P. E. S. COLLEGE OF ENGINEERING, MANDYA

Scheme of Teaching and Examinations - 2025

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2025-26)

B.E. I – Semester [Chemistry Group] | Stream: –Mechanical Engineering Stream (MES) | Programme: Mechanical Engineering

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	SEE Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	P25MAME101	Differential Calculus and Linear Algebra	Maths	3	2	0		03	50	50	100	04
2	ASC	P25CHME102	Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems	CHE	3	0	0		03	50	50	100	03
3	ESC	P25ESC1032	Computer-Aided Engineering Drawing for ME Stream	ME dept	2	0	2		03	50	50	100	03
4	ESC	P25ESC1041	Introduction to Building Science and Mechanics	Respective Engg dept	3	0	0		03	50	50	100	03
		P25ESC1045	Essentials of Information Technology	Respective Engg dept	3	0	0		03	50	50	100	03
5	PLC	P25PLC1051	Introduction to C Programming	Respective Engg dept	3	0	0		03	50	50	100	03
6	PLC	P25PLCL1061	Introduction to C Programming Laboratory	Respective Engg dept	0	0	2		03	50	50	100	01
7	ASC	P25CHMEL107	Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems Laboratory	CHE	0	0	2		03	50	50	100	01
8	AEC	P25ENG108	Communicative English-I	Humanities	0	2	0		02	50	50	100	01
9	AEC/ SDC	P25IDT109	Innovation and Design Thinking Laboratory	Any Dept	0	0	2		02	50	50	100	01
10	NCMC	P25ICO110	Indian Constitution	Humanities	1	0	0		01	100	--	100	PP
	TOTAL									**550**	**450**	**1000**	**20**

10	**AICTE Activity Points** (students have to earn **100** activity points between 01 to 08 semesters)	Compulsory requirement for the award of a degree

S- (SAAE) Students Academic Activity Engagement Hours, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **IC** – Integrated Course (Practical Course Integrated with Theory Course), **PLC(IC)**- Programming Language Course (Integrated Course), **AEC**- Ability Enhancement Course, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **ETC**- Emerging Technology Course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMC**- Humanity, Social Science and management Course, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **NCMC:** Non Credit Mandatory Course, **PP** : (Pass/Pass) is assigned to a non-credit course. "PP" represents pass in course provided students have successfully completed the CIE requirements. Otherwise, "NP-not pass shall be awarded. "PP" is essential for the award of the degree

Credit Definition: 1-hour Lecture **(L)** per week=**1Credit** 2-hoursTutorial**(T)** per week=**1Credit** 2-hours Practical / Drawing **(P)** per week=**1Credit**	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session 04-Credits (IC) are to be designed for 40 hours' theory and 10-12 hours of practical sessions 03-Credits courses are to be designed for 40 hours of Teaching-Learning Session 02- Credits courses are to be designed for 25 hours of Teaching-Learning Session 01-Credit courses are to be designed for 12 hours of Teaching-Learning sessions

The **Student Induction Programme** (SIP), initiated by the All India Council for Technical Education (AICTE), is designed to help newly admitted students in technical institutions transition smoothly into the higher education environment. It aims to familiarize students with the institutional culture, foster connections with peers and faculty, and provide a foundation for holistic learning. The first year of Engineering programmes is composed of I semester and II semester and Summer Semester. SIP activities shall be scheduled in the afternoon sessions during the first week of class commencement of I and II semesters only. Activities under SIP may include Physical Activities, Creative Arts, Universal Human Values, Literary Events, Proficiency Modules, Lectures by Eminent Personalities, Local Area Visits, Department/Branch Familiarization, and Innovation-related sessions. The specific programmes to be conducted will be notified separately by the University, with the academic calendar or separately.

AICTE Activity Points Requirement for BE/B.Tech. Programmes

As per AICTE guidelines (refer Chapter 6 – *AICTE Activity Point Program, Model Internship Guidelines*), in addition to academic requirements, students must earn a specified number of **Activity Points** to be earned is to be eligible for the award of their degree.

- **Regular students** admitted to a 4-year degree program must earn **100 Activity Points**.
- **Lateral entry students** (joining from the second year) must earn **75 Activity Points**.
- **Students transferred** from other universities directly into the fifth semester must earn **50 Activity Points** from the date of entry into VTU.

These Activity Points are **non-credit** and will not be considered for **the SGPA/CGPA** or be used for **vertical progression**. However, they are mandatory for the **award of the degree**, and the points earned will be reflected on the **eighth semester Grade Card**.

The hours spent for earning the activity points shall not be counted for regular attendance requirements. Students can accumulate these points at any time during their program, including on weekends, holidays, and vacations starting from the year of admission, provided they meet the minimum hours of engagement prescribed for each activity.

If a student fails to earn the required Activity Points, the eighth-semester Grade Card will be withheld until the requirement is fulfilled. Consequently, the degree will be awarded only after the Grade Card has been released.

Applied Mathematics-I					Applied Chemistry				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
P25MACV101	Differential Equations and Linear Algebra: CV Stream	3	2	0	P25CHCV102	Applied Chemistry for Sustainable Built Environment (CV)	3	0	0
P25MAME101	Differential Calculus and Linear Algebra: ME Stream	3	2	0	P25CHME102	Applied Chemistry for Metal Protection and Sustainable Energy (ME)	3	0	0
P25MAEE101	Calculus and Numerical Techniques: EEE Stream	3	2	0	P25CHEE102	Applied Chemistry for Futuristic Devices (EEE, ECE)	3	0	0
P25MACS101	Calculus and Linear Algebra: CSE Stream	3	2	0	P25CHCS102	Applied Chemistry for Smart Systems (CSE)	3	0	0
(ESC-I) Engineering Science Courses-I					**(PLC) Programming Language Courses and Laboratory**				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
P25ESC1041	Introduction to Building Sciences	3	0	0	P25PLC1051	Introduction to C Programming (For none IT programmes)	3	0	0
P25ESC1042	Introduction to Electrical Engineering	3	0	0	P25PLC1052	Python Programming (for CSE and allied programmes)	3	0	0
P25ESC1043	Introduction to Electronics & Communication	3	0	0	P25PLCL1061	Introduction to C Programming Laboratory (For none IT programmes)	0	0	2
					P25PLCL1062	Python Programming Laboratory (For CSE and allied programmes)	0	0	2
P25ESC1044	Introduction to Mechanical Engineering	3	0	0	**Computer Aided Engineering Drawing**				
P25ESC1045	Essentials of Information Technology	3	0	0	P25ESC1031	Computer Aided Drawing for CV Stream	2	0	2
					P25ESC1032	Computer Aided Drawing for ME stream Engineering	2	0	2
	Applied Chemistry Lab (ASC Lab)				P25ESC1033	Computer Aided Drawing for EEE stream	2	0	2
P25CHCVL107	Applied Chemistry Laboratory (Applied Chemistry for Sustainable Built Environment)	0	0	2	P25ESC1034	Computer Aided Drawing for CSE stream	2	0	2

The Mathematics/Chemistry courses shall be taught by a single faculty member per session, with no sharing of the course (subject) modules. The **tutorial sessions** for the **mathematics course** shall be conducted in the Laboratory environment using **MATLAB software** to enhance computational understanding and application skills.

Students admitted to a specific engineering stream are required to select and successfully complete **Applied Mathematics-I** and **Applied Chemistry courses** that are aligned with their program stream. These courses are intended to reinforce the academic foundations and develop the professional competencies relevant to their chosen engineering discipline.

Engineering Sciences Courses-I (ESC-I): These courses are designed to broaden the technical knowledge of students beyond their core area of study. These courses enable students to gain a foundational understanding of engineering principles from other stream courses. Students are required to select and complete two courses that are not belong to their admitted program stream. For example, a student admitted to the any programme of the Civil Engineering stream should not select Introduction to Building Sciences but any other two. One course shall select under ESC-I and another course under ESC-II. The two courses must be different from the other.

For the course **Interdisciplinary Project,** it is mandatory to form a team comprising students from multiple engineering disciplines. For example, a project team may include students from Mechanical Engineering, Electronics and Communication Engineering (ECE), and Computer Science and Engineering (CSE), working collaboratively to design and implement the project.

Computer-Aided Engineering Drawing: The courses under this category are stream-specific. Students must select and complete the course that corresponds to their admitted engineering stream.

Course Title	**Differential Calculus and Linear Algebra**						
Course Code	**P25MAME101**						
Category	**Mathematics for ME stream**						
Scheme and Credits	Theory/Practical/Integrated					Teaching hours	Credits
	L	T	P	SS	Total		
	3	2	0	-	04	40 hrs Theory+20 hrs lab)	04
CIE Marks:50	**SEE Marks:50**		**Total Max. marks = 100**		**Duration of SEE: 03 Hours**		

I Semester

Course Learning Objectives: By the end of the course, students will be able to:

- **Apply concepts of polar curves, curvature, series expansions, indeterminate forms, and multivariable calculus** to analyze and solve problems involving single- and multivariable functions.
- **Formulate and solve first-order and higher-order ordinary differential equations** using methods such as exact equations, integrating factors, Bernoulli's method, variable separation, and homogeneous solutions, and interpret their applications in engineering contexts.
- **Use linear algebra techniques and numerical methods**—including matrix transformations, rank determination, system consistency tests, Gauss/Jordan/Seidel methods, LU decomposition, eigenvalue–eigenvector analysis, and matrix polynomials—to model and solve linear systems relevant to engineering problems.

Unit	Syllabus content	Hours
I	**Polar Curves and Curvature:** Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and radius of curvature - Cartesian, parametric, polar and pedal forms. **Self - study:** Center and circle of curvature, evolutes and involutes.	08
II	**Series Expansions, Indeterminate Forms and Multivariable Calculus:** Statement and problems on Taylor's and Maclaurin's series expansion for one Variable. Indeterminate forms- L'Hospital's rule. Partial Differentiation: Partial differentiation, total derivative- differentiation of composite functions. Jacobian. Maxima and minima for a function of two variables. **Self - study:** Euler's theorem and problems. Method of Lagrange's undetermined multipliers with single constraint.	08
III	**Ordinary Differential Equations (ODE) of First Order and First Degree and Nonlinear ODE:** Exact and reducible to exact differential equations- Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ *and* $\frac{1}{m}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$ only. Linear and Bernoulli's differential equations. Orthogonal trajectories, Law of natural growth and decay. **Self-Study**: Separation of Variable and Homogeneous differential equations.	08
IV	**Linear Algebra-1:** Elementary row transformation of a matrix, Row echelon form and Rank of a matrix. Inverse of matrix by Jordan method. Consistency and Solution of system of linear equations -Gauss-elimination method, LU decomposition method and approximate solution by Gauss-Seidel method. Application to traffic flow. **Self-Study**: Gauss-Jordan method.	08

V	**Linear Algebra-2**: Eigen values and Eigen vectors, Rayleigh's power method to find the dominant Eigen value and Eigen vector. Model matrix, Diagonalization of the matrix, inverse of a matrix by Cayley-Hamilton theorem, Characteristic and minimal polynomials of block matrices, Moore-Penrose pseudo inverse. **Self-Study:** Normal form of the system of linear equations.	08

COURSE OUTCOMES: On completion of the course, student should be able to:
CO1: Apply foundational concepts of calculus and differential equations to analyze geometric properties of curves, solve first order ordinary differential equations, and model physical phenomena in science and engineering.
CO2: Apply the principles of linear algebra to solve systems of linear equations, determine eigen values and eigenvectors, and analyze real-world problems such as traffic flow.
CO3: Demonstrate the applications of mechanical engineering and allied engineering science using modern ICT tools.

Text books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons,10th Ed., 2018.
3. Gilbert Strang, Linear Algebra and its Applications, Cengage Publications, 4th Ed., 2022.

Reference books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017
2. Srimanta Pal & Subodh C.Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. N. P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication,3rd Ed., 2014.
5. Ray Wylie, Louis C. Barrett, Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th Ed., 2017.
6. David C Lay, Linear Algebra and its Applications, Pearson Publishers,4th Ed.,2018. Gareth Williams, Linear Algebra with Applications" Jones Bartlett Publishers Inc.,6th Ed., 2017.

Web links and Video Lectures (e-Resources):

- http://academicearth.org/
- VTUe-Shikshana Program
- VTU EDUSAT Program
- https://nptel.ac.in/courses/111106135
- https://nptel.ac.in/courses/111105160

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	2	3										
CO3	3	2										
Strength of correlation: Low-1, Medium-2, High-3												

PART-A		
Academic Year: 2025-2026	**Semester:** I/II	**Scheme:** P25
Course Title: Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems		
Course Code: P25CHME102	**CIE Marks:** 50	**CIE Weightage:** 50
Teaching hours/week (L: T:P) 3:0:0	**SEE Marks:** 50	**SEE Weightage**:50
Teaching hours of Pedagogy: 40	**Exam Hours:** 03	
Credits: 03		

Prerequisite:

- A foundation in materials science, physical and inorganic chemistry, electrochemistry, solid-state chemistry, and environmental science.
- A basic understanding of nanotechnology, corrosion mechanisms and sensor technology

Course learning Objectives:

CLO1: To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
CLO2: To enable students to acquire knowledge on principles of chemistry for engineering applications.
CLO3: To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
CLO4: To provide students with a solid foundation in analytical reasoning required to solve societal problems.
CLO5: To acquire the skills pertaining to analytical techniques and to apply them for Engineering field.

UNIT 1: Corrosion Science and Coating Technologies	Hrs: 08

Corrosion: Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration corrosion, corrosion control-metal coating; galvanization, surface conversion coating; anodization and cathodic protection; sacrificial anode method, corrosion penetration rate (CPR) - Introduction and numerical problems.
Coating Technologies: Introduction, technological importance, electroplating - electroplating of chromium; hard, electro-less plating - electroless plating of Nickel, difference between electroplating and electroless plating.

Self-Study Content: monitoring and detection of corrosion, Pitting and crevice corrosion, organic and nano coatings.

Textbook:
Corrosion Engineering, M .G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
"Hand book on Electroplating with Manufacture of Electro chemicals", ASIA PACIFIC BUSINESS PRESS Inc., 2017. Dr. H. Panda,

Teaching Learning Process: chalk and talk method, Use of online platforms for assignments / Notes/ Quizzes

UNIT 2: Sustainable Green Fuels	Hrs: 08

Fuels: Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV. Knocking in internal combustion engines - knocking mechanism in IC engines and anti-knocking agents - methyl tertiary butyl ether (MTBE) and

ethyl tert-butyl ether (ETBE), importance of octane and cetane rating of fuel.

Green Fuels: Introduction, power alcohol – properties, applications and its limitations, biodiesel - synthesis by trans-esterification method, advantages and its applications. Production of green hydrogen by photocatalytic water splitting and its advantages, hydrogen storage – introduction, advantages and limitations of metal hydride and ammonia as chemical hydrogen carriers.

Self-Study Content: Hybrid fuel system, properties of biodiesel, waste to fuel conversion technologies.

Textbook:

Applied Chemistry for Mechanical Engineering and Allied Branches, C Manasa, Vrushabendra B, Srikantamurthy N. ISBN: 978-93-58380-90-3, Astitva Prakashan

Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi

Teaching Learning Process: chalk and talk method, Use of ICT–Online videos, online courses

UNIT 3: Materials for Energy Systems	Hrs:08

Nanomaterials: Introduction, synthesis of TiO_2 nanoparticles by sol-gel method and its uses in catalytic converter applications, size-dependent properties of nanomaterial-surface area, catalytical, electrical and thermal conductivity. Graphene - Synthesis by chemical vapor deposition method, properties and engineering applications, role of carbon nanotubes (CNTs) in energy devices.

Energy Systems: Batteries - Introduction, classification of batteries, characteristics-capacity, power density, cell balancing and cycle life, construction, working and applications of Li-ion battery. Fuel cells - Introduction, construction and working of solid oxide fuel (SOFCs) for auxiliary power units (APUs) applications, difference between fuel cell and battery, solar photovoltaic cells (PV cells) - construction, working, advantages and limitations.

Self-Study Content: Hydrothermal and solvothermal methods for metal oxide nanoparticles. Solid state batteries, Organic PV cells.

Textbook: Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019

Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.

Teaching Learning Process: chalk and talk method, Use of ICT–Online videos, online courses

UNIT 4: Materials for Engineering Applications	Hrs: 08

Engineering Polymers: Introduction, molecular weight of polymers - number average and weight average molecular weight, numerical problems, synthesis, properties and engineering applications of chlorinated polyvinyl chloride (CPVC), and polymethyl methacrylate (PMMA), relationship between the polymers' structure and properties in regard to chain architecture. Glass transition temperature (Tg), factor affecting Tg and its significance.

Polymer Composites: Introduction, fiber-reinforced polymers (FRPs); Kevlar – Synthesis, properties and industrial applications. Carbon-fiber - Preparation from Polyacrylonitrile (PAN), properties and industrial applications.

3D Printing materials: Introduction, synthesis, properties and applications of polylactic acid (PLA) resin.

Self-Study Content: Polymer Degradation & Stability, Nano composites, composite 3D Printing Materials.

Textbook: Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, New age Int. Publishers, 4th Edition, 2021.

Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014

Teaching Learning Process: chalk and talk method, Use of ICT–Online videos, online courses

UNIT 5: Fluid Technology and Smart Sensors	Hrs:08

Lubricants: Introduction, classification, ideal properties and applications. Lubricant testing; experimental determination of viscosity using Ostwald's viscometer.

Industrial Coolants: Introduction, types-water and oil-based coolants, properties and industrial applications.

Industrial effluents: Introduction, determination of COD and numerical problems.

Sensors: Introduction, potentiometric sensor - principle and its application in the estimation of iron in steel industry effluent, conductometric sensor - principle and its application in the estimation of acid mixture in electrochemical bath effluent. pH sensor - principle and its application in the estimation of pKa of acid electrolyte.

Self-Study Content: coolant additives, Sensor Calibration & Data Interpretation, Amperometric sensors, optical sensors, biosensors, gas sensors.

Teaching Learning Process: chalk and talk method, Experiments in laboratories shall be executed in blended mode

Textbook:

Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: The National Academies Press. doi: 10.17226/4782.

Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyanarayanan, Nirali Prakashan, 2020.

Course Outcomes: At the end of the course students should be able to :

CO1: Understand the principles, types, control methods of corrosion and the fundamentals of electroplating and electroless plating technologies.

CO2: Apply the concepts of fuel calorific value, engine knocking, green fuels, and hydrogen production and storage to solve practical problems and evaluate fuel performance

CO3: Analyse the synthesis, properties, and applications of nanomaterials, and evaluate batteries, fuel cells, and photovoltaic systems for energy conversion and storage.

CO4: Evaluate the synthesis, properties, structure–property relationships, and engineering applications of polymers, polymer composites, and 3D printing materials.

CO5: Analyse the properties, testing methods, and applications of lubricants and examine the principles and applications of different analytical techniques.

Suggested Learning Resources:

Textbooks:

Sl.no	Title	Author	Year & Edition	Publisher
1	A Text book of Engineering Chemistry	S. S. Dara	15th Edition 2020.	S. Chand & Company Ltd.
2	"Chemistry for Engineering Students"	B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar.	10th Edition, 2020	Subash Publications
3	Text Book of Polymer Science	F. W. Billmeyer	15th Edition, 2020	John Wiley & Sons

Reference Books:				
1.	A Text Book of Engineering Chemistry	R. V. Gadag and Nityananda Shetty	2nd Edition, 2016.	I.K. International Publishing house
2	Nanotechnology A Chemical Approach to Nanomaterials	G.A. Ozin & A.C. Arsenault	2005.	RSC Publishing
3	Engineering Chemistry	PC Jain & Monica Jain	2015-16thEdition.	Dhanpat Rai Publication.0

Web links and Video Lectures (e-resources)

1. https://www.vturesource.com/post/1570/News/Bomb-calorimeter-construction-working-vtu-chemistry.html?utm_source
2. https://pubs.acs.org/doi/10.1021/acsomega.3c00963?utm_source
3. https://youtu.be/qTw_p9dkiVU
4. https://youtu.be/wdCYXj-bI-U
5. https://youtu.be/Y0EkLYK5i-c
6. https://youtu.be/tzTxMF7CDd4
7. https://youtu.be/YxrpQEX9ORA
8. https://youtu.be/Gxv4r9qoRf8
9. https://youtu.be/XIjDw5Sw9c4
10. https://youtu.be/j_rNjiIiBKE
11. https://youtu.be/GpbcjWstzEE
12. https://youtu.be/ygtbo5KDXeI
13. https://www.youtube.com/watch?v=ygtbo5KDXeIhttps://youtu.be/y-7t-GdRTKA
14. https://pmc.ncbi.nlm.nih.gov/articles/PMC11085161/?utm_source

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning(Example)

1. **Project-Based Learning (PBL):** Students gain knowledge by working on complex, real-world projects over time.
   Example: Building prototypes, developing community solutions, research presentations.
2. **Flipped Classroom:** Students learn theoretical content at home (videos, readings) and engage in problem-solving or discussions in class.

Course Name: Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems
Course Code: P25CHME102

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	1	1		2					1					
CO-2	3	2		1					2					
CO-3	3	3		2					2					
CO-4	3	3		3					3					
CO-5	3	2		1					1					

3 – HIGH, 2 – MEDIUM, 1 - LOW

Academic Year: 2025-26	Semester: I	Scheme: P25
Course Title: Computer Aided Engineering Drawing for ME Stream		
Course Code: P25ESC1032	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P): 2:0:2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy:40 Hours	Exam Hours: 3 Hrs	
Credits:03		

Course Learning Objectives

- To understand the fundamentals and significance of engineering drawing and BIS conventions.
- To learn the use of computer-aided drafting tools for creating 2D and 3D drawings.
- To develop skills in orthographic projection, sectional views, and development of solids.
- To acquire the ability to visualize and model simple engineering components in 3D.

Unit 1:	**Hrs:8**

Introduction: Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Orthographic Projections of Points, Lines and Planes: Introduction to Orthographic projections, Orthographic projections of points in 1st and 3rd quadrants. Orthographic projections of lines (Placed in First quadrant only as per BIS) Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).

Unit 2:	**Hrs:8**

Orthographic Projection of Solids: Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.

Unit 3:	**Hrs:8**

Section of Solids: Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice).

Development of Lateral Surfaces of Solids: Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations. Problems on applications of development of lateral surfaces like funnels and trays.

Unit4:	**Hrs:8**

Isometric Views: Introduction to Isometric views, Isometric projections, Isometric scale. Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids, step block. Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views.

Unit 5:	**Hrs:8**

Concept of Part Design (For CIE Only):3D Modeling: Simple machine parts / engineering components. (Applying material properties and rendering for realistic visualization) Sheet Metal & Surface Design: Automotive panels, HVAC ducting Concept of Industrial drawing.

Suggested Learning Resources:

Textbooks:

Sl. No	Title	Author	Year & Edition	Publisher
1	A Textbook of Computer Aided Engineering Drawing	K. R. Gopalakrishna, & Sudhir Gopalakrishna	2017, 39th Edition,	Subash Stores, Bangalore.
2	Engineering Drawing: Plane and Solid Geometry	Bhatt, N. D.	2023, 53rd Edition	Charotar Publishing House Pvt. Limited.

Reference Books:

1.	Engineering Visualisation	S. N. Lal and T. Madhusudhan	2022, 1st Edition	Engage Learning India Pvt. Ltd.
2.	Computer Aided Engineering Drawing	P.J. Shah	2021	S. Chand Publishing
3.	Engineering Drawing	M. B. Shah & B.C. Rana	2009, Revised Edition	Pearson Education

Web links and Video Lectures (e-resources)

- https://nptel.ac.in/courses/112104172
- https://nptel.ac.in/courses/112102304
- https://nptel.ac.in/courses/112105294
- https://www.coursera.org/courses?query=3d%20modeling&utm
- https://www.classcentral.com/subject/sheet-metal-design?utm

Teaching-Learning Process (Innovative Delivery Methods)

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching learning process and facilitate the achievement of course outcomes.

- Flipped Classroom
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	Generate orthographic projections of points, lines, planes, and solids manually and with computer aided tools.	3	2	2	1	2								
CO2	Develop the lateral surfaces of solids for real-world applications.	3	2	2		1								
CO3	Draw isometric views and convert isometric drawings to orthographic views.	3	2	2		2								
CO4	Create basic 3D models of engineering components and parts.	3	2	3	2	3								

Academic Year: 2025-26	Semester: I	Scheme: P25
Course Title: Introduction to Building Science and Mechanics		
Course Code: P25ESC1041	CIE Marks: 50	CIE Weightage: 50%
Teaching hours/week (L: T:P): 3:0:0	SEE Marks: 50	SEE Weightage: 50%
Teaching hours of Pedagogy: 40	Exam Hours: 3	
Credits: 3		

Prerequisite:

Students should have a foundation in mathematics and physics, along with introductory knowledge of engineering graphics and construction materials to take Building Science and Mechanics.

Course Learning Objectives: This course will enable the students to,

- Introduce the basic principles of building science and the role of different civil engineering disciplines in the design and construction of buildings.
- Provide an overview of construction materials, structural elements, and their significance in the performance of buildings.
- Develop awareness of sustainability concepts and green building practices for a sustainable built environment.
- Familiarize students with the fundamental principles of engineering mechanics, including force systems, equilibrium, and structural behavior.
- Build a foundation for analyzing geometrical properties of sections to support further learning in structural analysis and design.

Unit 1	**Hrs: 08**

Introduction to building science: Importance and Scope of various fields of Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering, Environmental Engineering, Construction Planning and Project Management.

Basic Materials of Construction: Types and Uses of Bricks, Stones, Cement, Structural Steel, Wood and Concrete. Structural Elements of a Building: Concept of Foundation, Plinth, Lintel, Chejja, Masonry wall, Column, Beam, Slab, Flooring and Staircase.

Self-Study Content: Modern concretes (self-compacting, fiber-reinforced, geopolymer).

Unit 2	**Hrs: 08**

Sustainable Built Environment: Emerging materials: Types and Uses of Autoclaved Aerated Concrete (AAC) blocks, Bamboo, Recycled plastics, Material selection criteria, Durability, Sustainability, Smart City concept. Green Building

Green building: materials and rating systems IGBC, LEED, GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights - Point System with Differential weightage.

Self-Study Content: Use of waste plastic in road construction & composite panels.

Unit 3	**Hrs: 08**

Force Systems: Concept of idealization, System of forces, Principles of transmissibility of a force, Resolution and composition of forces, Law of Parallelogram of forces, Concurrent and non-concurrent coplanar force systems, Moment of forces, Couple, Varignon's theorem: Numerical examples.

Self-Study Content: Lami's theorem (Three concurrent force equilibrium). equilibrium polygon method (non-concurrent forces).

Unit 4	**Hrs: 08**
Equilibrium and Support Reactions: Free body diagram, equations of equilibrium, Lami's Theorem, Equilibrium of Coplanar Concurrent and Non -concurrent force systems: Numerical examples. Types of loadings, beams and supports, Concept of Statically determinate and indeterminate structures (Definitions with examples only), Support reactions: Numerical examples on Statically determinate beams.	
Self-Study Content: Study equilibrium illustrations like Railway bridge (simply supported beam with moving loads)	
Unit 5	**Hrs: 08**
Centroid of Plane areas: Introduction, Locating the centroid of rectangle, triangle, circle, semicircle and quadrant of a circle using method of integration, centroid of composite areas and simple built-up sections: Numerical examples.	
Self-Study Content: case study on centroid location affects stability (e.g., ships, towers).	

Course outcomes: On completion of this course, students are able to;

COs	**Course Outcomes** with **Action verbs** for course topics	**Bloom's Taxonomy Level**	**Level Indicator**
CO1	***Explain*** the fundamental concepts of building science, disciplines of civil engineering, construction materials, and structural elements of buildings.	**Understand**	**L2**
CO2	***Examine*** the sustainability aspects of the built environment through appropriate selection of green materials and interpretation of rating systems.	**Analyse**	**L4**
CO3	***Apply*** the principles of force systems and equilibrium to determine support reactions	**Apply**	**L3**
CO4	**Analyse** the centroid of simple and composite plane areas using first principles	**Analyse**	**L4**

Suggested Learning Resources:

Text Books:

Sl. No.	**Title**	**Author**	**Year & Edition**	**Publisher**
1	Building Construction	Rangwala,	2016 33rd Edition	Charotar Publishing House Pvt. Ltd.
2	Basic Civil Engineering and Engineering Mechanics	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan,	2015 3rd Edition	Laxmi Publications
3	Elements of Civil Engineering and Engineering Mechanics	Kolhapure B K	11th Edition, 2018	Eastern Book Promoters Belgaum [EBPB]

Reference Books:

1	Mechanics for Engineers: Statics and Dynamics	Beer F.P. and Johnston E. R.,	1987 4th Edition	McGraw Hill, ISBN: 9780070045842
2	Engineering Mechanics-Statics, Vol I	Meriam J. L. and Kraige L. G,	2008 6th Edition	Wiley publication
3	Engineering Mechanics - Statics and Dynamics	Irving H. Shames	2002 4th Edition	Prentice-Hall of India (PHI).

4.	Engineering Mechanics: Principles of Statics and Dynamics	Hibbler R. C.	2017	Pearson Press, New Delhi
5	Engineering Mechanics	Timoshenko S, Young D. H., Rao J. V., Sukumar Patil	2017 5th Edition	McGraw Hill Publisher, ISBN: 9781259062667
6	Engineering Mechanics	Bhavikatti S S,	2018 4th Edition	New Age International Publications
7	Engineering Mechanics	Reddy Vijaykumar K and Suresh Kumar K,	2013 3rd Edition	BS Publications

Web Links and Video Lectures (e-resources):

1. Centroids &Area of Moments: https://www.youtube.com/watch?v=3YBXteL-qY4
2. Introduction To Engineering Mechanics - Newton's Laws of motion - Kinetics – Kinematics: https://www.youtube.com/watch?v=ksmsp9OzAsI
3. Statics and Dynamics in Engineering Mechanics: https://www.youtube.com/watch?v=x1ef048b3CE
4. Solving Forces in Equilibrium: https://www.youtube.com/watch?v=l_Nck-X49qc
5. Centre of Gravity - Definition, Examples, Experiment: https://www.youtube.com/watch?v=R8wKV0UQtlo
6. System of Forces: https://www.youtube.com/watch?v=0RZHHgL8m_A
7. Understanding the Area Moment of Inertia: https://www.youtube.com/watch?v=Bls5KnQOWkY
8. Types of Beams in Engineering Mechanics: https://www.youtube.com/watch?v=Zrc_gB1YYS0
9. Understanding and Analysing Trusses: https://www.youtube.com/watch?v=Hn_iozUo9m4

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning:

1. Flip Class
2. Seminar/Poster Presentation
3. Individual role play/ Team Demonstration/ collaborative activity
4. Case study
5. Learn by Doing

COURSE ARTICULATION MATRIX
(INTRODUCTION TO BUILDING SCIENCE AND MECHANICS - P25ESC1041)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1			2	2					2		
CO2	2	2	1			2	2						3	
CO3	3	3	2			2						3		
CO4	3	3	2			2							3	

3-High, 2 Medium, 1-Slight

Academic Year: 2025-26	**Semester:** I/II	**Scheme:** P25
Course Title: Essentials of Information Technology		
Course Code: P25ESC1045	**CIE Marks:** 50	**CIE Weightage:** 50%
Teaching hours/week (L: T:P): 3:0:0	**SEE Marks:** 50	**SEE Weightage:** 50%
Teaching hours of Pedagogy:40 Hours	**Exam Hours:** 3 Hrs	
Credits:03		

Course Learning Objectives:

- Understand core concepts of computing, including data handling, operating systems, networking, software engineering, and web development.
- Apply technical and ethical principles to design secure, efficient, and responsible computing solutions.

Unit 1:	**Hrs:8**

Data Storage: Bits and Their Storage, Main Memory, Mass Storage, Representing Information as Bit Patterns, The Binary System, Storing Integers, Storing Fractions.
Data Manipulation: Computer Architecture, Machine Language, Program Execution, Arithmetic/Logic Instructions, Communicating with Other Devices.
Textbook 1: Chapter-1 (1.1-1.7), Chapter-2 (2.1-2.5)

Unit 2:	**Hrs:8**

Operating Systems: The History of Operating Systems, Operating System Architecture, Coordinating the Machine's Activities, Handling Competition Among Processes, Security.
Algorithms: The Concept of an Algorithm, Algorithm Representation, Algorithm Discovery.
Textbook 1: Chapter-3, Chapter-5 (5.1-5.3)

Unit 3:	**Hrs:8**

Networking and the Internet: Network Fundamentals, The Internet, The World Wide Web, Internet Protocols, Security.
Cybersecurity: Overview—What is Cybersecurity?, Brief History of Cybersecurity Events, The Basic Information Security Model, Cyber Hygiene, Teams in Cybersecurity.
Ethical Issues in Information Technology: Overview, Ownership Rules, Ethics and Online Content.
Textbook 1: Chapter-4Textbook 2: Chapter-16, Chapter-17

Unit4:	**Hrs:8**

Software Engineering: The Software Engineering Discipline, The Software Life Cycle, Software Engineering Methodologies, Modularity, Tools of the Trade.
Database Systems: Database Fundamentals, The Relational Model.
Textbook 1: Chapter-7 (7.1-7.5), Chapter-9 (9.1-9.2)

Unit 5:	**Hrs:8**

Introduction to HTML and Website Development: What is HTML?, Cascading Style Sheets (CSS), Website Design and Storyboarding, Structure of a Website.
Computer Graphics: The Scope of Computer Graphics, Overview of 3D Graphics, Modeling, Rendering.
Textbook 2: Chapter-12. Textbook 1: Chapter-10 (10.1-10.4)

Suggested Learning Resources:
Textbooks:

Sl. No.	Title	Author	Year & Edition	Publisher
1	Computer Science: An Overview,	J. Glenn Brookshear and Dennis Brylow,	2017, 12th Edition	Pearson Education Limited
2	Fundamentals of Information Technology	Roy, Shambhavi; Daniel, Clinton; and Agrawal, Manish		Digital Commons at The University of South Florida (2023)
Reference Books:				
1.	Introduction to Information Technology	V. Rajaraman,	2018, 3rd Edition,	PHI Learning,
2.	Information Technology in Theory.	Pelin Aksoy,	First Edition,	Cengage.

Web links and Video Lectures (e-resources)

- Information Technology: https://onlinecourses.swayam2.ac.in/cec20_cs05/preview
- Computer Organization and Architecture: https://nptel.ac.in/courses/106103068
- Introduction To Internet: https://nptel.ac.in/courses/106105084

Teaching-Learning Process (Innovative Delivery Methods)

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching learning process and facilitate the achievement of course outcomes.

1. Flipped Classroom
2. Problem-Based Learning (PBL)
3. Case-Based Teaching
4. Simulation and Virtual Labs
5. ICT-Enabled Teaching

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	Illustrate different information representation and manipulation schemes.	3				2								1
CO2	Make use of Information Technology (IT) infrastructure for information exchange.					3				2				2
CO3	Apply basic software engineering concepts for Website and application development.	2		3		2								3
CO4	Develop queries for quick insert, access and updating of structured information.					3								2
CO5	Identify role of cybersecurity and ethics issues in Information Technology (IT)						2	3						1

Academic Year: 2025-26	**Semester: I**	**Scheme: P25**
Course Title: **Introduction to C Programming**		
Course Code: **P25PLC1051**	CIE Marks:**50**	CIE Weightage:**50%**
Teaching hours/week (L:T:P): **3:0:0**	SEE Marks:**50**	SEE Weightage:**50%**
Teaching hours of Pedagogy:**40**	Exam Hours: **3 Hrs**	
Credits:**3**		

Course learning Objectives:

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

- Explain the basic structure, syntax, and primitive constructs of a C program, including data types, variables, and operators.
- Apply decision-making and looping constructs to develop programs that solve simple computational problems.
- To implement solutions for data manipulation and problem-solving in real-world contexts using Use arrays and string operations.
- Develop modular programs using user-defined functions and apply concepts of recursion and parameter passing.
- Demonstrate the use of structures and pointers to represent and manipulate complex data efficiently.
- Integrate various C programming constructs to design, implement, and debug complete programs for practical applications.

Unit 1	**8 Hours**

Flowchart and Algorithms: Art of Programming through Algorithms & Flowcharts.
Overview of C: History of C, Importance of C, Basic Structure of C Programs, Programming Style, Compiling and Executing a 'C' Program.
Constants, Variables and Data Types: Character Set, C Tokens, Keywords and Identifiers, Constants, Variables,
Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants, Declaring a Variables as Constants and Volatile, Input/Output Statements in C.

Textbook Map: Chapter 1. 6, 2.1, 2.2, 2.8, 2.9, 2.10, Chapter 3.2 to 3.14, Chapter 5.1 to 5.5

Unit 2	**8 Hours**

Operators: Introduction to Operators, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Precedence of Arithmetic Operators.
Decision Making, Branching, Looping: Introduction, Decision Making with IF Statement, Simple IF Statement,
The IF ELSE Statement, Nesting of IF..ELSE Statements, The ELSE IF Ladder, The Switch Statement, The?: Operator, The GOTO Statement, WHILE, DO, FOR, Jumps in LOOPS.

Textbook Map: Chapter 4.1 to 4.7, 4.12, Chapter 6.1 to 6.9, Chapter 7.1 to 7.5

Unit 3	**8 Hours**

Arrays and Strings: Introduction, Declaration and Initialization of One-dimensional and Two-Dimensional Arrays, Declaring and Initializing String Variables, Example programs using arrays, Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, Comparison of Two Strings, String handling Functions.

Textbook Map: Chapter 8.1 to 8.6, Chapter 9.2 to 9.5, 9.7, 9.8

Unit 4	8 Hours
User-defined Functions: Introduction, Need for User-defined Functions, A Multi-functional Program, Elements of User-defined Functions, Definition of Function, Return Values and their Types, Function Calls, Function Declaration, No Arguments and no Return Values, Arguments but no Return Values, Nesting of Functions.	
Textbook Map: Chapter 10.1 to 10.8, 10.10 to 10.14	
Unit 5	**8 Hours**
Structures and Pointers: Introduction, defining a Structure, Declaring and Accessing Structure Variables and Members, Structure Initialization, Copying and Comparing Structure Variables, Array of Structures, Arrays within Structures. **Pointers:** Introduction, Understanding Pointers, Accessing the Address of Variable, declaring pointer variables, initialization of pointers, accessing variables through its pointer.	
Textbook Map: Textbook 1: Chapter 7	
Textbooks: Chapter 11.1 to 11.6, 11.8, 11.19, Chapter 12.1 to 12.6	
Suggested Learning Resources:	

1	Programming in ANSI C	9e, E Balaguruswamy		Tata McGraw Hill Education
Reference Books:				
1.	PROGRAMMING IN C	Reema Thareja, Oxford University	3rd Edition	2023
2	The 'C' Programming Language	Brian W. Kernighan and Dennis M. Ritchie	2nd Edition	Prentice Hall of India, 2015

Web links and Video Lectures (e-Resources):

1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2. https://nptel.ac.in/courses/106/105/106105171/ MOOC

Courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods.

- https://www.tutorialspoint.com/what-is-an-algorithm-and-flowchart-in-c-language
- https://www.tutorialspoint.com/cprogramming/c_data_types.htm
- https://www.tutorialspoint.com/cprogramming/c_operators.htm
- https://www.ccbp.in/blog/articles/decision-making-statements-in-c
- https://www.tutorialspoint.com/cprogramming/c_arrays.htm
- https://www.geeksforgeeks.org/variables-in-c/
- https://www.w3schools.com/c/c_arrays.php
- https://www.programiz.com/c-programming/c-strings
- https://www.programiz.com/c-programming/c-pointers
- https://www.scaler.com/topics/c/structures-c/

Course Outcomes: On completion of this course, students are able to:

COs	**Course Outcomes** with ***Action verbs*** for the Course topics	Bloom's Taxonomy Level	Program Outcome Addressed (PO #) with BTL
CO1	Apply the fundamental programming principles to construct efficient solutions by integrating C language features such as	L2, L3	PO1

	data types, control structures, arrays, functions, structures, and pointers.		
CO2	*Analyze and Develop* algorithms/logical constructs to solve problems through systematic and efficient programming approaches.	L4	PO2, PO3
CO3	*Construct* C programs by integrating multiple programming components and techniques.	L4, L6	PO3
CO4	Design and implement modular programs by integrating user-defined functions, structures, and pointers to develop efficient solutions for complex computational problems.	L4, L6	PO3, PO4
CO5	Design and develop optimized efficient programs using C programming practices and modern tools, ensuring robustness, scalability, and maintainability for the given problem.	L6	PO4, PO5

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
#1	3											3	
#2		3	2										3
#3			2										
#4			2	2									
#5				2	2								

Academic Year: 2025-26	Semester: I	Scheme: P25
Course Title: **Introduction to C Programming Laboratory**		
Course Code: **P25PLCL1061**	CIE Marks:**50**	CIE Weightage:**50%**
Teaching hours/week (L: T:P): **0:0:2**	SEE Marks:**50**	SEE Weightage:**50%**
Teaching hours of Pedagogy: **24**	Exam Hours: **3**	
Credits:**1**		

PRACTICAL COMPONENT	
1.	Develop a program to calculate the temperature converter from degree to Fahrenheit.
2.	Develop a program to find the roots of quadratic equations.
3.	Develop a program to find whether a given number is prime or not.
4.	Develop a program to find key elements in an array using linear search.
5.	Given age and gender of a person, develop a program to categorize senior citizen (male & female).
6.	Generate Floyd's triangle for given rows.
7.	Develop a program to find the transpose of a matrix.
8.	Develop a program to concatenate two strings, find length of a string and copy one string to other using string operations.
9.	Develop a modular program to find GCD and LCM of given numbers.
10.	Develop a program to declare the structure of employees and display the employee records with higher salary among two employees.
11.	Develop a program to add two numbers using the pointers to the variables.
12.	Develop a program to find the sum of digits of a given number.
13.	Develop a program to perform Matrix Multiplication.
14.	Develop a program to create an array of structures to store book details and check whether a specific book, as requested by the user, is available or not.

Course Outcome

Course Outcomes: On completion of this course, students are able to:

COs	**Course Outcomes** with ***Action verbs*** for the Course topics	**Bloom's Taxonomy Level**	**Program Outcome Addressed (PO #) with BTL**
CO1	Apply fundamentals of C programming constructs to implement and solve basic computational problems.	L3	PO1,PO2
CO2	Develop C programs to transform data structures such as arrays, strings and matrices to solve the given problems.	L5	PO2,PO3,PO4
CO3	Create efficient modular programs by employing advanced C programming concepts.	L4,L6	PO2,PO3,PO4
CO4	Design, implement and test programs that solve real-world problems utilizing modern tools for efficient coding and debugging.	L4,L6	PO3, PO4,PO5,PO11

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
#1	3	3										3	3
#2		2	2	1									2
#3		2	2	1									2
#4			2	1	1						2		

PART-A		
Academic Year: 2025-2026	**Semester:** I/II	**Scheme:** P25
Course Title: Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems Laboratory		
Course Code: P25CHMEL107	**CIE Marks:** 50	**CIE Weightage:** 50
Teaching hours/week (L: T:P) 0:0:2	**SEE Marks:** 50	**SEE Weightage**:50
Teaching hours of Pedagogy: 20	**Exam Hours:** 02	
Credits: 01		
Prerequisite: Know basic chemistry concepts, handle chemicals and instruments safely, measure and record accurately.		

Course learning Objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To enable students to acquire knowledge on principles of chemistry for engineering applications.
- To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
- To provide students with a solid foundation in analytical reasoning required to solve societal problems.
- To acquire the skills pertaining to analytical techniques and to apply them for Engineering field.

FIXED SET OF EXPERIMENTS

1. Estimation of total hardness of water by EDTA method
2. Determination of chemical oxygen demand (COD) of industrial wastewater
3. Estimation of iron in steel industry effluent by diphenyl amine indicator method
4. Determination of alkalinity of water using standard NaOH solution
5. Estimation of acid mixture in electrochemical bath effluent using conductometric sensor (Conductometry)
6. Estimation of iron in rust sample by Potentiometric sensor (Potentiometry)
7. Determination of pKa of acid electrolyte using pH sensor (Glass electrode)
8. Estimation of copper present in e-waste by optical sensor (Colorimetry)
9. Determination of viscosity coefficient of lubricant using Ostwald's viscometer
10. Determination of acid value of biofuel
11. Green synthesis of copper nanoparticles for conductive inks
12. Synthesis of polylactic acid (PLA).

Course Outcomes: At the end of the course students should be able to :

CO1: Apply titrimetric and redox-based analytical techniques for the analysis of the constituents.
CO2: Analyze the experimental data using a suitable sensor to interpret the results obtained.

Course Name: Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems Laboratory

Course Code: P25CHMEL102

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1					2									
CO-2					3									

3 – HIGH, 2 – MEDIUM, 1 - LOW

Course Title:	**Communicative English – I (Common to all branches)**		
Course Code:	P25ENG108	**CIE Marks**	50
	Theory	**SEE Marks**	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	0:2:0:2	**Exam Hours**	02 Theory
Total Hours of Pedagogy	30 hours	**Credits**	01

Module-1: Introduction to Communication Skills	6 Hours
Introduction to communication, Meaning and process, Channels of communication, Elements of communication, Barriers to effective communication. Activities - Making introductions, sharing personal information, Describing feelings and opinions.	
Module-2: Listening Skills I	**4 Hours**
Hearing vs. Listening, Types of listening, Determinants of good listening, Active listening process, Barriers to listening, Activities - Listening for pronunciation practice, listening for personal communication, Listening for communication - language functions	
Module-3: Speaking Skills I	**6 Hours**
Basics of speaking, Elements and Functions of speaking, structuring your speech, Focusing on fluency, Homographs and Signpost words. Activities – Free Speech and Pick and Speak	
Module-4: Reading Skills I	**4 Hours**
Developing reading as a habit, building confidence in reading, improving reading skills, Techniques of reading - skimming and scanning. Activities - understanding students' attitudes towards reading, countering common errors in reading, developing efficiency in reading.	
Writing Skills I	**4 Hours**
Improving writing skills, Spellings and punctuation, Letter and Paragraph writing. Activity – Writing your personal story	
Module-5: Body Language and Presentation Skills	**6 Hours**
Elements of body language, Types, Adapting positive body language, Cultural differences in body language. 4 Ps in presentations, Overcoming the fear of public speaking, Effective use of verbal and nonverbal presentation techniques. Activity – Group presentations	
Course Outcomes: On completion of this course, students will be able to, CO1: Understanding elements of communication, barriers to effective communication, and channels of communication. CO2: Learning determinants of good listening, active listening processes, and types of listening. CO3: Mastering basics of speaking, structuring speeches, focusing on fluency, and overcoming fear of public speaking. CO4: Developing efficiency in writing, understanding common errors, and practicing letter and paragraph writing	

Textbooks and Reference Books:

1. Communication Skills by Sanjay Kumar and Pushpa Lata, Oxford University Press - 2015.
2. Everyday Dialogues in English by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
3. Developing Communication Skills by Krishna Mohan& Meera Banerjee (Macmillan)

4. The Oxford Guide to Writing and Speaking, John Seely, Oxford.
5. English Language Communication Skills - Lab Manual cum Workbook by Rajesh Kumar Singh, Cengage learning India Pvt Limited – 2018

CO – PO – PSO Matrix

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11		PSO1	PSO2	PSO3
CO1								1	3		2				
CO2									3		1				
CO3								1	3		2				
CO4					1				3		2				
CO															

Academic Year: 2025-2026	**Semester:** I	**Scheme:** P25
Course Title: Innovation & Design Thinking Laboratory		
Course Code: P25IDT109	**CIE Marks:** 50	**CIE Weightage:** 50
Teaching hours/week (L:T:P) 0:0:2	**SEE Marks:** 50	**SEE Weightage**:50
Teaching hours of Pedagogy: -	**Exam Hours:** 02	
Credits: 01		

Prerequisite:

- Empathy, creativity, experimentation, and iteration
- Ability to identify and tackle complex problems
- Hands-on experience with prototyping and user testing

Course learning Objectives:

CLO1: Understand a community-based challenge and perform research to analyze the problem.
CLO2: Generate and evaluate solution ideas based on the problem analysis and select a feasible concept for prototyping.
CLO3: Learn and apply appropriate rapid prototyping tools and techniques (e.g., Arduino, 3D printing, Figma, Onshape, etc.) to build a Proof of Concept (PoC).
CLO4: Demonstrate their prototype solution through a structured presentation or demo, explaining the design decisions, functionality, and potential impact.

Course content

Week -1&2
Introduction to Social Entrepreneurship, Innovation and Design Thinking Group discussion on What is Innovation vs Invention. Why Design Thinking is important. Brief about 5 stages: Empathize – Define – Ideate – Prototype – Test.

Week -3,4&5
Problem Immersion & 5W1H Mind Mapping, Root Cause (Fishbone) & User Journey Mapping Ideation (Design Sprint principles & SCAMPER).

Week -6,7 &8
Low-Fidelity Wireframing & Information Architecture (IT), High-Fidelity Prototyping (IT), CAD Design - Part 1 (2D Sketching) (Circuit branches, Mech, Civil), CAD Design - Part 2 (3D Part modelling & Assembly) (Circuit branches)

Week-9 10 &11
UI Design using Figma (IT), Backend Setup (Supabase) & Database Design (IT), Frontend Development - Flutter flow (IT), Basic Electronics and Simulation (Circuit branches), Arduino Basics (Circuit branches), Arduino Sensor integration (Circuit branches), Digital fabrication using Laser cutting and 3D printing (Mech/civil), woodworking (Mech/Civil)

Week- 12,13&14: Prototype building Hackathon and Demo Day

Course Outcomes: At the end of the course students should be able to:

CO1: Apply innovation strategies to real-world challenges
CO2: Analyze market trends and user needs to identify opportunities for innovation
CO3: Develop problem statements and ideate multiple creative solutions.
CO4: Build Prototypes to demonstrate design concepts.

Course Articulation Matrix														
Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3	3			2	2		2			1		
CO2		3	2			2	1		2			2		
CO3	2	3	3						2	2		1		
CO4	2	3		2	3				2	2				

Indian Constitution			
Course Code	**P25ICO110**	CIE Marks	100
Teaching Hours/Week (L: T:P: S)	1:0:0	SEE Marks	---
Total Hours of Pedagogy	01Hours/Week	Total Marks	100
Credits	00	Exam Hours	-

Course objectives: This course will enable the students

1. To know about the basic structure of the Indian Constitution.
2. To know the Fundamental Rights (FRs), DPSP's, and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, and procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Module - 1

Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.

Module - 2

FR's, FD's and DPSP's: Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.

Module - 3

Union Executive: Parliamentary System, Union Executive - President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.

Module - 4

State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions.

Module-5

Professional Ethics: Ethics & Values. Types of Ethics. Scope & Aims of Professional & Engineering Ethics. Positive and Negative Faces of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching -Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation-based learning, (v) Personalized learning, (vi) Problems based learning through discussion. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students in theoretical applied and practical skills.
Course outcome (Course Skill Set): At the end of the course the student will be able to :
CO1: Analyse the basic structure of Indian Constitution.
CO2: Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3: know about our Union Government, political structure & codes, procedures.
CO4: Understand our State Executive & Elections system of India.
CO5: Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.