(Long)*
3. Assess the accuracy of approximating functions using Taylor series versus actual function values. *(Long)*
4. Examine the usefulness of Jacobians in transformation of coordinates. *(Short)*
5. Evaluate the efficiency of using spherical coordinates in evaluating triple integrals over a sphere. *(Long)*

Course Objectives:

1. Drawing indispensable connection between arrangement of atoms and molecules in crystal formation.
2. Understanding the basic principles in quantum mechanics and wave motion.
3. Appreciating the diverse mechanism, Qubit system and algorithms in quantum computing.
4. Understanding the fundamental concepts and applications of Magnetic and Dielectric materials in Engineering Physics.
5. Analyzing the characteristics, properties and applications of different types of LASERS & Optical Fibers.

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

Course Code	Course Outcomes	Mapping with Pos			Dok
		PO1	PO2	PO12	
CO.1	Analyze crystal structures, identify defects, and apply XRD techniques for material characterization.	3	2	1	L1 ,L2
CO.2	Apply quantum mechanical principles to explain particle behaviour and energy band formation in solids.	3	2	3	L2, L3
CO.3	Understand quantum computing concepts, use quantum gates, and explain basic quantum algorithms.	3	2	2	L2, L3
CO.4	Classify magnetic and dielectric materials and explain their properties, synthesis, and applications.	3	2	2	L1, L4
CO.5	Explain the principles of lasers and fiber optics and their applications in communication and sensing.	3	2	1	L2, L5

SYLLABUS**UNIT – I: Crystallography & Material Characterization****(11 Hours)**

Introduction, Basic terms of crystallography, Crystal lattice, Lattice parameters, Bravais lattices, Crystal structures, Miller Indices, Inter-planar distances, APF (atomic packing factor- SC, BCC & FCC), Crystal defects (point, line, surface and volume), concept of nano-materials, Synthesis of nano material by using ball milling, characterization techniques (XRD), Bragg's Law.

CO's-CO1**Unit – II: Quantum Mechanics****(12 Hours)**

Introduction, Black body radiation, Photoelectric effect, Hypotheses and principle of de-Broglie and Heisenberg, Physical significance of wave function, Postulates of Quantum mechanics, operators in Quantum mechanics, Eigen value and Eigen functions, Expectation value, Derivation of Schrodinger's wave

equation (time independent), Particle in potential well (1D), Classification of solids based on energy gap, Quantum confinement of nanomaterials. **CO's-CO2**

UNIT –III: Quantum Computing

(14 Hours)

Introduction, Linear Algebra for quantum computation, Direc Bra-Ket notation and properties, Hilbert space & Bloch sphere, Concept of Quantum Computers, Difference between Classical & Quantum Bits, multiple qubits, Quantum computing system for information processing, Evolution of Quantum systems. **CO's-CO3**

UNIT- IV: Magnetic & Dielectric Materials

(12 Hours)

Introduction to magnetic materials, origin of magnetic moment, classification of magnetic materials, Hysteresis, soft and hard magnetic materials, Synthesis of ferrimagnetic material using sol-gel method, applications of magnetic hyperthermia in Medical and Industrial fields.

Introduction to dielectric materials, Types of polarization (electronic, ionic and orientation), Types of dielectric materials (Ferro, Piezo and Pyro), Applications of Dielectric materials in Electronics & Computer Sciences. **CO's-CO4**

UNIT – V: Laser & Fiber Optics

(13 Hours)

Introduction to LASER, Characteristics of LASER, Relationship between Einstein Coefficients, Meta-stable state, Population inversion, Pumping and Lasing action in LASER, Types of Lasers (Ruby, He-Ne), Medical and Industrial applications of LASERs.

Introduction to fiber optics, Construction and Working principle of Optical Fibers, Derivations (θ_A , NA) Types of Optical fibers, Losses in optical fibers, Applications of optical fibres in Communication systems & Health monitoring systems. **CO's-CO5**

Board of Studies : Department of Physics

Approved in BOS No: 01, 12th Sep, 2025.

Approved in ACM No: 01, 26th Sep, 2025.

Textbooks:

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
4. M. N. Avadhanulu, P. G. Kshirsagar & TVS Arun Murthy: A Text book of Engineering Physics, S. Chand Publications, 11th Edition, 2019
5. Engineering Physics by Shatendra Sharma & Jyotsna Sharma, Pearson Publications, 2019

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.

Web References:

1. <https://nptel.ac.in/courses/115/106/115106119/> – Solid State Physics
2. <https://nptel.ac.in/courses/115/106/115106086/> – Quantum Mechanics
3. <https://qiskit.org/textbook/> – Quantum Computing
4. <https://www.fiberoptics4sale.com/blogs/archive-posts> – Fibre Optics
5. <https://www.rp-photonics.com/encyclopedia.html> – Lasers and Photonics

E-Books:

1. Crystallography: An Introduction – Walter Borchardt-Ott
2. Introduction to Solid State Physics – Charles Kittel
3. Introduction to Classical and Quantum Computing – Thomas G. Wong
4. Quantum Computation and Quantum Information – Michael A. Nielsen & Isaac L. Chuang
5. Optical Fiber Communications: Principles and Practice – John M. Senior

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	40	20
L2	30	30
L3	30	--
L4	--	30
L5	--	20
Total (%)	100	100

Sample Short and Long Answers questions of Various Cognitive Levels

Remember

1. Define Miller indices.
2. State Bragg's law.
3. Write Schrödinger's time-independent wave equation.
4. List types of magnetic materials.
5. Define population inversion.

L2 – Understand

1. Explain the significance of the de-Broglie wavelength.
2. Describe the concept of quantum confinement.
3. Explain the construction and working principle of a Ruby laser.
4. Differentiate between ferroelectric and piezoelectric materials.
5. Explain the concept of numerical aperture in optical fibers.

L3 – Apply

1. Calculate the inter-planar distance for given Miller indices and lattice constants.
2. Determine energy levels for a particle in a 1D box of given length.

3. Calculate the d spacing for the given values of n , λ and θ using Bragg's law.
4. Compute the acceptance angle for an optical fiber for the given refractive indices.
5. Solve a problem involving magnetization using Weiss theory.

L4 – Analyze

1. Compare the applications of SEM and XRD in material characterization.
2. Analyze differences between classical and quantum computing in terms of speed and complexity.
3. Evaluate the performance of different magnetic materials for electric vehicle motors.
4. Analyze loss mechanisms in optical fibers.
5. Compare various laser types for industrial cutting applications.

L5 – Evaluate/Create

1. Design a basic quantum circuit for a 2-qubit entanglement experiment.
2. Propose a novel application of piezoelectric materials in IoT devices.
3. Develop a new method for reducing fiber optic losses in long-distance communication.
4. Formulate a magnetic material synthesis method for a specific biomedical application.
5. Create a computational model to simulate the effect of lattice defects on XRD patterns.

**Chairperson
Board of studies (Physics)**

R25ES01 PROBLEM SOLVING AND PROGRAMMING WITH C 3 0 0 3

(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))

Course Objectives:

1. To impart adequate knowledge on the need of programming languages and problem-solving techniques and develop programming skills.
2. To express algorithms and draw flowcharts in a language independent manner.
3. To enable effective usage of Operators & Control Structures.
4. To learn about the design concept of Arrays, Strings and Functions.
5. To understand Structures and Unions and their usage.
6. To assimilate about Pointers, Dynamic Memory Allocation and know the significance of Pre-processors, perform operations on files.

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

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
CO1	Illustrate the fundamental concepts of computers and basic computer programming and problem-solving approach.	3	3	2	3	2	L1, L2
CO2	Understand the Control structures, Branching and Looping.	3	3	3	3	2	L1, L2 L3
CO3	Make use of Arrays and Develop Programs on modular programming using functions and strings.	3	3	3	2	3	L1, L2, L3
CO4	Demonstrate the ability to write programs using Structures and Unions.	3	3	3	3	2	L4
CO5	Apply File handling operations.	3	3	3	3	3	L4, L5

SYLLABUS

UNIT-I:

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development, algorithms(Ex: Biggest of three numbers, Quadratic root Equations) flowcharts and Pseudo code.

Introduction to C Language – Structure of C Programs, Identifiers, Data Types, Tokens, Keywords, Variables, Scope, Life time variable, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements-Condition Statements (Decision Making) – if and switch statements, Control statements (loops)-while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Command Line Arguments.

COs-CO1

Self-Learning Topics: Compilation and Interpretation.

UNIT- II:

Arrays: Concepts, Declaration, Initialization of an array, Types of an array, Array applications (Linear Search, Binary search and Bubble sort).

Functions: Designing Structured Programs, Functions, user defined functions, types of functions, inter function communication, Parameter Passing Technics, passing an array to a function, type qualifiers, recursive functions, Limitations of recursion, Storage classes-auto, register, static, extern, scope rules.

COs-CO2

Self-Learning Topics: Function Passing Technics

UNIT – III:

15 Hours

Pointers – Introduction (Basic Concepts), Pointers, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, dynamic memory allocation functions (malloc(), calloc(), realloc(), and free()) , array of pointers, pointer applications, pointers to void, pointers to functions.

Strings – Concepts, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion.

COs–CO3

Self-Learning Topics: String Pattern Matching

UNIT- IV:

10 Hours

Structures: Declaration, initialization, accessing structures, operations on structures, Complex structures-Nested structures, structures containing arrays, structures containing pointers, arrays of structures, structures and functions, passing structures through pointers, self-referential structures.

Unions: Declaration, initialization, accessing union.

COs–CO4

Self-Learning Topics: How do you pass a structure to a function?

UNIT-V:

10 Hours

File I/O: Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file modes, file input / output functions (standard library input / output functions for files), Positioning functions (fseek ,rewind and ftell), Enumerated data type, Type def and bit fields, Preprocessor commands.

COs-CO5

Self-Learning Topics: Binary Files and operations on Binary files

Board of Studies: Computer Science and Engineering.

Approved in BOS No: 01, 12-09-2025

Approved in ACM No: 01, 26-09-2025

TEXT BOOKS:

1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C. P. Dey and M Ghosh , Second Edition, Oxford University Press.
3. Kanetkar Y, “Let us C”, BPB Publications, 2007.
4. Hanly J R & Koffman E.B, “Problem Solving and Program design in C”, Pearson

Education, 2009.

REFERENCE BOOKS:

1. The C Programming Language, B.W. Kernighan and Dennis M. Ritchie, Second Edition, Pearson education.
2. Programming with C, B. Gottfried, 3rd edition, Schaum's outlines, McGraw Hill Education (India) Pvt Ltd.
3. E. Balaguruswamy, "Programming with ANSI-C", Fourth Edition, 2008, Tata McGraw Hill.
4. Let us 'C', By Yashavanth Kantkar, bpb Publication.
5. Venugopal K. R and Prasad S. R, "Mastering 'C'", Third Edition, 2008, Tata McGraw Hill.

Web References:

1. <http://www.c4learn.com/>
2. <http://www.geeksforgeeks.org/c/>
3. <http://nptel.ac.in/courses/122104019/>
4. <http://www.learn-c.org/>
5. <https://www.tutorialspoint.com/c-programming/>

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	35	--
L2	40	--
L3	25	40
L4	--	35
L5	--	25
Total (%)	100	100

Sample Short and Long Answers questions of various Cognitive Levels

L1: Remember

1. What are the five key features of the C programming language?
2. What are the top 5 applications of C programming language?
3. What do you mean by reserved words in C programming language?
4. What do you mean by library functions?
5. List the name of the tokens.
6. What is static() function in C programming?
7. What is the difference between operators = and ==?
8. What are 3 main drawbacks of C language?
9. What is the difference between R-value and L-value?
10. How does const char*p differ from the char const* p

L2: Understand

1. What is the importance of function?
2. Explain the function prototype with an example.

3. What do you mean by error? Discuss types of errors() in C language.
4. What do you mean by function pointer?
5. What is a header file in the C programming language?
6. How can you implement decision-making processes in C language?
7. What are the 4 primary sections to define a function in C language?
8. What are modifiers? List the C programming modifiers?
9. What is an array, and why does it play a major role in C programming?
10. Is size of() a function or operator?

L3: Apply

1. Program to find Factorial of number?
2. Fibonacci Series Program?
3. Palindrome Program?
4. Program to reverse a String?
5. Find a given number is Armstrong Number?
6. Print first n Prime Numbers?
7. Find Largest among n Numbers?
8. LCM of Two Numbers?
9. GCD of Two Numbers?
10. Reverse a String?

L4: Analysing

1. Swapping Two Numbers using Bitwise operators?
2. Copy File to another File?
3. C program to get and set system current system date and time?
4. C program to run DOS command?

L5: Evaluating

1. C program to find two smallest elements in a one-dimensional array?
2. C program to find odd or even numbers using Bit masking?
3. Swapping two bits of byte using C program?

**Chairperson
Board of Studies (CSE)**

R25HS01**ENGLISH FOR SKILL ENHANCEMENT****2 0 0 2****(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))****Learning Objectives**

This course will enable students to:

1. Improve vocabulary and use it effectively in oral and written communication.
2. Apply correct grammar and sentence structures in various communication contexts.
3. Develop reading comprehension skills through known and unknown passages.
4. Write coherent and structured paragraphs, essays, précis, and formal letters.
5. Acquire skills for writing abstracts, technical reports, and professional documents.

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

CO Code	Course Outcomes	Mapping with POs			Pos
		PO9	PO10	PO11	
R25HS01.1	Use an enhanced vocabulary with accuracy in spoken and written English.	1	3	2	L1,L2
R25HS01.2	Apply rules of functional grammar and sentence structures to avoid common errors.	2	3	1	L2,L3
R25HS01.3	Demonstrate effective reading strategies for comprehension and critical understanding.	2	3	1	L2,L3
R25HS01.4	Write structured paragraphs, essays, précis, and formal letters in appropriate formats.	2	3	1	L2,L3,L4
R25HS01.5	Prepare professional abstracts and reports following formal writing conventions.	1	2	3	L2,L3,L4

Board of Studies: Department of English

Approved in BOS No:01

Approved in ACM No:01

SYLLABUS**UNIT –I : Theme-Perspectives****12hours****Lesson: ‘The Generation Gap’ by Benjamin M. Spock****Vocabulary:** The Concept of Word Formation -The Use of Prefixes and Suffixes – Words Often Mis spelt - 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.**Co’s-CO1****UNIT-II Theme-Digital Transformation****10hours****Lesson: ‘Emerging Technologies’****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 Feature so fa 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.**Co’s-CO2**

UNIT-III Theme-Attitude and Gratitude 12hours

Poem: Leisure’ by William Henry Davies and ‘Be Thankful’ by Unknown author

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.

Co’s-CO3

UNIT-IV Theme-Entrepreneurship 10hours

Lesson: Why a Start-Up Needs to Find its Customers First by Pranav Jain

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.**Co’s-CO4**

UNIT-V Theme-Integrity and Professionalism 10hours

Lesson: Professional Ethics

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.**Co’s-CO5**

TEXTBOOK:

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

REFERENCEBOOKS:

1. Swan, Michael.(2016).Practical English Usage. Oxford University Press.NewEdition.
2. Karal, Rajeevan. 2023. English Grammar Just for You.Oxford University Press. New Delhi
3. 2024. Empowering with Language: Communicative English for Undergraduates .Cengage Learning India Pvt. Ltd. New Delhi
4. SanjayKumar&PushpLata.2022.CommunicationSkills–AWorkbook.Oxford University Press. New Delhi
5. Wood, F.T.(2007).Remedial English Grammar .Macmillan.
6. Vishwamohan, Aysha.(2013).EnglishforTechnicalCommunicationforEngineering Students. McGraw-Hill Education India Pvt. Ltd

- **Web References:**

1. <https://www.grammarly.com/blog/-Grammartips>.
2. <https://owl.purdue.edu/-Academic> writing resources.
3. <https://www.oxfordlearnersdictionaries.com/-Vocabulary> and pronunciation.
4. <https://www.britishcouncil.org/english-English> learning resources.
5. <https://writingcenter.unc.edu/-Writingandeditingstrategies>.

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	40	20
L2	30	30
L3	30	--
L4	--	30
L5	--	20
Total (%)	100	100

Sample Short and Long Answers questions of Various Cognitive Levels**L1 – Recall (Short Answer Type)**

1. Define a Phrase and clause? **(SA)**
2. List the examples for Prefix and Suffix?**(SA)**
3. State the Kinds of Clauses?**(SA)**
4. Name any two examples for Imperative Sentence?**(SA)**
5. Write the Antonym for Convict?**(SA)**

L2 – Understand

1. Explain the different processes of Word Formation ?**(LA)**
2. Describe the Reading Strategies and Its importance ?**(LA)**
3. Explain the Techniques for Writing Precisely ?**(LA)**
4. Discuss the Commonly mis spelt words?**(SA)**
5. Explain Skimming and Scanning ?**(SA)**

L3 – Apply

1. Explain the Homonyms, Homographs and Homophones ?**(LA)**
2. Write a paragraph on the topic “Cloud Computing” ?**(LA)**
3. Determine a report on ‘Meri Mati Mera Desh’ campaign announced by PM Narendra Modi?**(LA)**
4. Write your opinion on the accommodation of Indian words into the English? Do you think it is a welcome sign? Explain your answer?**(SA)**

5. 'Make hay while the sunshines.' Explain this proverb using a real-life example?(**LA**)

L4 – Analyze

1. Describe your College Day Celebrations in about 200 words?(**LA**)
2. Analyse the metaphor of "Toasting" and its implications for the language?(**LA**)
3. Compare the experience of your college with school in about 200 words(**LA**)
4. Analyze on the topic Artificial Intelligence. (**SA**)
5. Examine the role of Communication Skills in Corporate Company ?(**SA**)

L5 – Create

1. Design the main characteristics of good paragraph? Write a paragraph on your own incorporating these essential features of a paragraph?(**LA**)
2. Develop a technical report on the feasibility of an anti-ragging cell in your college.?(**LA**)
3. Propose the importance of creating Coherence when writing a paragraph? Explain your answer using an example paragraph of your own(**LA**)
4. Formulate the Steps to Write a Formal Letter ?(**LA**)
5. Design a Resume for Assistant Manager in a Well reputed Company with requisite qualifications and Experience ?(**LA**)

Chairperson
Board of studies (English)

R25ES11

ENGINEERING MECHANICS
(Mechanical Engineering)

3 0 0 3

Course Objectives:

1. Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
2. Perform analysis of bodies lying on rough surfaces.
3. Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
4. Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
5. Explain the concepts of work energy method and its applications to translation, rotation and plane motion and solve problems of vibration.

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

Course Code	Course Outcome Statement	Mapping with POs and PSOs					DoK
		PO 1	PO2	PO3	PSO1	PSO2	
R25ES11.1	Determine resultant of forces acting on a body and analyze equilibrium of a body subjected to a system of forces.	3	3	2	3	2	L1, L2
R25ES11.2	Solve problem of bodies subjected to friction.	3	3	3	3	2	L2, L3
R25ES11.3	Find the location of centroid and calculate moment of inertia of a given section.	3	3	3	3	3	L3
R25ES11.4	Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.	3	3	3	3	3	L3, L4
R25ES11.5	Solve problems using work energy equations for translation, fixed axis rotation and plane motion and solve problems of vibration.	3	3	3	3	3	L4, L5

SYLLABUS

UNIT - I: Introduction to Engineering Mechanics **14 Hours**

Force Systems: Basic concepts, Rigid Body equilibrium, System of Forces, Parallelogram law, Coplanar Concurrent Forces, Components of forces in Space, Resultant, Moment of Forces and its Application. Couples and Resultant of Force System: Equilibrium of Force Systems, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

CO's-CO1

UNIT - II: Friction and Centre of Gravity **16 Hours**

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction. Motion of Bodies, Wedge friction, Screw jack and Differential Screw jack.

CO's-CO2

Centroid and Centre of Gravity: Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections, Centre of Gravity and its implications, Theorem of Pappus.

UNIT - III: Moment of Inertia **15 Hours**

Definition, Area Moment of Inertia, Moment of inertia of Plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections. Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem. **CO's-CO3** Mass Moment of Inertia: Moment of Inertia of Masses, Radius of Gyration, Transfer Formula for Mass Moments of Inertia, Mass moment of inertia of composite bodies.

UNIT - IV: Dynamics of a Particle **14 Hours**

Rectilinear motion, Plane curvilinear motion: Rectangular and Polar coordinates. Relative and constrained motion, Newton's law of motion for a particle (rectangular, path, and polar coordinates). Work -kinetic energy, power, potential energy. Impulse and momentum: Linear, Angular, Elastic Impact (Direct and oblique).

CO's-CO4

UNIT - V: Kinetics of Rigid Bodies **16 Hours**

Introduction, Types of motion, Instantaneous centre of rotation in plane motion and simple problems, D' Alembert's principle and its applications in plane motion and connected bodies. Work-Energy Method: Work-Energy principle and its application in plane motion of connected bodies or Systems, Work energy Applied to particle motion, Kinetics of rigid body rotation.

CO's-CO5

Board of Studies: Mechanical Engineering

Approved in BoS No: 01 12th August 2025

Approved in ACM No: 01

TEXT BOOKS:

1. Singer's Engineering Mechanics – Statics and Dynamics, Reddy Vijay Kumar K. and J. Suresh Kumar. B.S Publications, 3rd Edition, Rpt. 2024.
2. Engineering Mechanics, Shames and Rao, Pearson Education, 1st Edition, 2005.

REFERENCE BOOKS:

1. Vector Mechanics for Engineers – Statics and Dynamics, Beer F.P and Johnston E.R Jr., Mc Graw Hill, 12th Edition, 2019.
2. Engineering Mechanics, Dumir P.C, Sengupta and Srinivas, Universities Press, 1st Edition, 2020.
3. Engineering Mechanics, Hibbeler R.C, Pearson, 14th Edition, 2017.
4. Engineering Mechanics, Arshad Noor, Zahid and Goel, Cambridge University Press, 1st Edition, 2018.
5. Engineering Mechanics, Basudeb Bhattacharyya, Oxford University Press, 2nd Edition, 2014.

Web References

1. <https://nptel.ac.in/courses/112103109>
2. <https://www.engineeringtoolbox.com/>
3. <https://mechanicalc.com/>
4. <https://ocw.mit.edu/courses/mechanical-engineering/>

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	10%	5%
L2	20%	15%
L3	35%	35%
L4	25%	30%
L5	10%	15%
Total (%)	100%	100%

Sample Questions

L1 – Remember

1. State the laws of friction.
2. Define centroid and centre of gravity.
3. What is D'Alembert's principle?
4. List the types of rigid body motion.

L2 – Understand

1. Explain the parallel axis theorem with an example.
2. Describe the Theorem of Pappus and its applications.
3. Differentiate between static and dynamic friction.
4. Explain polar coordinate representation in curvilinear motion.

L3 – Apply

1. Find the centroid of a composite L-section.
2. Determine the mass moment of inertia of a flywheel.
3. Calculate the power required to lift a load using a screw jack.
4. Solve for impulse and momentum in a direct impact problem.

L4 – Analyze

1. Compare oblique and direct impacts with numerical examples.
2. Analyze the motion of a rigid body with an instantaneous centre of rotation.
3. Examine the effect of friction on wedge operation efficiency.
4. Analyze plane motion using D'Alembert's principle.

L5 – Evaluate/Create

1. Design a screw jack to lift a 2-ton load with minimum effort.
2. Propose a method to reduce energy losses in lifting mechanisms.
3. Create a composite section with maximum strength-to-weight ratio.
4. Develop a work-energy solution for a complex rigid body motion.

**Chairperson
Board of Studies (ME)**

R25ES09

PYTHON PROGRAMMING

2 0 0 2

(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))

Prerequisites: Requires analytical skills and logical reasoning.**Course Objectives:**

1. Learn Syntax and Semantics and create Functions in Python.
2. Handle Strings and Files in Python.
3. Understand Lists, Dictionaries and Regular expressions in Python.
4. Implement Object Oriented Programming concepts in Python.
5. Build Web Services and introduction to Network and Database Programming in Python.

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

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
CO1	Examine Python syntax and semantics and be fluent in the use of Python flow control and functions	3	3	3	3	3	L1, L2
CO2	Demonstrate proficiency in handling Strings and File Systems.	3	3	2	2	3	L1, L2 L3
CO3	Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions	3	3	3	2	3	L1, L2, L3
CO4	Interpret the concepts of Object-Oriented Programming as used in Python.	3	3	3	3	2	L4
CO5	Implement exemplary applications related to Network Programming, Web Services and Databases in Python	3	3	3	3	3	L4, L5

SYLLABUS**UNIT-I:****10 Hours**

Introduction to python programming: Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types

Control Structures: - Selection Statements: if statement, if-else statement, if-elif-else statement, nested-if statement.

Iterative Statements: while loop, for loop, break statement, continue statement, pass and else statements used with loops

COs-CO1

Self-Learning Topics: Standard Types and

UNIT- II:

Strings: Creation, Indexing, Slicing, Methods, String Formatting, **Lists:** Creation, Indexing, Slicing, List Comprehension, Methods, **Tuples:** Properties, Indexing, Methods, **Sets:** Creation, Operations, Methods, **Dictionaries:** Creation, Access, Methods, Dictionary Comprehension, Iterating over data structures.

Cos-CO2

Self-Learning Topics: Dictionaries methods

UNIT- III:

10 Hours

Functions: Need for functions, Function definition, Function call, Variable scope and lifetime, Return statement, Positional arguments, Keyword arguments, Default arguments and variable length arguments, Recursive functions, Lambda functions, Generators

File: File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules.

COs–CO3

Self-Learning Topics: Functions Arguments

UNIT – IV:

12 Hours

Exceptions in Python: Errors in Python Program: Compile-Time Errors, Runtime Errors, Logical Errors, Exception Handling, Types of Exceptions, and Keywords in Exception handling.

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules.

COs–CO4

Self-Learning Topics: Multithreading

UNIT- V:

10 Hours

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs.

Web Programming: Introduction, Web Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application, Advanced CGI, Web (HTTP) Servers.

COs-CO5

Self-Learning Topics: To learn the Tkinter and CGI

Board of Studies: Computer Science and Engineering.

Approved in BOS No: 01, 12-09-2025

Approved in ACM No: 01, 26-09-2025

TEXT BOOK:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
2. Python Programming: Using Problem Solving Approach by Reema Thareja, Oxford Higher Education

REFERENCE BOOKS:

1. Think Python, Allen Downey, Green Tea Press
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
5. Learning Python, Mark Lutz, O'Really

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs41/preview
2. <https://www.coursera.org/specializations/python>
3. <https://www.coursera.org/learn/python-for-applied-data-science-ai>

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	40	--
L2	40	--
L3	20	25
L4	--	35
L5	--	40
Total (%)	100	100

Sample Short and Long Answers questions of various Cognitive Levels**L1: Remember**

1. What is Python?
2. Mention any two unique features of Python.
3. Who developed Python and when was it released?
4. List two differences between Python 2 and Python 3.
5. What are keywords in Python? Give examples.
6. Define variables and literals in Python.
7. What are identifiers? State any two rules for naming them.
8. Write the syntax to take input from the user in Python.
9. What is the role of indentation in Python?
10. Explain the history and evolution of Python programming language.
11. Describe the major differences between Python 2 and Python 3.
12. Write a Python program to print "Hello, World!" and explain each line of code.
13. Explain Python tokens with examples.
14. What are fundamental data types in Python? Explain each with an example.
15. Discuss input and output handling in Python with suitable examples.
16. Describe the different types of number data types in Python.
17. Explain control flow statements in Python with examples (if, if-else, if-elif-else, nested if).
18. Explain for and while loops in Python. Write a program using each.
19. Differentiate between break, continue, and pass statements with examples.
20. What are identifiers? Explain the rules and conventions for naming them in Python.
21. Discuss the significance of indentation in Python. Why is it important?
22. Write a Python program to find the sum of all even numbers from 1 to 100 using a loop.

L2: Understand

1. Explain list operations: creation, insertion, updating, deletion, searching, and sorting with examples.
2. Write a Python program to demonstrate nested lists and access nested elements.
3. What is list comprehension? Write a program to filter even numbers from a list.
4. Compare lists and tuples in terms of mutability and performance.
5. Write a Python program to create and access elements in a nested tuple.
6. Write a program to sort elements in a tuple.
7. Explain string initialization, slicing, and concatenation with examples.
8. Describe various string handling methods (like upper(), lower(), replace(), split(), etc.)
9. Write a program to format a sentence using f-strings and .format() method.
10. Explain set creation and operations (union, intersection, difference, symmetric difference) with code.
11. Write a Python program to remove duplicates from a list using sets.
12. Describe CRUD operations on dictionaries with examples.
13. What are dictionary methods? Demonstrate get(), items(), update(), and pop() with code.
14. Write a program to sort a dictionary by its keys and values using lambda.
15. What are regular expressions? Explain sequence characters, quantifiers, and special characters with examples.

L3: Apply

1. Describe the concept of variable scope and lifetime in Python with suitable examples.
2. Define a function in Python.
3. What is the need for functions in programming?
4. Write a recursive function to compute the factorial of a number.
5. Discuss lambda functions and provide examples demonstrating their use.
6. Explain generators in Python and write a generator function using yield to produce even numbers up to a limit.
7. Write a function that takes a list and returns the sum of even numbers using filter() and lambda.
8. What does the return statement do in a function?
9. Describe the process of opening, reading, writing, and closing files in Python with code snippets
10. Write a program to read a text file and count the number of lines, words, and characters
11. Demonstrate how to write a list of strings to a file and then read and display the contents
12. Differentiate between text files and binary files in Python, with examples.
13. What are the different modes to open a file in Python?
14. Write the syntax to open and close a file.
15. How do read(), read line(), and read lines() differ?
16. What is the use of the with statement for file operations?
17. How do you write data to a file in Python

L4: Analysing

1. Explain the main concepts of OOP with examples: Class, Object, Inheritance, Polymorphism, Encapsulation, and Abstraction.
2. Compare and contrast structured programming and object-oriented programming.
3. Write a Python program to define a class with data members and methods, then create an object to access them.

4. Explain inheritance with an example program showing single and multiple inheritances.
5. How does polymorphism work in Python? Give a practical example.
6. Describe the different types of errors that can occur in a Python program.
7. Explain the syntax and flow of exception handling in Python with try, except, else, and finally blocks.
8. Write a program that handles multiple exceptions using Python's exception handling mechanism.
9. What is the role of the raise keyword? Write an example.
10. Write a Python program that demonstrates the use of custom exceptions.

L5: Evaluating

1. What is the difference between a process and a thread?
2. Explain the concept of the Global Interpreter Lock (GIL) in Python.
3. What are the `thread` and `threading` modules in Python?
4. How do threads improve program performance?
5. Name some related modules used in Python for threading.
6. Mention some other GUI frameworks available for Python besides Tkinter.
7. What are the basic steps to create a simple GUI window using Tkinter?
8. Name any two widgets commonly used in Tkinter.
9. What is the role of the event loop in GUI programming?
10. Explain threads and processes with examples. How does multithreading differ from multiprocessing?
11. What is the Global Interpreter Lock (GIL)? How does it affect multithreading in Python?
12. Write a Python program using the `threading` module to create and run multiple threads.
13. Discuss synchronization issues in multithreaded programs and how Python handles them.
14. Describe the Tkinter module and explain how to create a basic window application using it.
15. Write a Python program using Tkinter to create a GUI with a button that displays a message when clicked.
16. What are the roles of widgets and geometry managers in Tkinter? Explain with examples.

Chairperson
Board of Studies (CSE)

R25BS03

ENGINEERING PHYSICS LAB

0 0 2 1

(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))

Course Objectives:

1. To provide practical exposure to advanced concepts in solid-state, modern physics, and material science.
2. To synthesize nonmaterial's and study their physical, electrical, magnetic, and optical properties.
3. To perform semiconductor characterization using Hall Effect, band gap, and related techniques.
4. To explore and experimentally verify principles of lasers, optical fibers, and the photoelectric effect.
5. To develop skills in experimental data analysis, application of least squares method, and technical reporting.

Course Outcomes

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

Course Code	Course Outcomes	Mapping with POs and PSOs											DoK
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	
R25BS03.1	To Determine the value of Planck's constant, Energy gap, Hall co-efficient experimentally and to Synthesize magnetite using sol-gel method.	3	2	2	1	3	1	1	1	2	1		L1, L2
R25BS03.2	Practical Study of the B-H curve and P-E loop & determination of magnetic moment, dielectric constant.	3	3	2	2	3	1	1	1	2	1		L2, L3
R25BS03.3	To observe Curie temperature, calculate least squares of a torsional pendulum, study the wave length and V-I, L-I characteristics of a laser, bending losses, NA of an optical fiber practically.	2	2	3	2	3	1	1	2	2	2		L3

Board of Studies: Department of Physics

Approved in BOS No: 01, -- August, 2025

Approved in ACM No: 01

- | | |
|--|----------|
| 1. Determination of work function and Planck's constant using photoelectric effect. | CO's-CO1 |
| 2. Synthesis of magnetite (Fe ₃ O ₄) powder using sol-gel method. | CO's-CO1 |
| 3. Determination of energy gap of a semiconductor. | CO's-CO1 |

AIET | R25BS03 | PHYSICS | ENGINEERING PHYSICS LAB

4. Determination of Hall coefficient and carrier concentration of a given semiconductor. CO's-CO1
5. Determination of magnetic moment of a bar magnet and horizontal earth magnetic field. CO's-CO2
6. Study of B-H curve of a Ferro magnetic material. CO's-CO2
7. Study of P-E loop of a given ferroelectric crystal. CO's-CO2
8. Determination of dielectric constant of a given material. CO's-CO2
9. Determination of Curie's temperature of a given ferroelectric material. CO's-CO3
10. A) Determination of wavelength of a laser using diffraction grating. CO's-CO3
B) Study of V-I & L-I characteristics of a given laser diode.
11. A) Determination of numerical aperture of a given optical fiber. CO's-CO3
B) Determination of bending losses of a given optical fiber.
12. Understanding the method of least squares - torsional pendulum as an example. CO's-CO3

Reference Books:

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

Online Learning Resources:

1. Engineering Physics Practical by S.P. Singh & Manisha
2. Practical Physics by G.L. Squires
3. Engineering Physics by M.N. Avadhanulu & P.G. Kshirsagar
4. Applied Physics for Engineers by Neeraj Mehta
5. Optoelectronics and Photonics by S.O. Kasap

Sample Questions (L1–L5)

L1 – Recall (SA)

1. Define Hall coefficient and verify experimentally.
2. Find the Curie's temperature of a given ferromagnetic material.
3. Write the Aim, apparatus, procedure to find the dielectric constant of a given material.
4. List the losses in an optical fiber and prove experimentally.
5. Find the numerical aperture of a given optical fiber and write the procedure and result.

L2 – Understand (SA/LA)

1. Synthesize magnetite using sol-gel method. (LA)
2. Describe the principle of energy gap measurement in semiconductors. (SA)
3. Explain the working of a laser diode and its applications. (LA)
4. Discuss the effect of bending losses and prove experimentally. (LA)
5. Explain the B-H curve for ferromagnetic materials. (SA)

L3 – Apply (LA)

1. Determine the magnetic moment of a given bar magnet using the vibration magnetometer.
2. Calculate the Hall voltage for a given semiconductor sample.
3. Measure the wavelength of a laser using diffraction grating.
4. Determine the dielectric constant of a given material experimentally.
5. Find the numerical aperture of a given optical fiber.

L4 – Analyze (LA/SA/VIVA)

1. Compare the magnetic properties of ferromagnetic and paramagnetic materials.
2. Analyze the effect of temperature on the energy gap of semiconductors.
3. Interpret the P-E loop for a given ferroelectric material.
4. Compare core and cladding refractive indices in optical fibers.
5. Analyze the shape of a B-H curve for different materials.

L5 – Create (LA)

1. Design an experimental setup to measure fiber attenuation under various bending radii.
2. Propose a method to synthesize nano-particles with controlled size and shape.
3. Develop a procedure for simultaneous measurement of multiple semiconductor properties.
4. Create a laser experiment to measure both wavelength and beam divergence.
5. Propose a method to measure dielectric constant at different frequencies.

**Chairperson
Board of Studies (Physics)**

R25ES03 PROBLEM SOLVING AND PROGRAMMING WITH C LAB 0 0 2 1
(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))

Course Objectives: To work with an IDE to create, edit, compile, run and debug programs

1. To analyze the various steps in program development.
2. To develop programs to solve basic problems by understanding basic concepts in C like Operators, control statements etc.
3. To develop modular, reusable and readable C Programs using the concepts like functions, Arrays.
4. To write programs using the Dynamic Memory Allocation concept.

To create, read from and write to text and binary files At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs			
		PO1	PO2	PO3	Dok
CO1	Read, understand, and trace the execution of programs written in C language.	2	2	2	L1, L2
CO2	Select the right control structure for solving the problems .and demonstrate the application of arrays functions and strings	3	3	3	L2,L3
CO3	Develop Debug and Execute programs to demonstrate the applications of Pointers, Structures& Unions, and Files.	3	3	3	L2, L3

Board of Studies: Computer Science and Engineering

Approved in BOS No: 01, 12-09-2025

Approved in ACM No: 01, 26-09-2025

Week 1: Practice Sessions

- a) Write a C program addition of two numbers.
- b) Write a C program year is leap or not.
- c) Write a simple program that prints the results of all the operators available in C (including pre/post increment, bitwise and/or/not , etc.). Read required operand values from standard input.
- d) Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input

Week 2: Simple Numeric Problems

- a) Write a program for finding the max and min from the three numbers.
- b) Write the program for the simple, compound interest.
- c) Write a program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
- d) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

$$5 \times 1 = 5$$

$$5 \times 2 = 10$$

$$5 \times 3 = 15$$

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

Week 3: Expression Evaluation

- a) Write a C program the given number is strong or not?
- b) Write a C program the given number is Armstrong or not?
- c) A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula $s = ut + (1/2)at^2$ where u and a are the initial velocity in m/sec ($= 0$) and acceleration in m/sec^2 ($= 9.8 m/s^2$)).
- d) 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)
- e) Write a program that finds if a given number is a prime number
- f) Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
- g) 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.
- h) Write a C program to generate all the prime numbers between 1 and n , where n is a value supplied by the user.
- i) Write a C program to find the roots of a Quadratic equation.
- j) Write a C program to calculate the following, where x is a fractional value. $1 - x/2 + x^2/4 - x^3/6$
- k) Write a C program to read in two numbers, x and n , and then compute the sum of this geometric progression: $1 + x + x^2 + x^3 + \dots + x^n$. For example: if n is 3 and x is 5, then the program computes $1 + 5 + 25 + 125$.

Week 4: Arrays, Functions and Pointers

- a) Write a C program to find the minimum, maximum and average in an array of integers.
- b) Write a function to compute mean, variance, Standard Deviation, sorting of n elements in a single dimension array.
- c) Write a C program that uses functions to perform the following:
 - i. Addition of Two Matrices
 - ii. Multiplication of Two Matrices
 - iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be the same.
- d) Write C programs that use both recursive and non-recursive functions
 - i. To find the factorial of a given integer.
 - ii. To find the GCD (greatest common divisor) of two given integers.
 - iii. To find x^n
- e) Write a program for reading elements using a pointer into an array and display the values using the array.
- f) Write a program for display values reverse order from an array using a pointer.
- g) Write a program through a pointer variable to sum of n elements from an array.

Week 5: Strings

- a) Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
- b) Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
- c) Write a C program that uses functions to perform the following operations:
- d) To insert a sub-string into a given main string from a given position.
- e) To delete n Characters from a given position in a given string.

- f) Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
- g) Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
- h) Write a C program to count the lines, words and characters in a given text.

Week 6: Files

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

Week 7: Miscellaneous

- a) Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.
- b) Write a C program to construct a pyramid of numbers as follows:

i. 1	ii. *	iii. 1	iv. *	v. 1
1 2	* *	2 3	**	2 2
1 2 3	* * *	4 5 6	* * *	3 3 3
			* *	4 4 4 4
			*	

TEXTBOOKS:

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

REFERENCE BOOKS:

- 1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
- 2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
- 3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
- 4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
- 5. Programming in C. P. Dey and M Ghosh , Second Edition, Oxford University Press

Chairperson
Board of Studies (CSE)

R25HS02 ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB
(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))

0 0 2 1

Learning Outcomes:

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

1. Listen actively and identify important information in spoken texts
2. Interpret the speech and infer the intention of the speaker
3. Improve their accent for intelligibility
4. Speak fluently with clarity and confidence
5. Use the language in real life situations

CO Code	Course Outcome Statements	Mapping with POs			DoK
		PO9	PO10	PO11	
CO1	Listen actively and identify key information in spoken texts from diverse accents.	3	2	3	L1, L2
CO2	Interpret the speaker's intention and infer meaning from context.	2	3	2	L2, L4
CO3	Improve pronunciation and neutralize accent for greater intelligibility.	3	2	1	L2, L3
CO4	Speak fluently and confidently in both social and professional settings.	3	2	2	L3, L4
CO5	Apply English language skills creatively and appropriately in real-life situations.	2	3	2	L3, L4, L5

Syllabus

Exercise-1 CALL Lab:

06hours

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

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

ICS Lab:

Instruction: Spoken and Written language - Formal and Informal English - Greetings -

Introducing Oneself and Others

Practice: Any Ice-Breaking Activity

CO's-CO1**Exercise-2 CALL Lab:**

06hours

Instruction: Listening vs. Hearing - Barriers to Listening

Practice: Listening for General Information - Multiple Choice Questions - Listening

Comprehension Exercises

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 **CO's-CO2**

Exercise-3 CALL Lab:-

06hours

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.)

CO's-CO3

Exercise-4 CALL Lab:-

04hours

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

CO's-CO4

Exercise-5 CALL Lab:-

04hours

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
Practice: Silent Speech - Dumb Charades Activity

CO's-CO5

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)

Board of Studies:

Department of English

Approved in BOS No:01

Approved in ACM No:01

REFERENCE 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. Orient BlackSwan Pvt. Ltd.
3. Mishra, Veerendra et al. (2020). English Language Skills: A Practical Approach. Cambridge University Press

4. (2022). English Language Communication Skills – Lab Manual cum Workbook. Cengage Learning India Pvt. Ltd.
5. Ur, Penny and Wright, Andrew. 2022. Five Minute Activities – A Resource Book for Language Teachers. Cambridge University Press.

Web References

- BBC Learning English – <https://www.bbc.co.uk/learningenglish>
- Cambridge English – <https://www.cambridgeenglish.org/learning-english>
- British Council – <https://learnenglish.britishcouncil.org>

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	10%	5%
L2	20%	15%
L3	35%	35%
L4	25%	30%
L5	10%	15%
Total (%)	100	100

Sample Questions (L1–L5)

- **L1 – Remember**
 1. Define active listening.
 2. List types of barriers to listening.
 3. State three differences between British and American English.
 4. Name two non-verbal communication methods.
- **L2 – Understand**
 1. Explain why telephone etiquette is important in professional contexts.
 2. Differentiate between formal and informal greetings.
 3. Describe the purpose of minimal pairs in pronunciation practice.
 4. Interpret the meaning of “listening for evaluation.”
- **L3 – Apply**
 1. Role-play a dialogue requesting permission in a formal setting.
 2. Perform a descriptive speech about a place using a provided picture.
 3. Tell a short story based on given keywords.
 4. Conduct a gap-fill listening exercise and complete the transcript
- **L4 – Analyze**
 1. Analyze the tone and intonation in a recorded speech.
 2. Compare two storytelling performances for clarity and engagement.
 3. Identify implied meanings in a listening passage.
 4. Evaluate how cultural context affects conversational style.

- **L5 – Evaluate/Create**

1. Create a new role-play scenario for handling a customer complaint.
2. Develop an original short story incorporating at least three idiomatic expressions.
3. Design a non-verbal communication activity for peer practice.
4. Compose a summary of a given speech, highlighting key points and inference.

Chairperson
Board of studies (English)

R25ES19

PYTHON PROGRAMMING LAB

0 0 2 1

(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))

Prerequisites: Students should install Python on Linux platform

Course Objectives:

1. To be able to introduce core programming basics and program design with functions using Python programming language.
2. To understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
3. To understand the high-performance programs designed to strengthen the practical expertise.

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

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
CO1	Student should be able to understand the basic concepts scripting and the contributions of scripting language	3	3	3	3	3	L1, L2
CO2	Ability to explore python especially the object-oriented concepts, and the built-in objects of Python.	3	3	3	3	2	L1, L2 L3
CO3	Ability to create practical and contemporary applications such as TCP/IP network programming, Web applications, discrete event simulations.	3	3	3	2	3	L1, L2, L3

Board of Studies: Computer Science and Engineering.

Approved in BOS No: 01, 12-09-2025

Approved in ACM No: 01, 26-09-2025

Developing the following programs:

Week1:

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.

Week2:

3. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
4. Write a python script to print the current date in the following format “Sun May 29 02:26:23 IST 2017”

Week3:

5. Write a program to create, append, and remove lists in python.
6. Write a program to demonstrate working with tuples in python.

Week4:

7. Write a program to demonstrate working with dictionaries in python.
8. Write a python program to find largest of three numbers.

Week5:

9. Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula: $c/5 = f-32/9$]

Week6:

10. Write a Python program to construct the following pattern, using a nested for loop

```
*
* *
* * *
* * * *
* * * * *
* * * * *
* * * *
* * *
* *
*
```

11. Write a Python script that prints prime numbers less than 20.

Week7:

12. Write a python program to find factorial of a number using Recursion.

Week8:

13. Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides).

Week9:

14. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.

Week10:

15. Write a python program to define a module and import a specific function in that module to another program.

Week11

16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.

Week12

17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.

Week13:

18. Write a Python class to convert an integer to a roman numeral.

Week14:

19. Write a Python class to implement pow(x, n)

Week15:

20. Write a Python class to reverse a string word by word.

**Chairperson
Board of Studies (CSE)**

R25BS04 DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS 3 1 0 3
(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))

Course Objectives:

1. Understand and solve first-order ordinary differential equations and apply them to real-life problems.
2. Solve higher-order ordinary differential equations using analytical methods.
3. Apply Laplace transform techniques to solve initial value problems and evaluate integrals.
4. Analyze vector functions using differentiation to compute gradient, divergence, curl, and related properties.
5. Apply vector integration theorems to evaluate line, surface, and volume integrals.

Course Outcomes:

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

Course Code	Course Outcomes	Mapping with POs			Dok
		PO1	PO2	PO3	
CO1	Solve and apply first-order ODEs to physical and engineering problems.	3	3	3	L1,L2
CO2	Solve higher-order linear ODEs with constant coefficients using analytical methods.	3	2	2	L2–L3
CO3	Use Laplace transforms to solve initial value problems and evaluate definite integrals.	3	3	2	L2,L3,L4
CO4	Apply vector differentiation to compute gradient, divergence, curl, and related properties.	3	3	2	L2–J3
CO5	Evaluate line, surface, and volume integrals using vector integration theorems.	3	2	3	L2,L3,L4

SYLLABUS

UNIT-I: First Order ODE

8 Hours

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

COs: CO1

Self-learning Topics: Solving DE of first order by different methods

UNIT-II: Ordinary Differential Equations of Higher Order

10 Hours

Second and higher order linear differential equations with constant coefficients: Complementary function – Particular Integral – concept of inverse differential operator Non-Homogeneous terms of the type e^{ax} , $\sin$, $\cos ax$, polynomials in x , $e^{ax}V(x)$ and $xV(x)$, method of variation of parameters

COs: CO2

Self-learning Topics: Evaluation of homogenous and Non –Homogenies equations

UNIT-III: Laplace Transforms

13 Hours

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

COs: CO3

Self-learning Topics: Finding the Differentiation and Integration by Laplace Transforms

UNIT-IV: Vector Differentiation

10 Hours

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

COs: CO4

Self-learning Topics: Evaluation of Vector Differential functions

UNIT-V: Vector Integration

10 Hours

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

COs: CO5

Self-learning Topics: Evaluation of Vector Integral functions

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, KhannaPublishers,36th Edition,2010
2. R. K. Jainand S .R. K. Iyengar ,Advanced Engineering Mathematics, Narosa Publications, 5thEdition,2016.
3. **Reference Books:**
4. Erwin Kreyszig, Advanced Engineering Mathematics,9th Edition, John Wiley&Sons,2006.
5. G. B. Thomasand R. L. Finney,Calculus and Analytic geometry, 9thEdition, Pearson, Reprint,2002.
6. H.K.DassandEr.RajnishVerma, Higher Engineering Mathematics, S Chandand Company Limited,NewDelhi.
7. N.P.BaliandManishGoyal,Atext book of Engineering Mathematics ,Laxmi Publications, Reprint,2008.

eBooks& Reference Books:

8. **“Advanced Engineering Mathematics” by Erwin Kreyszig**
Comprehensive coverage of ODEs, Laplace transforms, and vector calculus.
Google Books Preview
9. **“Differential Equations with Boundary-Value Problems” by Dennis Zill**
Excellent for step-by-step solution methods.
Google Books Preview
10. **“Vector Calculus” by Jerrold E. Marsden & Anthony Tromba**
Standard reference for vector differentiation and integration.
Google Books Preview

Web References:

1. **NPTEL – Differential Equations for Engineers**
IIT Kharagpur video lectures covering first-order, higher-order ODEs, Laplace transforms.
<https://nptel.ac.in/courses/111/105/111105045>
2. **NPTEL – Multivariable Calculus & Vector Calculus**
IIT Kanpur lectures on vector differentiation, integration, and theorems.
<https://nptel.ac.in/courses/111/104/111104092>
3. **Paul’s Online Math Notes – DE & Vector Calculus**
<https://tutorial.math.lamar.edu>
4. **MIT OpenCourseWare – Differential Equations (18.03)**
Complete lecture videos, notes, and assignments.
<https://ocw.mit.edu/courses/mathematics/18-03sc-differential-equations-fall-2011/>
5. **Khan Academy – Differential Equations & Vector Calculus**
Short visual-based tutorials for quick conceptual understanding. <https://www.khanacademy.org/math>

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	10%	5%
L2	25%	20%
L3	50%	50%
L4	10%	15%
L5	5%	10%
Total (%)	100	100

Sample Short and Long Answer Questions – By Cognitive Level

L1 – Remember

1. Define exact differential equation.
2. State Newton’s law of cooling.
3. Write the Laplace transform of e^{at} .
4. Define gradient and curl.
5. State Gauss’s divergence theorem.

L2 – Understand

1. Explain the method to solve a Bernoulli equation.
2. Describe the concept of complementary function and particular integral.
3. Explain the first shifting theorem of Laplace transforms.
4. Interpret the meaning of divergence in vector calculus.
5. Explain the significance of Stokes’s theorem.

L3 – Apply

1. Solve $(2xy+y^2)dx+(x^2+2xy)dy=0$ $(2xy + y^2)dx + (x^2 + 2xy)dy = 0$ $(2xy+y^2)dx+(x^2+2xy)dy=0$.
2. Solve $y''-3y'+2y=e^{2x}$ $y''-3y'+2y=e^{2x}$.
3. Find the Laplace transform of $t e^{-3t} \sin(2t)$ $t e^{-3t} \sin(2t)$.
4. Calculate the curl of $\vec{F}=y\hat{i}+z\hat{j}+x\hat{k}$ $\vec{F}=y\hat{i}+z\hat{j}+x\hat{k}$.
5. Evaluate $\oint_C (x dy - y dx)$ where C is a circle.

L4 – Analyze

1. Determine whether the given vector field is irrotational.
2. Compare the method of undetermined coefficients with variation of parameters.
3. Analyze the solution of Newton's law of cooling for different cooling rates.
4. Determine if a given differential equation is exact and make it exact if necessary.
5. Evaluate a line integral using both direct and Green's theorem methods and compare results.

L5 – Evaluate/Create

1. Develop a model using first-order ODE for population growth.
2. Create a Laplace transform-based solution for an RLC circuit.
3. Formulate a problem in heat conduction and solve using vector calculus.
4. Design a problem integrating divergence theorem with a physical application.
5. Construct an initial value problem and solve using Laplace transform and convolution theorem.

Chairperson
Board of Studies (Mathematics)

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.

CO's-CO2

UNIT-III: Energy sources:

Batteries: Introduction – Classification of batteries - Primary, secondary and reserve batteries with examples. Construction, working and applications of Zn-air and Lithium ion 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- Dulong's formula - Numerical problems.

Fossil fuels: Introduction, Classification, Petroleum - Refining of Crude oil, Cracking - Types of cracking- Moving bed catalytic cracking. LPG and CNG composition and uses.

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

COs-CO3

UNIT - IV: Polymers:

Definition - Classification of polymers: Based on origin and tacticity with examples – Types of polymerization-Addition: free radical (mechanism), ionic and co-ordination polymerisation (reactions and examples) and condensation polymerization.

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

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.

COs-CO4

UNIT-V- Advanced Functional Materials:

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).

Lubricants: Introduction, Types, classification, Properties- Viscosity, flash point, fire point, cloud point, pour point.

COs-CO5

Board of Studies : Department of Chemistry

Approved in BOS No: 11th, September, 2025

Approved in ACM No: 01

Text books:

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

- Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

Reference Books:

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

Web References:

- NPTEL – Engineering Chemistry (IIT Madras / Bombay)**
Video lectures by premier IIT faculty on entire syllabus topics.
<https://nptel.ac.in/courses/122103029>
- LibreTexts – Chemistry for Engineers**
Free, peer-reviewed, and accessible content on water chemistry, electrochemistry, polymers, etc. <https://chem.libretexts.org>
- GeeksforGeeks – Engineering Chemistry Concepts**
Useful for quick concept reviews and practical applications (e.g., corrosion, fuel cells, polymers). <https://www.geeksforgeeks.org/engineering-chemistry>
- Wiley Online Library – Open Access Chemistry Articles**
Articles on smart materials, biodegradable polymers, and engineering applications.
<https://onlinelibrary.wiley.com>
- ScienceDirect – Applied Chemistry for Engineers**
Latest research articles on corrosion, fuel chemistry, and environmental chemistry.
<https://www.sciencedirect.com>

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	40	20
L2	30	30
L3	30	--
L4	--	30
L5	--	20
Total (%)	100	100

Sample Short and Long Answers questions of Various Cognitive Levels

L1 – Recall (Short Answer Type)

- Define *temporary hardness* of water. **(SA)**
- List different types of corrosion. **(SA)**
- State the standard electrode potential of hydrogen electrode. **(SA)**
- Name any two biodegradable polymers. **(SA)**
- Write the formula for calculating calorific value. **(SA)**

L2 – Understand

- Explain the process of lime-soda water treatment with reactions. **(LA)**
- Describe the mechanism of galvanic corrosion. **(LA)**
- Explain the working of a proton-exchange membrane (PEM) fuel cell. **(LA)**
- Discuss the differences between thermoplastics and thermosetting plastics. **(SA)**
- Explain the principle of UV–Visible spectroscopy. **(SA)**

L3 – Apply

- Calculate the hardness of a water sample given EDTA titration data. **(LA)**

2. Apply Nernst equation to find the potential of a Zn^{2+}/Zn electrode. **(LA)**
3. Determine the efficiency of a lead-acid battery from given discharge data. **(LA)**
4. Apply Langelier saturation index to predict scale formation in a water sample. **(SA)**
5. Evaluate the calorific value of a coal sample from bomb calorimeter readings. **(LA)**

L4 – Analyze

1. Compare hot lime soda and cold lime soda processes for water softening. **(LA)**
2. Analyze the reasons for intergranular corrosion in stainless steel. **(LA)**
3. Compare and contrast Fischer–Tropsch and Bergius processes for synthetic fuel production. **(LA)**
4. Analyze the advantages of conducting polymers over conventional polymers. **(SA)**
5. Examine the role of biosensors in environmental monitoring. **(SA)**

L5 – Create

1. Design a hybrid water treatment process combining reverse osmosis and ion exchange for municipal water supply. **(LA)**
2. Develop a corrosion prevention plan for an offshore oil rig. **(LA)**
3. Propose an innovative biodegradable polymer blend for surgical implants and justify the selection. **(LA)**
4. Formulate an energy storage system integrating hydrogen fuel cells with solar power. **(LA)**
5. Design a spectroscopic analysis procedure for detecting trace heavy metals in water samples. **(LA)**

**Chairperson
Board of studies (Chemistry)**

R25ES12 ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING 3 0 0 3

(Mechanical Engineering)

Prerequisites: Mathematics**Course Objectives**

1. Understand fundamentals of DC and AC circuits, phasors and power concepts.
2. Describe basic electrical installations, protection devices and battery characteristics.
3. Explain construction, operation and performance parameters of transformers and electrical machines.
4. Understand PN-junction diodes, rectifiers, filters and basics of BJT/FET devices.
5. Apply circuit analysis methods and device concepts to simple practical problems.

CO Code	Course Outcome Statement	PO1	PO2	PO3	PSO1	PSO2	DOK Levels
CO1	Apply KCL/KVL and analyze simple DC and AC circuits to find voltages, currents and power.	3	3	2	3	2	L1, L2, L3
CO2	Compute power, power factor, and perform basic energy consumption & battery/back-up calculations; explain earthing and LT switchgear components.	3	3	2	3	2	L2, L3
CO3	Explain working principles, equivalent circuits, losses and efficiency of transformers; describe operation of DC & induction machines.	3	3	3	3	2	L2, L3
CO4	Analyze rectifier circuits and filter behaviour; compute ripple and discuss harmonics.	3	3	3	3	2	L3, L4
CO5	Describe semiconductor device characteristics (PN diode, Zener, BJT, FET) and identify suitable applications.	3	2	2	2	2	L1, L2, L3

SYLLABUS**UNIT-I:****12 Hours**

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL and KCL, analysis of simple circuits with dc excitation.

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Three phase balanced circuits, voltage and current relations in star and delta connections.

CO's - CO1

UNIT-II:

10 Hours

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.

CO's - CO2

UNIT-III:

12 Hours

Electrical Machines: Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three phase transformer connections. Construction and working principle of DC machines, Torque equations and Speed control of DC motors, Construction and working principle of Three phase Induction motor, Torques equations and Speed control of Three phase induction motor.

CO's - CO3

UNIT-IV:

12 Hours

P-N Junction and Zener Diode: Principle of Operation Diode equation, Volt, Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.

Rectifiers and Filters: P-N junction as a rectifier, Half Wave Rectifier, Ripple Factor, Full Wave Rectifier, Bridge Rectifier.

CO's - CO4

UNIT-V:

10 Hours

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Amplifying Action, common Emitter.

Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET.

CO's -

CO5

Board of Studies: Electrical and Electronics Engineering.

Approved in BOS No: 01,

Approved in ACM No: 01.

TEXTBOOKS:

1. Basic Electrical and electronics Engineering, MS Sukija and TK Nagasarkar, Oxford University, 1st Edition, 2012
2. Basic Electrical and electronics Engineering, DP Kothari and IJ Nagarath, McGraw Hill Education, 2nd Edition, 2020

REFERENCEBOOKS:

1. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, PEI and PHI, 9th Edition, 2006.
2. Millman's Electronic Devices and Circuits, J. Millman, C. C. Halkias and Satyabrata Jit, TMH, 2nd Edition, 1998.
3. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, McGraw Hill, 6th Edition, 1971.
4. Linear circuit analysis, Raymond A. DeCarlo and Pen, Min, Lin, Oxford University Press, 2nd edition, 2004.

5. Network Theory, N.C. Jaganand C. Lakshminarayana, McGraw Hill, 2nd Edition, 2005
6. Network Theory, Sudhakar and Shyam Mohan Palli, Tata McGraw Hill, 2nd Edition, 2011.
7. Fundamentals of Electrical Engineering, L. S. Bobrow, Oxford University Press, 12th edition, 2003.
8. Electrical and Electronic Technology, E. Hughes, Pearson Education, 10th Edition, 2010.
9. Electrical Engineering Fundamentals, V.D. Toro, Prentice Hall India, 2nd Edition, 1989

Web references

1. <https://www.electrical4u.com> — practical tutorials on machines, circuits, power
2. <https://www.allaboutcircuits.com> — circuit theory & device references
3. <https://nptel.ac.in> — NPTEL courses (search related EE subjects)
4. <https://ocw.mit.edu> — MIT OCW electrical engineering materials

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	10%	5%
L2	20%	15%
L3	35%	35%
L4	25%	30%
L5	10%	15%
Total (%)	100%	100%

Sample Questions

L1 – Remember

1. State Kirchhoff's Voltage Law.
2. Define RMS value of a sinusoidal waveform.
3. What is earthing and why is it necessary?
4. Give the diode equation (qualitative form) and name the diode regions.

L2 – Understand

1. Explain the physical meaning of reactive power and power factor.
2. Describe how a step-down transformer works and list its losses.
3. Explain how a Zener diode is used for voltage regulation.
4. Discuss differences between BJT and FET in terms of control and input impedance.

L3 – Apply

1. For the given RLC series circuit (values provided), compute phasor current and impedance at 50 Hz.
2. Calculate the ripple factor for a full-wave rectifier with given load and capacitor.
3. Given a three-phase balanced load, compute line and phase currents for star and delta connections.
4. Size a simple battery backup requirement: given load (W) and required backup time (hours), calculate required battery amp-hours (assume efficiency and voltage).

L4 – Analyze

1. Analyze the effect of adding a capacitor for power factor correction to a lagging power factor load; compute new apparent power.
2. Given a transformer equivalent circuit, determine regulation and efficiency at a specified load.
3. Compare harmonic content between half-wave and full-wave rectifiers and discuss implications on filter design.
4. Analyze a BJT CE amplifier small-signal model to find approximate voltage gain.

L5 – Evaluate / Create

1. Propose a small LT distribution layout (single-line) for a departmental lab with protection devices and earthing plan; justify device selections.
2. Design a simple LC filter to meet a specified ripple target for a rectifier output and show calculations.
3. Recommend a speed control approach for a given DC motor application and justify choice (method and expected performance).
4. Evaluate two candidate semiconductors (BJT vs FET) for a given amplifier application and choose the best device with reasons.

**Chairperson
Board of Studies (EEE)**

R25ES07 COMPUTER AIDED ENGINEERING DRAWING 2 0 2 3
(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))

Course Objectives:

1. To introduce students to the fundamentals of engineering drawing and BIS drawing standards.
2. To develop the ability to visualize and represent objects in orthographic, sectional, and isometric views.
3. To impart skills to create 2D engineering drawings using conventional methods and CAD software.
4. To teach the development of surfaces for manufacturing and fabrication processes.
5. To enable students to produce accurate engineering drawings for real-world mechanical components and assemblies.

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

Course Code	Course outcomes	Mapping with POs and PSOs					DoK
		PO1	PO2	PO3	PSO1	PSO2	
R25ES07.1	Understand and apply the principles of orthographic and isometric projections.	3	2	3	2	2	L1,L2,L3
R25ES07.2	Create sectional views and dimensioned drawings using BIS standards.	3	3	3	3	3	L2,L3,L4
R25ES07.3	Use CAD software to generate 2D engineering drawings.	3	2	3	3	2	L2,L3, L4
R25ES07.4	Visualize and construct solid models from 2D views.	3	3	2	3	2	L3,L4
R25ES07.5	Interpret and produce engineering drawings of mechanical components and assemblies for industrial applications.	3	2	2	3	3	L3,L4

SYLLABUS

UNIT – I: Introduction to Engineering Drawing (Conventional)

16 HOURS

Principles of Engineering Drawing and their significance - Size of drawing sheets, Types of lines, Dimensioning, Title block - BIS Conventions to Lettering.

Geometrical Constructions, Scales, Plain and Diagonal, Conic Sections including the Rectangular Hyperbola, General method only. Cycloid, Epicycloid and Hypocycloid. **CO's-CO1**

UNIT - II: Orthographic Projections

(Conventional and Computer Aided)

16 HOURS

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.

CO's-CO2

UNIT – III: Projections of Regular Solids

(Conventional and Computer Aided)

16 HOURS

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

CO's-CO3

UNIT – IV: Development of Surfaces (Conventional):

12 HOURS

Prism, Cylinder, Pyramid and Cone.

CO's-CO4

UNIT – V: Isometric Projections

(Conventional and Computer Aided)

15 HOURS

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

CO's-CO5

Note:

1. The End Semester Examination will be in conventional mode.
2. CIE – I will be in conventional mode.
3. CIE – II will be using Computer.

Board of Studies: Mechanical Engineering

Approved in BoS No: 01 12thAugust 2025

Approved in ACM No: 01

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhatt, Charotar, 54th Edition, 2023.
2. Engineering Drawing and graphics Using AutoCAD, T. Jeyapoovan and Vikas, S. Chand and company Ltd., 3rd Edition, 2010.

REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C.M. Agrawal, McGraw Hill, 3rd Edition, 2019.

2. Engineering Graphics and Design, WILEY, John Wiley and Sons Inc, 3rd Edition, 2020.
3. Engineering Drawing, M. B. Shah and B.C. Rane, Pearson, 2nd Edition, 2009.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford, 1st Edition, 2015.
5. Computer Aided Engineering Drawing, K. Balaveera Reddy, CBS Publishers, 2nd Edition, 2015.

WEB REFERENCES:

1. NPTEL – Engineering Drawing: <https://nptel.ac.in/courses/105104148>
2. AutoCAD Tutorials – CADTutor: <https://www.cadtutor.net/tutorials/autocad/>
3. MIT OpenCourseWare – Technical Drawing: <https://ocw.mit.edu/courses/mechanical-engineering/technical-drawing-and-design/>
4. Autodesk Learning Hub: <https://knowledge.autodesk.com/>
5. Engineering Drawing Basics: <https://www.engineeringdrawing.org/>

E- Books

1. Engineering Drawing by N.D. Bhatt (Latest Edition)
2. Engineering Graphics and Design by WILEY
3. Engineering Drawing and Graphics Using AutoCAD by T. Jeyapoovan
4. Technical Drawing with Engineering Graphics by Giesecke et al.
5. Computer Aided Engineering Drawing by K. Balaveera Reddy

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	20%	10%
L2	30%	25%
L3	30%	35%
L4	15%	20%
L5	5%	10%
Total (%)	100	100

Sample Short and Long Answers questions of Various Cognitive Levels**L1 – Recall**

- Define orthographic projection. (SA)
- List different types of conic sections. (SA)
- State the principle of isometric projection. (SA)
- Identify the types of scales used in engineering drawing. (SA)

L2 – Understand

- Explain the difference between first-angle and third-angle projection methods. (LA)
- Describe the process of drawing a cycloid curve. (LA)
- Explain the use of auxiliary planes in orthographic projection. (SA)

- Describe the conventions used in sectional views. (SA)

L3 – Apply

- Draw the orthographic projections of a hexagonal prism with its axis inclined to HP. (LA)
- Using CAD, create the front, top, and side views of a given solid. (LA)
- Develop the lateral surface of a cone of given dimensions. (SA)
- Generate isometric views for a simple mechanical part. (LA)

L4 – Analyze

- Compare conventional and CAD-based drafting methods in terms of accuracy and time. (LA)
- Evaluate the role of dimensioning standards in engineering drawings. (SA)
- Analyze the difference in representation between isometric projection and isometric drawing. (SA)
- Study a given mechanical drawing and identify missing or incorrect features. (LA)

L5 – Create

- Design an assembly drawing of a simple mechanical component using CAD. (LA)
- Create a 3D model from given orthographic views in CAD. (LA)
- Develop a CAD template for orthographic and isometric views of a standard part. (LA)
- Prepare a working drawing including all views, dimensions, and sectional details for a machine part. (LA)

**Chairperson
Board of Studies (ME)**

R25ES13

MATERIAL SCIENCE AND METALLURGY

3 0 0 3

(Mechanical Engineering)

Course Objectives:

1. Students will be able to understand different types of materials and understand the concepts of crystallography and the necessity of alloying.
1. Students will be able to understand the construction and interpretation of phase diagrams.
2. Students will be able to gain knowledge on ferrous alloys and heat treatment of steels.
3. Students will be able to gain knowledge on non-ferrous alloys.
4. Students will be able to study the properties & application of Ceramics, Polymers and Composite materials.

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

CO code	Course outcomes	Mapping with POs and PSOs					DoK
		PO1	PO2	PO3	PSO1	PSO2	
R25ES13.1	Describe different materials and their crystal structures and correlate structure with properties.	3	1	2	2	1	L1, L2, L3, L4
R25ES13.2	Interpret the phase diagrams.	3	2	1	2	1	L1, L2, L4
R25ES13.3	Express the importance of composition, properties, and applications of ferrous alloys and describe heat treatment processes	3	1	1	2	2	L1, L2, L3, L4
R25ES13.4	Express the importance of composition, properties, and applications of non-ferrous alloys.	3	1	1	2	1	L1, L2, L4
R25ES13.5	Express the importance of composition, properties, and applications of composites, ceramics, and polymers.	3	3	2	2	1	L1, L2

SYLLABUS

Unit I-Structure of metals & Constitution of alloys

13 HOURS

Structure of metals - Introduction to materials, Crystallography, and Packing efficiency of cubic structures. Imperfection in solids: Point, Line and Volume defects, Crystallization of a pure metal, grain and grain boundaries. Effect of grain size on properties of materials.

CO_s-CO1

Constitution of alloys - Necessity of alloying, Types of solid solutions, Hume-Rothery rules, various material strengthening mechanisms.

Unit II-Phase Diagrams

16 HOURS

Construction and interpretation of phase diagrams, Lever rule and Phase rule. Binary phase diagrams -Isomorphous, Eutectic and Partial Eutectic -Invariant transformations -Eutectic, Eutectoid, Peritectic and Peritectoid transformations. Study of Iron - Iron Carbide phase diagram.

CO_s-CO2

Unit III-Steels, Cast Irons & Heat treatment

17 HOURS

Steels - Plain carbon steels-Low, Medium and High carbon steels. Alloy steels - Stainless Steels and Tool steels. Introduction to BIS designation of steels.

Cast Irons-Structure, properties and applications of White Cast iron, Malleable Cast Iron, Grey Cast Iron and Ductile Cast Iron.

CO_s-CO3

Heat treatment: Annealing, Normalizing, Hardening, TTT diagram for eutectoid steels.

Unit IV-Non-ferrous Metals and Alloys

14 HOURS

Properties and applications of (i) Al and its alloys (Al-Cu, Al-Mg-Si and Al-Si: alloys) (ii) Copper and its alloys (Cu-Zn and Cu-Sn alloys) (iii) Magnesium and its alloys (AZ, AM and ZK series) and (iv) Titanium and its alloys (Alpha, Beta and Alpha-Beta alloys)

CO_s-CO4

Unit V-Composites, Polymers and Ceramics

15 HOURS

Composites –Definition- properties and application of composites

Polymers and Ceramics- Homo polymer –Copolymer- Polymerization - Classification of polymers - Thermoplastics - Thermosets- Properties and applications of Ceramics - Abrasives.

CO_s-CO5

Board of Studies: Mechanical Engineering

Approved in BoS No: 01 12th August 2025

Approved in ACM No: 01

Textbooks:

1. Material Science and Metallurgy for Engineers, Kodgire V. D. & Kodgire S.V., 37th Edition, Everest Publishing House, 2015.
2. Materials Science and Engineering, William D. Callister & David G. Rethwisch, 9th Edition, Wiley Publications, 2013.

References:

1. Introduction to Physical Metallurgy, Sidney H Avner, 2 Editions, Tata McGraw-Hill Publications, 1997.
2. Material Science & Engineering, R. Balusubrahmanium, 2 Editions, Wiley India, 2014.

WEB REFERENCES

- **ASM International:**
https://www.google.com/search?sca_esv=f6511093bb828960&rlz=1C1CHZN_enIN1140IN1140&cs=0&q=The+Minerals%2C+Metals+%26+Materials+Society+%28TMS%29&sa=X&ved=2ahUK Ewj0ouSnw8uPAxWC1jgGHX2wBGEQxccNegQIFBAB&mstk=AUtExfCbHT7fMpnL4c_ymOuaRqcLnykKn1mdR2C5Mpgav2ma4dbKK4-ytrUDwJv5kCbZGyb9d18UNjxGPn_sR7pARSnUJxNL_mfbOwTfhYr89geaU9l_Y2vHWhlCd3VVIYScEEM&csui=3
- Scientific Journals & Publications:
https://www.google.com/search?sca_esv=f6511093bb828960&rlz=1C1CHZN_enIN1140IN1140&cs=0&q=Metallurgical+and+Materials+Engineering&sa=X&ved=2ahUKEwj0ouSnw8uPAxWC1jgGHX2wBGEQxccNegQIHBAB&mstk=AUtExfCbHT7fMpnL4c_ymOuaRqcLnykKn1mdR2C5Mpgav2ma4dbKK4-ytrUDwJv5kCbZGyb9d18UNjxGPn_sR7pARSnUJxNL_mfbOwTfhYr89geaU9l_Y2vHWhlCd3VVIYScEEM&csui=3
- University library guides often list academic journals such as [Journal of Materials Science](#), [Steel & Metallurgy](#), and [The Journal of The Institution of Engineers \(India\)](#).

e- Books

- <https://ebooks.schandgroup.com/home/product-details/299501;seoMode=true>
- <https://asmedigitalcollection.asme.org/materialstechnology#:~:text=The%20Journal%20of%20Engineering%20Materials,%2C%20biomaterials%2C%20and%20nanostructured%20materials.>
- <https://mechanicalc.com/reference/engineering-materials#:~:text=The%20major%20classifications%20of%20engineering,materi%20properties%20are%20also%20provided.>
- <https://collegedunia.com/courses/bachelor-of-technology-btech-metallurgical-engineering#:~:text=Ans.,expertise%20in%20the%20related%20field.>

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	15%	10%
L2	30%	25%
L3	35%	40%
L4	20%	25%
L5	—	—
Total (%)	100	100

Sample Short and Long Answers questions of Various Cognitive Levels

L1 – Recall (Short Answer)

1. Define material and metal.
2. Describe liver rule and phase rule.
3. List the types of steels and cast irons.
4. State the properties of copper and its alloys.
5. Define composite materials.

L2 – Understand (SA/LA)

1. Explain imperfections in solids. (SA)
2. Discuss binary phase diagram and invariant transformations. (LA)
3. Explain about low, medium and high carbon steels (LA)
4. Describe properties of gun metal. (SA)
5. Interpret the thermosetting and thermo plastics. (LA)

L3 – Apply (LA)

1. Calculate the packing efficiency of different structures.
2. Apply the concept of BIS designation to all types of steels.

L4 – Analyze (LA)

1. Analyze the effect of cooling on grain boundary.
2. Evaluate percentage of carbon from iron-carbon diagram.
3. Compare the steels and cast iron with respect to their applications.
4. Analyze the performance of different non-ferrous alloys

**Chairperson
Board of Studies (ME)**

Course Objectives:

1. To develop practical skills in analytical chemistry techniques such as volumetric, conductometric, potentiometric, and colorimetric methods.
2. To provide hands-on experience in determining chemical concentrations and material properties.
3. To familiarize students with the preparation of polymers and study of corrosion.
4. To introduce applications of chemistry in modern technology through virtual experiments.
5. To encourage scientific thinking and analytical problem-solving in laboratory settings.

Course Outcomes

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

Course Code	Course Outcomes										
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	DoK
CO1	Estimation of Hardness of water by EDTA, concentration of Unknown acids by Conductometry and Potentiometry	3	2	2	1	3	1	1	1	2	L1, L2
CO2	Determination of concentration of Unknown acids by pH metrry and some properties of lubricating Oils.	3	3	2	2	3	1	1	1	2	L2, L3
CO3	Determination of rate of corrosion of metals, and preparation of polymers.	2	2	3	2	3	1	1	2	2	L3

Board of Studies: Department of Chemistry

Approved in BOS No: 11th, September, 2025

Approved in ACM No: 01

Week-1

1. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method. **COs:CO1**

Week-2 & 3

Conductometry:

1. Estimation of the concentration of strong acid by Conductometry. **COs:CO1**
2. Estimation of the concentration of strong and weak acid in an acid mixture by Conductometry. **COs:CO1**

Week-4 & 5

Potentiometry:

1. Estimation of concentration of Fe^{+2} ion by Potentiometry using KMnO_4 . **COs:CO1**
2. Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone. **COs:CO1**

Week-6

pH Metry: 1. Determination of an acid concentration using pH meter. **COs: CO2**

Week-7

1. Estimation of amount of Ferrous ion (Fe^{+2}) by Dichrometry.

Week- 8

1. Determination of Acid value of Oil sample.
2. Estimation of Viscosity of lubricating Oil sample **COs: CO2**

Week-9 & 10

Preparations:

1. Preparation of Bakelite. **COs:CO5**
2. Preparation of Nylon-6,6. **COs: CO3**

Week-11: Corrosion:

1. Determination of rate of corrosion of mild steel in the presence and absence of inhibitor. **COs: CO3**

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 Website: <https://vlab.amrita.edu/?sub=2>

Reference Books:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's textbook 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).

Sample Short and Long Answers questions of Various Cognitive Levels

L1 – Recall (SA)

1. Define complexometric titration.
2. List two polymers prepared in the lab.

3. Mention the types of corrosion.
4. Name the indicator used in EDTA titration for hardness.

L2 – Understand (SA/LA)

1. Explain the principle of conductometric titration. (LA)
2. Describe the working of a pH meter. (SA)
3. Explain the role of inhibitors in corrosion prevention. (LA)
4. Describe the quinhydrone electrode in potentiometry. (SA)

L3 – Apply (LA)

1. Determine hardness of a given water sample using EDTA method.
2. Calculate concentration of strong and weak acid mixture from conductometric readings.
3. Estimate Fe^{2+} ion concentration using potentiometry.
4. Prepare Nylon 6,6 and describe the reaction.
5. Use pH meter to determine unknown acid concentration.

L4 – Analyze (LA)

1. Compare conductometric and potentiometric titrations.
2. Analyze how polymer structure affects its properties.
3. Examine factors affecting corrosion rate.
4. Compare efficiency of different corrosion inhibitors.

L5 – Create (LA)

1. Design a virtual experiment to test a new corrosion inhibitor.
2. Develop an experimental plan to study effect of pH on corrosion rate.
3. Propose a polymer synthesis route for biodegradable plastics.
4. Design a small-scale fuel cell demonstration kit

**Chairperson
Board of Studies (Chemistry)**

R25ES14

MATERIAL SCIENCE & METALLURGY LAB

0 0 2 1

(Mechanical Engineering)

Course Objectives:

1. To know the importance of specimen preparation for micro-structural study
2. To understand the microstructures of various pure metals,
3. To understand the microstructures of various steels.
4. To understand the microstructures of various cast irons.
5. To understand the microstructures of various non-ferrous alloys.

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

CO	Course outcomes	Mapping with POs and PSOs					DoK
		PO1	PO2	PO3	PSO1	PSO2	
R25ES14.1	Explain the steps involved in the metallographic examination.	3	2	1	2	2	L1,L2, L3
R25ES14.2	Understand the microstructure of pure metals like Fe, Cu, and Al.	3	2	2	2	1	L1, L2, L3
R25ES14.3	Elucidate the microstructures of various steels.	3	3	2	2	2	L1,L2, L3, L4
R25ES14.4	Describe the microstructures of various Cast Irons.	2	2	1	2	1	L1,L2, L3
R25ES14.5	Explain the microstructures of various Non-Ferrous alloys.	3	2	2	2	2	L2, L3, L4

List of Experiments:

1. Study of Metallurgical Microscope
2. Specimen preparation for metallographic examination
3. Microstructure of pure metals like Fe, Al, Cu
4. Microstructure of Plain Carbon Steels
5. Microstructures of Cast Irons.

33 HOURS

CO_s-CO1

CO_s-CO1

CO_s-CO2

CO_s-CO2

CO_s-CO4

6. Microstructure of Non-Ferrous Alloys	CO _s -CO5
7. Microstructure of Stainless Steels	CO _s -CO3
8. Microstructure of Tool Steels	CO _s -CO3
9. Microstructure of Hardened Steels	CO _s -CO3
10. Jominy and quench test	CO _s -CO4
11. Study of Samples of Composites	CO _s -CO5

Board of Studies: Mechanical Engineering

Approved in BoS No: 01 12th August 2025

Approved in ACM No: 01

TEXTBOOKS:

1. V. Raghavan, “Material Science and Engineering”, Prentice Hall of India Private Limited, Fifth Edition.
2. George Murray, Charles V. White, Wolfgang Weise, “Introduction to Engineering Materials”, CRC Press, 2007.
3. William. D. Callister, David G. Rethwisch, “Materials Science and Engineering: An Introduction”, John Wiley & Sons, 2018.

REFERENCE BOOKS:

1. Donald R Asklund and Pradeep P Phule “Essentials of Materials Science and Engineering”, by Pradeep P. Fulay (Author), Donald R. Askeland, 2013.
2. K. K. Chawala, Ceramic Matrix composite Materials, Kluwer Academic Publishers, 2002.
3. Myer Kutz, “Mechanical Engineers’ Handbook”, John Wiley & Sons, 2015.

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- <https://www.bing.com/ck/a?!&&p=a92c81f96998e0b9c417e4716e74650637e5784c0d52de2d363a145926b7e30cJmltdHM9MTc1NzQ2MjQwMA&pptn=3&ver=2&hsh=4&fclid=2c203b73-7018-6724-37d1-2d2971f06657&psq=MATERIAL+SCIENCE+%26+METALLURGY+LAB+WEB+REFERENCE&u=a1aHR0cHM6Ly9saWJndWlkZXMuY2FtLmFjLnVrL21hdGVyaWFsc3NjaWVuY2UvcmluL3dwLWNvbnRlbnQvdXBsb2Fkcy8yMDIxLzEwL0RLLi1ibXQtbGFjLW1hbnVhbC0ucGRm>
- <https://www.bing.com/ck/a?!&&p=09f342d324e843b9f4388eef60a37dbf5c8f079120c2c837282ee2859a760c94JmltdHM9MTc1NzQ2MjQwMA&pptn=3&ver=2&hsh=4&fclid=2c203b73-7018-6724-37d1-2d2971f06657&psq=material+science+metallurgy+lab+web+reference&u=a1aHR0cHM6Ly9saWJndWlkZXMuY2FtLmFjLnVrL21hdGVyaWFsc3NjaWVuY2UvcmluL3dwLWNvbnRlbnQvdXBsb2Fkcy8yMDIxLzEwL0RLLi1ibXQtbGFjLW1hbnVhbC0ucGRm>

[Ly93d3cuaWl0ay5hYy5pbi9tc2UvcGh5c2ljYWxtZXRhbGx1cmd5L3BkZi9tYW51YWwvMjBzZXQIMjAxLnBkZg](https://www.researchgate.net/publication/351111111)

e- Books

- Materials Science and Engineering: An Introduction by William D., Callister, David G. Rethwisch
- Mechanical Metallurgy by George E. Dieter –
- Materials Science and Engineering by Raghavan V –

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	15%	10%
L2	30%	25%
L3	35%	40%
L4	20%	25%
L5	—	—
Total (%)	100	100

Sample Short and Long Answers questions of Various Cognitive Levels

L1 – Recall (SA)

1. What is the use of micro structural study?
2. What is the difference between Metallurgical microscope and Biological microscope?
3. What is a cooling curve?
4. How Cast iron and steel are distinguished with respect to carbon percentage?
5. Draw the microstructure of Hypo eutectoid steel?

L2 – Understand (SA/LA)

1. Explain important properties of different types of cast irons?
2. List out some important Non-Ferrous metals?
3. Explain the difference between Hardness & Harden ability?
4. Differentiate between hardenability and hardness?
5. List different types of hardness testing methods?

L3 – Apply (LA)

1. Derive the formula to calculate BHN.
2. calculate the magnifying power of a microscope
3. Demonstrate procedure to measure the hardness of specimen

Analyze (LA)

1. Enumerate the need for heat treatment of steel?
2. Analyze the structure of Malleable cast irons?
3. Evaluate significance of melting point temperature of Aluminum?
4. Compare Ferrite malleable, pearlitic malleable and Pearlitic- ferrite malleable cast irons?

**Chairperson
Board of Studies (ME)**

(Mechanical Engineering)

Course Objectives

This lab course will enable students to:

1. Verify basic electrical circuit laws and theorems in DC and AC circuits.
2. Perform experiments on transformers, DC machines, induction motors, and alternators.
3. Measure power and analyze performance of electrical systems.
4. Operate and test basic electronic devices such as diodes, transistors, and FETs.
5. Use standard electrical and electronic instruments for testing and measurement.

CO Code	Course Outcome	PO1	PO2	PO3	PSO1	PSO2	DOK
CO1	Analyze and solve electrical circuits using KVL, KCL, and network theorems.	3	3	3	3	3	L2, L3
CO2	Conduct experiments on magnetic, DC, and AC circuits.	3	3	3	3	3	L3
CO3	Study and evaluate performance of electrical machines.	3	3	3	3	3	L3, L4
CO4	Identify components of low-voltage installations and measure system parameters.	3	3	3	3	2	L2, L3
CO5	Characterize diodes, transistors, and FETs in various configurations.	3	3	3	3	3	L3, L4

List of Experiments:**PART A: ELECTRICAL**

1. Verification of KV Land KCL CO's - CO1
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer. CO's -CO2
 (ii) Verification of Relationship between Voltages and Currents (Star Delta, Delta Delta, Delta Star, Star Star) in a Three Phase Transformer CO's - CO2
3. Measurement of Active and Reactive Power in a balanced Three phase circuit CO's - CO2.
4. Performance Characteristics of a Separately Excited DC Shunt Motor. CO's - CO3
5. Performance Characteristics of a Three phase Induction Motor.. CO's - CO3

6. No Load Characteristics of a Three phase Alternator.

CO's - CO3

PARTB: ELECTRONICS

1. Study and operation of
 - (i) Multimeters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO. CO's - CO4
2. P-N Junction diode characteristics. CO's - CO5
3. Zener diode characteristics and Zeneras voltage Regulator. CO's - CO5
4. Input and Output characteristics of Transistor in CB, CE configuration. CO's - CO5
5. Full Wave Rectifier with and without filters. CO's - CO5
6. Input and Output characteristics of FET in CS configuration. CO's - CO5

TEXT BOOKS:

1. Basic Electrical and electronics Engineering, M.S.Sukijaand T.K.Nagasarkar, Oxford University press, 1stEdition, 2012.
2. Basic Electrical and electronics Engineering, D.P.Kothariand I.J.Nagarath, McGrawHill Education, 2ndEdition,2020.

REFERENCE BOOKS:

1. Electronic Devices and Circuits, R.L.Boylestad and Louis Nashelsky, PEIandPHI, 9thEdition, 2006.
2. Millman's Electronic Devices and Circuits, J. Millman,C. C. Halkias and Satyabrata Jit, TMH, 2ndEdition, 1998.
3. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, McGraw Hill, 6th Edition, 1971.
4. Linear circuit analysis, Raymond A. De Carlo and Pen, Min, Lin, Oxford University Press 2nd Edition, 2004.
5. Network Theory, N.C.Jaganand C.Lakshminarayana, McGrawHill,2ndEdition,2005.
6. Network Theory, Sudhakar and Shyam Mohan Palli, Tata McGraw Hill, 2ndEdition, 2011.

7. Fundamentals of Electrical Engineering, L. S. Bobrow, Oxford University Press, 12th Edition 2003.
8. Electrical and Electronic Technology, E.Hughes, Pearson Education, 10th Edition, 2010.
9. Electrical Engineering Fundamentals, V.D.Toro, Prentice Hall India, 2nd Edition, 1989.

Web References

1. <https://www.electrical4u.com/>
2. <https://www.allaboutcircuits.com/>
3. <https://www.electronics-tutorials.ws/>
4. <https://nptel.ac.in/courses/108105064/>

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	10%	5%
L2	20%	15%
L3	35%	35%
L4	25%	30%
L5	10%	15%
Total (%)	100%	100%

Sample Questions by DOK Level

L1 – Remember

1. State Kirchhoff's Voltage Law.
2. Define active and reactive power.

L2 – Understand

1. Explain the role of filters in rectifier circuits.
2. Describe star and delta connections in transformers.

L3 – Apply

1. Measure the power factor in a balanced three-phase circuit.
2. Plot the characteristics of a PN-junction diode.

L4 – Analyze

1. Compare CB and CE transistor configurations based on gain.
2. Analyze the performance characteristics of a DC shunt motor.

L5 – Evaluate/Create

1. Suggest improvements to reduce ripple in a rectifier output.
2. Design a small test setup to verify three-phase transformer voltage relationships.

**Chairperson
Board of Studies (EEE)**

2. TRADES FOR DEMONSTRATION & EXPOSURE:

6 HOURS

- i. Machine Shop (Lathe operations)
- ii. Power Tools
- iii. Welding

CO's-CO1

CO's-CO2

CO's-CO2

Board of Studies: Mechanical Engineering

Approved in BoS No: 01 12th August 2025

Approved in ACM No: 01

TEXT BOOKS:

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

REFERENCE BOOKS:

- 1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
- 2. Workshop Manual / Venkat Reddy/ BSP

WEB REFERENCES:

- 1. NPTEL – Basic Engineering Workshop – IIT Kharagpur
- 2. MIT OCW – Manufacturing Processes
- 3. Carpentry Tools and Their Uses – The Constructor
- 4. Sheet Metal Projects – Instructables
- 5. Electrical House Wiring Basics – EEP
- 6. Introduction to Foundry – TheConstructor
- 7. Welding Safety Guide – OSHA

e- Books:

- 1. “Workshop Technology” by Hajra Choudhury, Vol. 1 & 2 Classic text on fitting, carpentry, smithy, welding, and machine tools. Google Books Preview
- 2. “Basic Mechanical Engineering” by Pravin Kumar Covers basic trades and safety in labs. Google Books
- 3. “Electrical Wiring Residential” by Ray C. Mullin Excellent for understanding house wiring in detail. [Amazon](#)
- 4. “Fitting and Machining” by TAFE Publications Used in Australian vocational education; practical and rich in diagrams. WorldCat

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	10%	5%
L2	25%	20%
L3	50%	50%
L4	10%	15%
L5	5%	10%
Total (%)	100	100

Sample questions of Various Cognitive Levels**L1 – Remembering**

- Name two tools used in carpentry for marking and measuring.
- What is the standard file used in metal fitting?
- List types of sheet metals used in fabrication.
- Define flux in welding.
- What is the purpose of a lathe machine?

L2 – Understanding

- Explain the function of a dovetail joint.
- Describe how a parallel wiring connection works.
- Why are safety goggles important in foundry work?
- Differentiate between square fit and V-fit.
- Explain the role of pattern in sand moulding.

L3 – Applying

- Fit a square V-joint using file and check accuracy with try square.
- Demonstrate wiring of a two-way switch circuit.
- Create a funnel from a sheet metal piece using required operations.
- Weld two mild steel plates using lap joint method.
- Operate lathe to turn down a mild steel bar to a specific diameter.

L4 – Analyzing

- Compare the strength of dovetail and mortise & tenon joints.
- Analyze reasons why a soldering joint might fail.
- Identify errors in sheet metal layout that can waste material.
- Suggest a better weld type for joining thin plates.
- Evaluate advantages of using sand casting over die casting.

L5 – Creating / Evaluating

- Design an alternate carpentry joint that combines both strength and ease of making.
- Suggest modifications to improve ergonomics in the fitting workstation.
- Propose a new layout for the electrical wiring panel to improve accessibility.
- Design a jig/fixture to hold work piece during welding to improve safety and accuracy.
- Critically evaluate traditional hand tools vs. modern power tools for workshop tasks.

**Chairperson
Board of Studies (ME)**

PART-B**R25HS03****IT SKILLS LAB****0 0 2 1****(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))**

Course Objectives:

1. To assemble and disassemble a computer.
2. To solve hardware and software problems.
3. To learn about Networking of computers and use Internet facility for Browsing and Searching.
4. To develop project documentation using MS word.
5. To work with various productivity tools including Excel, PowerPoint.
6. To work with different online repositories such as GITHUB, AI CHATBOT.

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

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	S0 1	S0 2	
CO1	Perform Hardware troubleshooting and Perform Hardware troubleshooting	3	3	3	3	2	L2, L3
CO2	Apply different way of hooking the PC on to the internet from home and Workplace.	3	2	2	2	3	L1, L2 L3
CO3	Design word documents by learning word processing and Create presentations by using different styles and using AI Tools-Chat GPT and GITHUB	3	3	3	2	3	, L3, L4

SYLLABUS**PC Hardware & Software Installation:****9 Hours**

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 it 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. Lab instructor should verify the installation and follow it up with a Viva.

COs-CO1**Internet & World Wide Web:****6 Hours**

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

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. **COs-CO2**

MS WORD

6 Hours

Task 1: 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 2: 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:

6 Hours

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, and 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

POWER POINT

6 Hours

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

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

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.**COs-CO3**

AI TOOLS – Chat GPT

6 Hours

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model Responds. Try asking questions, starting conversations, or even providing incomplete sentences to See how the model completes them. Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to Brainstorm creative ideas Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Explore – GITHUB

6 Hours

Task 1: Students should understand GITHUB and should possess accounts in it.

Task 2: Students should explore different repositories available in GITHUB and student should Create his/ her own simple repositories.

Task 3: Students should take simple experiments /presentations and upload them in their GITHUB Account.

Task 4: Students should understand how GITHUB Enterprise Cloud is used and also explore the GIT and GIT HUB resources.

COs-CO3

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
3. IT Essentials PC Hardware and Software Companion Guide, David Anfinson and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
4. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition
5. "Excel 2021: A Comprehensive Guide" by Chris Benham.
6. "Microsoft PowerPoint 2021: A Beginner's Guide" by Steve Lambert
7. GITHUB Quick Start Tutorials

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Main_Page
2. <https://edu.gcglobal.org/en/office2007>
3. <https://www.w3schools.com>

Internal Assessment Pattern:

Cognitive Level	Internal Assessment #1(%)
L1	30
L2	20
L3	30
L4	20
Total (%)	100

Sample Short and Long Answers questions of Various Cognitive Levels

L1: Remember

1. Identify Peripherals of a computer
2. Draw a Block Diagram of the CPU and explain the components along with the functions.

3. Explain the various steps in assembling and disassembling of the CPU.
4. Write the basic utilities used while creating a PowerPoint presentation.

L2: Understand

1. How to install windows operating system.
2. What are search engines and brief the advantages of search engines.
3. Explain the process of creating a project abstract.
4. Explain how to explore GITHUB resources

L3: Apply

1. Explain the process orientation and connectivity boot camp
2. Write the different formulae used while calculating GPA
3. Explain the insertion of various templates while creating power point presentations.
4. Discuss the format for customization your browser for effective searching and online etiquette.

L4: Analysing

1. Analyze a structured approach to experiment with prompts.
2. Explore different repositories available in GITHUB.
3. "Imagine a world where every person is born with a unique, magical ability that reflects their deepest desire or fear. Describe a day in the life of a character who discovers that their ability is far more powerful and dangerous than they ever imagined. How does this revelation affect their relationships, their view of themselves, and their place in society?"

**Chairperson
Board of Studies (CSE)**

R25MC01**EMPLOYABILITY SKILLS****0 0 2 1****(Common to EEE, MECH, ECE, CSE, CSE (CS), CSE (AI&ML), CSE (DS))****Learning Outcomes:**

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

1. Listen actively and identify important information in spoken texts
2. Interpret the speech and infer the intention of the speaker
3. Improve their accent for intelligibility.
4. Speak fluently with clarity and confidence
5. Use the language in real life situations

SYLLABUS**Unit – I: Introduction To communication skills****12 Hours**

1. Significance & Functions of communication skills
2. Warm up session
3. Routine
4. Parts of Speech
5. Sentence construction
6. LSRW SKILLS
7. Productive skills
8. Receptive skills
9. subject- Verb Agreement

UNIT-II Emotional Intelligence & Adaptability**10 Hours**

1. Role Playing
2. Building Better Habits Through Emotional Discipline
3. Getting someone's Attention and Interrupting
4. Giving Attention & Seeking Clarification
5. Asking for Giving opinions
6. Agreeing & Disagreeing with opinions
7. Building Self-confidence through Self Reflection
8. Exploring Your Values & Beliefs
9. Helping Old People & Guiding Young People
10. Practicing Patience
11. Practicing Gratitude
12. Finding Purpose in Daily Activities
13. Building Resilience After Setbacks
14. Practicing Conflict Resolution Basics
15. Learning to Apologize Sincerely
16. Practicing Team Work In Daily Life
17. Building Rapport
18. Saying 'No' Without Guilt
19. Practicing Empathy & Sympathy
20. Creativity
21. Motivation
22. Time Management
23. Anger Management
24. Self Improvement
25. Decision- Making
26. Holistic Health&Ethical Behaviour

Unit-III: Brainstorming**10 Hours**

1. Adjectives
2. Root Words
3. Prefixes and Suffixes
4. Homonyms , Homographs & Homophones
5. Basic to Advanced Vocabulary
6. Describing Person/place/things/objects

Unit – IV: Non-Verbal Communication**10 Hours**

1. Personal Appearance
2. Posture
3. Gestures
4. Facial Expressions
5. Eye Contact
6. Space Distancing
7. Group Activities & Group Dynamics
8. Interpersonal skills
9. Skits
10. Debate
11. Important Quotes & Saying

Unit – V: DYADIC COMMUNICATION**10 Hours**

1. Face to Face Conversation
2. Telephonic Conversation
3. Interviews

Board of Studies: Department of English

Approved in BOS No: 01

Approved in ACM No: 01

Suggested Readings:

1. **Soft Skills: Know Yourself and Know the World** – K. Alex Publisher: S. Chand Publishing
2. **Developing Employability Skills** – M. S. Rao Publisher: Pearson Education
3. **Enhancing Employability Skills** – Shalini Verma publisher: Pearson Education
4. **Employability Skills** – S. P. Dhanave Publisher: Orient BlackSwan
5. **Soft Skills and Employability Skills** – T. M. Farhathullah Publisher: Emerald Publishers
6. **Business Communication** – Meenakshi Raman & Prakash Singh Publisher: Oxford University Press
7. **Communication Skills for Professionals** – Nira Konar Publisher: PHI Learning

Sample Short and Long Answers questions of Various Cognitive Levels**L1: Remember**

1. What are the key differences between effective and poor listening?
2. How does the listening skill impacts learning?
3. What are the different types of listening skills?
4. What are the key points of barriers of listening?
5. What are the advantages and disadvantages reading skill?
6. How does communication platforms help the students?

L2: Understanding

1. Discuss the various strategies used in communication?
2. How does language play a role in the growth and development of student career?
3. What is role play, and how does it support in language learning?
4. Discuss the role of conversation and its impact on language learning.
5. How do the debates support students?

L3: Applying

1. What are the different types Communication?
2. What are the skills required in Practicing Team Work In Daily Life
3. Perform a descriptive speech about a place using a provided picture.
4. What is JAM activity and how is it influencing the language learners?

L4: Analysing

1. How do Public speech influence your learning?
2. What are the key challenges faced in giving a presentation?
3. How does Presentation skills develop your oral skills?
4. Discuss the role of Group discussion and its advantages?
5. How can Language helps in corporate world?

L5: Evaluating

1. What is inter- personal communication?
2. How do blog platforms impact writing style?
3. Explain the concept of Group activities and Group Dynamics?
4. How does building rapport play a role in delivering speech?
5. What is Telephone etiquette?

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Chairperson
(Board of English)