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 2025-2026)

B.E. II – Semester [Chemistry Group] | **Stream: Computer Science & Engineering Stream (CS & E)** | **Programme: CS & E, IS & E, AIML, DS, CSBS**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	P25MACS201	Numerical Methods	Mathematics	3	2	0		03	50	50	100	04
2	ASC	P25CHCS202	Applied Chemistry for Smart Systems	Chemistry	3	0	0		03	50	50	100	03
3	ETC	P25ESC2034	Computer Aided Drawing for CSE stream	Mechanical	3	0	0		03	50	50	100	03
4	ESC	P25ESC2042	Introduction to Electrical Engineering	EEE	3	0	0		03	50	50	100	03
		P25ESC2043	Introduction to Electronics & Communication Engineering	ECE									
5	PLC	P25PLC2052	Python Programming	Respective Engineering dept	3	0	0		03	50	50	100	03
6	PLCL	P25PLCL2062	Python Programming Laboratory	Respective Engineering dept	0	0	2		02	50	50	100	01
7	ASC	P25CHCSL207	Applied Chemistry for Smart Systems Laboratory	Chemistry	0	0	2		02	50	50	100	01
8	AEC	P25ENG208	Communicative English – II	Humanities	1	0	0		01	50	50	100	01
9	AEC/SDC	P25IDT209	Interdisciplinary Project Based Learning	Any Dept	0	0	2		02	50	50	100	01
10	NCMC	P25ICO210	Indian Constitution	Humanities	1	0	0		01	100	--	100	PP
				TOTAL						550	450	**1000**	**20**
11	**AICTE Activity Points** (students have to earn **100** activity points between 01 to 08 semester)				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:	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
1-hour Lecture **(L)** per week=**1Credit** 2-hours Tutorial **(T)** per week=**1Credit**	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
2-hours Practical / Drawing (**P**) per week=**1Credit**	01-Credit courses are to be designed for 12 hours of Teaching-Learning sessions

Integrated courses (IC), combining theory with practical components.

The theory sessions conducted for 3 hours per week, while the practical sessions will be conducted for 2 hours per week.

- The theory component will be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component will be assessed only through CIE. However, questions related to the practical content will be included in the SEE question paper as part of the final examination.

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 Physics				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
P25MACV101	Differential Calculus and Linear Algebra: CV Stream	3	2	0	P25PHCV102	Physics for Sustainable Structural System (CV stream)	3	0	0
P25MAME101	Differential Calculus and Linear Algebra: ME Stream	3	2	0	P25PHME102	Physics of Materials (Mech stream)	3	0	0
P25MAEE101	Differential Calculus and Linear Algebra: EEE Stream	3	2	0	P25PHEC102	Quantum Physics and Electronics Sensors (ECE stream)/	3	0	0
P25MACS101	Calculus and Linear Algebra: CSE Stream	3	2	0	P25PHEE102	Physics of Electrical & Electronics Materials (EEE)	3	0	0
					P25PHCS102	Quantum Physics and Applications (CSE stream)	3	0	0
Programme Specific Courses (PSC)					**Engineering Science Courses-I(ESC-I)**				
P25PSC1051	Engineering Mechanics	3	0	0	P25ESC1041	Introduction to Building Sciences	3	0	0
P25PSC1052	Elements of Mechanical Engineering	3	0	0	P25ESC1042	Introduction to Electrical Engineering	3	0	0
P25PSC1053	Elements of Electrical Engineering	3	0	0	P25ESC1043	Introduction to Electronics & Communication Engineering	3	0	0
P25PSC1054	Fundamentals of Electronics & Communication Engineering	3	0	0	P25ESC1044	Introduction to Mechanical Engineering	3	0	0
P25PSC1055	Programming in C	3	0	0	P25ESC1045	Essentials of Information Technology	3	0	0
P25PSC1056	Elements of Biotechnology and Biomimetics	3	0	0					
P25PSC1057	Principles of Soil Science and Agronomy	3	0	0					
Program-Specific Course Lab (PSCL)					**Emerging Technology Course (ETC)**				
P25PSCL1061	Mechanics and Materials Lab	0	0	2	P25ETC103	Introduction to AI and Applications	3	0	0
P25PSCL1062	Basic Electrical & Electronics Engineering Lab	0	0	2					
P25PSCL1063	Fundamentals of Electronics & Communication Engineering Lab	0	0	2		**Applied Physics Lab (ASC Lab)**			
P25PSCL1064	Elements of Mechanical Engineering Lab	0	0	2	P25PHCSL107	Quantum Physics and Applications Laboratory	0	0	2
P25PSCL1065	C Programming Lab	0	0	2					
P25PSCL1066	Soil Science and Agronomy Field Lab	0	0	2					
P25PSCL1067	Elements of Biotechnology Lab	0	0	2					

The Mathematics/Physics 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 Physics 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.

Programme Specific Courses (PSC): Programme Specific Courses (PSC) are a set of core courses tailored to the specific branch or discipline of engineering in which a student is enrolled (e.g., Mechanical Engineering, Computer Science, Civil Engineering, etc.). These courses are intended to provide students with in-depth knowledge and specialized skills essential for professional competence in their chosen field. Students must select and complete the courses from this group that **correspond to their admitted program stream**. Similarly, students are also required to choose and pass laboratory courses that are specific to their stream from the **Programme Specific Courses Laboratory (PSCL)** group.
Engineering Sciences Courses-I(ESC-I): Courses 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 disciplines. Students are required to select and complete the courses that do not belong to their admitted program stream. For example, a student admitted to the Civil Engineering program must choose a course such as Introduction to Mechanical Engineering or Introduction to Electrical Engineering, rather than Civil Engineering-related subjects. The course selected under Engineering Science Courses – II (ESC-II) must be different from the course chosen under ESC-I and must also not belong to the student's admitted engineering stream.

II Semester

Course Title	NUMERICAL METHODS						
Course Code	P25MACS201						
Category	Mathematics for CS and allied Stream						
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Credits
	L	T	P	SS	Total		
	3	2	0	--	04	(40 Hours Theory + 20 Hours Tutorial)	04
CIE marks:50	**SEE Marks:50**		**Total Max. marks = 100**		**Duration of SEE:03Hours**		

Course Learning Objectives:

1	Apply numerical methods to solve transcendental equations, perform interpolation, numerical integration, and solve ordinary differential equations
2	Solve first and higher-order differential equations using analytical methods and apply them to mathematical models.
3	Demonstrate the applications of computer science and allied engineering science using modern ICT tools.

Unit	Syllabus content	Hours
I	**Introduction to Numerical Methods:** Errors and their computation: Round off error, Truncation error, Absolute error, and Relative error and Percentage error. Solution of algebraic and transcendental equations: Bisection, Regula-Falsi, Secant and Newton-Raphson methods. **Self- Study:** solution of equations by Ramanujan's Method	08
II	**Numerical solutions for system of linear equations:** Norms: Vector norms and Matrix norms-L1, L2 and L∞, Ill conditioned linear system, condition number. Solution of system of linear equations: Gauss Seidel method and LU-decomposition method. Eigenvalues and Eigen vectors: Rayleigh power method, Jacobi's method. **Self-Study:** Relaxation and Aitkens method for system of linear equations.	08
III	**Interpolation:** Finite differences, interpolation using Newton Gregory forward and Newton Gregory backward difference formulae, Newton's divided difference. Lagrange interpolation formulae, piecewise interpolation-linear and quadratic. **Self-Study:** Numerical Differentiation.	08
IV	**Differential Equations of First and Higher Order:** Linear and Bernoulli`s differential equations. Exact and reducible to exact differential equations with integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $-\frac{1}{M}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$. Homogeneous and non-homogeneous Differential equations of higher order with constant coefficients. Inverse differential Operators: $e^{ax}, sin(ax+b), cos(ax+b)\ and\ x^n$. **Self-Study:** Method of Separation variables.	08
V	**Numerical Integration and Numerical Solution of Differential Equations:** Numerical integration: Trapezoidal, Simpson's 1/3rd, Simpson's 3/8th rule and Weddle's rule. Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector method.	08

	Self-Study: Runge-Kutta method of second order.	

COURSE OUT COMES: On completion of the course, student should be able to:

CO1: Apply numerical methods to solve transcendental equations, perform interpolation, numerical integration, and solve ordinary differential equations.

CO2: Solve first and higher-order differential equations using analytical methods and apply them to mathematical models.

CO3: Demonstrate the applications of computer science and allied engineering science using modern ICT tools.

TEACHING – LEARNING PROCESS: Chalk and Talk, power point presentation, animations,

TEXTBOOKS:

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation,New Age International Publishers, 8thEd., 2022.
2. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 5th Ed., 2023.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.

REFERENCEBOOKS:

1. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017
2. N. P. Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
3. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5th Ed. 2012.
4. Steven V. Chapra and Raymond P. Canale, Applied Numerical Methods with Matlab for Engineers andScientists, McGraw-Hill, 3rd Ed., 2011.
5. Richard L. Burden, Douglas J. Faires, A. M. Burden, Numerical Analysis, 10th Edition. 2010, Cengage Publishers.

Web links and Video Lectures (e-Resources):

- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program
- https://nptel.ac.in/courses/111105160
- https://nptel.ac.in/courses/127106019
- https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/

	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: II	Scheme: P25
Course Title: Applied Chemistry for Smart Systems		
Course Code: P25CHCS202	**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:

- 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.

UNIT 1: Functional Materials for Memory and Display Systems	Hrs: 08

Memory Devices: Introduction, organic semiconductors; types of organic semiconductors used in memory devices, p-type semiconductor-pentacene and n-type semiconductor-perfluoropentacene, difference between organic and inorganic memory devices. Construction, working and advantages of pentacene semiconductor chip.

Resistive RAM (ReRAM) Materials: Introduction, synthesis of TiO_2-RAM nanomaterial by sol-gel method, properties and applications.

Display Systems: Introduction, liquid crystals (LCs)-classification, properties and its applications. Construction, working principle and applications of LEDs, OLEDs, Active-Matrix Organic Light Emitting Diodes (AMOLEDs) and Quantum Light Emitting Diodes (QLEDs).

Self-Study Content: Next-Generation Non-Volatile Memories (ReRAM vs. Flash vs. FeRAM vs. MRAM)". Future Display Technologies: MicroLEDs and Quantum dots

Textbook Map: Organic *Electronics: Materials, Manufacturing and Applications* Wiley-VCH, 2006, **1st Edition**
OLED Display *Fundamentals and Applications* Wiley-SID Series in Display Technology, 2017, **1st Edition**.

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

UNIT 2: Quantum Materials and Polymers	Hrs: 08

Quantum Dots: Introduction, size dependent properties-quantum confinement effect, surface-to-volume ratio & band gap. Synthesis of Cd-Se Quantum dots by wet chemical method and its applications. Construction, working principle and applications quantum dot sensitized solar cells (QDSSCs).

Polymer: Introduction, number average and weight average molecular weight of the polymers and numerical problems, relationship between the polymers' structure and properties regarding-chain architecture. Synthesis and properties of nylon-12 and its advantages in 3D printing applications. Synthesis and properties of chlorinated polyvinyl chloride (CPVC), and polymethyl methacrylate (PMMA) and their uses in device applications.
Conducting polymers- Introduction, synthesis of polyaniline, conduction mechanism and its engineering applications.

Self-Study Content:
Biodegradable polymers, energy storage applications, hybrid materials (conducting polymer + nanoparticle composites)

Textbook Map:
H*andbook of Conducting Polymers*, CRC Press, **2007, 3rd Edition**. *(Comprehensive conducting polymer applications in devices)*
Organic Chemistry, Pearson, **2010, 6th edition (for polymerization basics)**

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

UNIT 3: Sustainable Chemistry for Energy Devices	Hrs:08

Energy Systems: Introduction, basic overview of Nernst equation, construction and working of concentration cell and numerical problems. Batteries-classification of batteries, construction, working and applications of Li-Ion battery.
Next-Generation Energy Devices: Introduction, construction and working of sodium ion battery and redox flow battery for EV applications. Construction and working of ultra-small asymmetric super capacitor and its applications in IoT/wearable devices.
Sustainable Energy Devices: Introduction, fuel cells, difference between fuel cell and battery, construction, working principle, applications and limitations of solid-oxide fuel cell (SOFCs) and solar photovoltaic cell (PV cell). Production of green hydrogen by photocatalytic water splitting by TiO_2 catalyst and its advantages.

Self-Study Content: Redox flow battery, proton exchange membrane fuel cell, role of nano materials, challenges and future directions of renewable energy storage for EV and IOT applications.

Textbook Map:
Fuel Cell Systems Explained, Wiley, 2003, **2nd edition**
Dunn, B., Kamth, H & Tarascon. J.M. Electrical Energy Storage for the Grid: A Battery of Choices Science, 2011.

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

UNIT 4: Chemical Sensors and Corrosion Control	Hrs: 08

Sensors: Introduction, terminologies-Transducer, Actuators and Sensors. Conductometric sensor-principle, construction and its application in the estimation of acid mixture. Colorimetric sensor-principle, instrumentation and its application in the estimation of copper in PCB. Electrochemical gas sensors- principle, construction and its application in the detection of NOx and SOx in air sample. Biosensor-principle, construction and working mechanism for the detection of glucose in biofluids.

Corrosion: Introduction, electrochemical theory of corrosion, types-differential metal and differential aeration corrosion-waterline and pitting corrosion, corrosion control-galvanization and anodization. Vapour corrosion inhibitors for protecting computer circuit boards, corrosion penetration rate (CPR)-definition, weight loss method-numerical problems.

Self-Study Content: IOT based sensor networks for air quality monitoring, electrochemical gas sensors for the detection of CO, NH_3 and H_2S, organic Vs inorganic corrosion inhibitors.

Textbook Map:

Fraden J, Handbook of Modern Sensors: Physics, Designs, and Applications, Springer, 2016, **5th Edition**

Revie R W and Uhlig H H, Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering, Wiley, 2008, **4th Edition**

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

UNIT 5: Green Materials and E-Waste Management	Hrs:08

Green Chemistry: Introduction, properties and applications of green solvents for server heat management. Synthesis and properties of glycerol trioleate ester and its uses in IT infrastructure applications. Green synthesis of ZnO nanoparticles and its uses in magnetic Radio Frequency Identification (RFID) and Internet of Nano Things (IONT) system applications.

Biomaterials: Introduction, synthesis and properties of polylactic Acid (PLA) and polyethylene glycol (PEG) and its uses in touch screen applications, synthesis and properties of Alginate Hydrogel and its uses in Brain-Computer Interfaces (BCIs) applications.

E-waste: Introduction, sources, composition of e-waste, effects of e-waste on environment and human health, Artificial intelligence in e-waste management, extraction of gold from e-waste by bioleaching method.

Self-Study Content: Ionic liquids as green solvents for electronics, a nono cellulose based biomaterials, eco-friendly battery disposable techniques.

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

Textbook Map:

Anastas, P. T., & Warner, J. C. *Green Chemistry: Theory and Practice*, Oxford University Press, 1998, **1st Editon**

Sinha S & Patel S- Waste Management: From Waste to Resource, Springer, 2021, **1st Edition**.

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

CO1: Understand the principles, materials, construction and working of organic memory devices and various display technologies.

CO2: Apply the synthesis techniques of nanomaterials and quantum dot materials to develop functional nanostructures and demonstrate their application in various electronic devices.

CO3: Critically evaluate the synthesis, properties and applications of polymers composites and microfabrication techniques in stretchable, wearable and smart electronic devices.

CO4: Analyze various electrode systems and sensing methods by understanding their

principle to evaluate electrochemical measurements. **CO5**: Apply appropriate methods for corrosion prevention and e-waste management in engineering practices.

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://youtu.be/1TGTVQbMlIc 2. https://www.youtube.com/watch?v=IzWONUYlQ5E&t=56s 3. https://youtu.be/3j0jLuOs0v4 4. https://youtu.be/CeZxn8CyM6Q 5. https://youtu.be/om0gppRTKoU 6. https://youtu.be/_ubwkG7uCFA 7. https://youtu.be/0EokkhdppgE?si=L6Znx5yXYjI9EVlw 8. https://youtu.be/hT2yCPnNEoI 9. https://www.youtube.com/watch?v=EE35ICGthR8 10. https://www.youtube.com/live/CMyIb58vd4Q 11. https://www.youtube.com/watch?v=YsZcSnqV9lg 12. https://youtu.be/xrsK9FUdvRE?si=prlzf7fRocxxygJr 13. https://youtu.be/OEDapr-9lNE?si=CYdVhq3d5ffzdXUC 14. https://youtu.be/QNKPaZkWC9Q?si=PyI4sQUL75340I9i 15. https://youtu.be/0Citdpy92EE 16. https://youtu.be/zaNdJ9I21YA 17. https://youtu.be/YAW7nMf8j0A 18. https://www.youtube.com/watch?v=FXGNQqdRBzc 19. https://www.youtube.com/watch?v=KvmqgAYO0MI

20. https://www.youtube.com/watch?v=SvlrAFDHOLc
21. https://youtu.be/kUCVBhSka2Q
22. https://www.youtube.com/watch?v=Ic5TEuKxj8M
23. https://www.youtube.com/watch?v=ATn92XwdgC4
24. https://www.youtube.com/watch?v=ldlniZfA2X4
25. https://www.youtube.com/watch?v=C0K1XRT1myg
17. https://www.youtube.com/watch?v=iVcSgej7-K8

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 Smart Systems
Course Code: P25CHCS202

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 CS Stream		
Course Code: P25ESC2034	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**

Computer Network Drawing (For CIE Only):2D Network drawing with wired and wireless, Network topology - wired and wireless.3D Modeling: Raspberry Pi / Arduino boards, Router & switches, IoT devices - Concept of converting to 3D printing format (stl) Concept of Industrial drawing.

Suggested Learning Resources:

Textbooks:

Sl. No.	Title	Author	Year &	Publisher

			Edition	
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 Visualization	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
4.	Technical Drawing with Engineering Graphics	Frederick E. Giesecke	2016	Prentice Hall

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.youtube.com/watch?v=zbqrNg4C98U

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 3D models of embedded, networking, and IoT devices.	3	2	3	2	3								

Academic Year: 2025-26	**Semester: II**	**Scheme: P25**
Course Title: **Introduction to Electrical Engineering**		
Course Code: **P25ESC2042**	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:

- Explain the generation of power and the laws used in DC circuits.
- Analyze single-phase and three-phase circuits.
- Describe the construction, operation and applications of DC machines.
- Describe the construction, operation and applications of transformers and induction motors.
- Explain electricity billing and safety measures

Unit 1	**8 Hours**

Power Generation: Conventional and nonconventional energy sources. Single-line diagram of power supply system showing power station, transmission system and distribution system. Definition of power grid.

DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. Problems.

Unit 2	**8 Hours**

Single-Phase Circuits: Generation of single-phase system. Equation of AC voltage and current, average value, RMS value, form factor, peak factor and their relation [No derivations]. Voltage and current relationships in R, L and C circuits, concept of power, reactive power, apparent power and power factor, analysis of R-L, R-C and R-L-C series circuits, parallel circuits, illustrative examples.

Three-Phase Circuits: Generation of three-phase systems, star and delta (mesh) connections, relation between phase and line values of voltages and of currents of star and delta connections. Definition of balanced and unbalanced source and load. Power, reactive power and power factor. Problems with balanced loads.

Unit 3	**8 Hours**

DC Generator: Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Simple problems.

DC Motor: Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and speed control of DC shunt motor. Applications of DC motors. Simple problems.

Unit 4	**8 Hours**

Transformers: Introduction to transformers, necessity of transformer, principles of operation, constructional features of single-phase transformers. EMF equation, losses, variation of losses with respect to load. Calculation of efficiency at different loads.

Three-phase induction Motors: Definition of rotating magnetic field (without derivation), Principle of operation. Constructional features of squirrel cage type and wound rotor type induction motor. Slip and its significance, problems. Applications.

Unit 5	**8 Hours**

Domestic Wiring: Two-way and three-way control of loads.

Electricity Bill: Definition of "unit" used for consumption of electrical energy, power rating of common household appliances. Two-part electricity tariff.

Equipment Safety measures: Working principle of fuse and miniature circuit breaker (MCB),

merits and demerits.

Personal safety measures: Electric shock, safety precautions to avoid shock. Earthing and types: Plate earthing and pipe earthing.

Suggested Learning Resources:

Textbooks:

1	B.L. Theraja	A textbook of Electrical Technology	S Chand and Company	Volume-1 Reprint Edition 2014
2	V. K. Mehta, Rohit Mehta	Principles of Electrical Engineering & Electronics	S. Chand and Company Publications,	2nd edition, 2015

Reference Books:

1.	D. P. Kothari and I. J. Nagrath	Basic Electrical Engineering	McGraw Hill	4th edition, 2019
2	Rajendra Prasad	Fundamentals of Electrical Engineering	PHI	3rd edition, 2014
3	E. Hughes	Electrical Technology	Pearson	12th Edition, 2016
4	K. Vijayarekha	Basic Electrical and Electronics Engineering	Cengage	Reprint 2023
5	Harish C Rai	Handbook of Electrical Engineering formulae	CBS Publications	2018

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

CO1: Analyse the single-line power supply system and compare conventional and non-conventional energy sources based on generation and distribution.

CO2: Apply AC circuit concepts to determine current, voltage, and power in single-phase and three-phase systems under different load conditions.

CO3: Analyze the working principles and performance characteristics of DC generators and motors for various applications.

CO4: Apply the principles of operation of transformers and three-phase induction motors to evaluate their performance and applications.

CO5: Analyze domestic electrical wiring systems and safety measures to ensure safe and efficient utilization of electrical energy.

COURSE ARTICULATION MARTIX[CAM]

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PSO1	PSO2
CO1	3	2					1						
CO2	3	3											
CO3	3	3											
CO4	3	3											
CO5	2	3				1	1	1					

EXPECTED ATTAINMENT TARGET OF EACH PO'S

%													

1. Level 3 is placed on the "apply or analyze or understand or design" level, which corresponds to 50% of the total distribution.
2. Level 2 is placed on the "apply or analyze or understand or design" level, which corresponds to 33% of the total distribution.
3. Level 1 is placed on the "apply or analyze or understand or design" level, which corresponds to 17% of the total distribution.

Web links and Video Lectures (e-resources)
1. www.nptel.ac.in 2. Principle of Electrical Sciences, Prof Sanjay Agrawal, Indira Gandhi National Open University. 3. Electricity and Electrical Wiring, Dr. Antara Mahanta Barua, Krishna Kanta Handiqui State Open University, Guwahati.
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. Technology Integration, 2. Collaborative Learning, 3. Flipped Classroom, 4. Visual Based Learning

Academic Year: 2025-26	Semester: II	Scheme: P25
Course Title: Introduction to Electronics and Communication Engineering		
Course Code: P25ESC2043	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: Mathematics, physics, and chemistry

Course learning Objectives:

- To prepare students with fundamental knowledge/ overview in the field of Electronics and Communication Engineering.
- To equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.
- Professionalism & Learning Environment: To inculcate in first-year engineering students an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social Context, and life-long learning needed for a successful professional career.

Unit 1:	**Hrs: 8**

Power Supplies: Block Diagram, Rectifiers, Reservoir and Smoothing Circuits, Improved Ripple Filters, Full Wave Rectifiers, Bi Phase Rectifiers Circuits, Bridge Rectifier Circuits, Voltage Regulators, Output Resistance and Voltage Regulation, Voltage Multipliers, (Only Voltage Doubler) Switched Mode Power Supplies.

Amplifiers: Types of Amplifiers, Gain, Input and Output Resistance, Frequency Response, Bandwidth, Phase Shift, Negative Feedback.

Text 1: Page No: 117-128, 139-146

Self-Study Content: Multistage Amplifiers, Power Amplifiers.

Unit 2:	**Hrs:8**

Oscillators: Positive Feedback, Condition for Oscillations, Ladder Network Oscillator, Wein Bridge Oscillator, Single-Stage Astable Oscillator, Crystal Controlled Oscillators (Only Concepts, Working, and Waveforms. No Mathematical Derivations)

Operational Amplifiers: Operational Amplifier Parameters, Operational Amplifier Characteristics, Operational Amplifier Configurations, Operational Amplifier Circuits.

Text 1: Page No:179-186, 165-169, 171-175

Self-Study Content: Practical Operational Amplifier Circuits.

Unit 3:	**Hrs: 8**

Analog Communication Schemes: Introduction, Modern Communication System Scheme: Information Source and Input Transducer, Transmitter, Channel or Medium, Noise, Receiver, Concept of Modulation, Concept of Radio Wave Propagation (Ground, Space, Sky), Types of Communication Systems. Modulation Schemes: Amplitude Modulation, Angle Modulation, Advantages of Digital Communication Over Analog Communication, Multiplexing, Digital Modulation Schemes: ASK, FSK, PSK, (Explanation with Waveform)

Text 2: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.9, 1.12, 1.15, 2.2.1, 3.2.1, 6.1, 6.11, 6.12, 6.13, 6.15, 6.16.

Self-Study Content: Other Modulation Techniques.

Unit 4:	**Hrs:8**
Embedded Systems: Definition, Embedded Systems Vs General Computing Systems, Classification of Embedded Systems, Major Application Areas of Embedded Systems, Purpose of an Embedded System, Core of The Embedded System: Microprocessors, GPP Vs ASIP, Microcontrollers, Microprocessor Vs Microcontroller, DSP, RISC V/S CISC, Memory: ROM, Sensors, Actuators, LED, 7-Segment LED Display. Text 3: 1.1, 1.2, 1.4, 1.5, 1.6, 2.1.1.1-2.1.1.6, 2.2.1, 2.3.1, 2.3.2, 2.3.3.1, 2.3.3.2.	
Self-Study Content: RAM, Optocoupler, Stepper motor.	
Unit 5:	**Hrs:8**
Boolean Algebra and Logic Circuits: Binary Numbers, Number Base Conversion- Binary, Decimal And Octal and Hexa Decimal Numbers and Vice-Versa, Complements-1's and 2's, Basic Definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates. **Combinational Logic:** Introduction, Design Procedure, Adders- Half Adder, Full Adder. Text 4: 1.2, 1.3, 1.4, 1.5, 2.1, 2.3, 2.4, 2.5, 2.7, 4.1, 4.2, 4.3.	
Self-Study Content: Other Combinational Circuits.	

Suggested Learning Resources:

Textbooks:

	Title	Author	Year & Edition	Publisher
1.	Electronic Circuits Fundamentals & Applications	Mike Tooley	2020, 5th Edition,	Elsevier
2.	Communication Systems	S L Kakani and Priyanka Punglia	2017, 1st Edition	New Age International Publisher
3.	Introduction to Embedded Systems	K V Shibu	2019, 2nd Edition	McGraw Hill Education
4.	Digital Logic and Computer Design	M. Morris Mano	2017	Pearson Education

Reference Books:

1.	Electronic Devices and Circuit Theory	Robert L. Boylstad, Louis Nashelsky	2015,11th Edition	PHI
2.	Basic Electronics	D.P Kothari and I. J Nagarath	2014	McGraw Hill Education

Web links and Video Lectures (e-resources)

1. https://nptel.ac.in/courses/122106025
2. https://nptel.ac.in/courses/108105132

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	**Analyze** the principles and applications of power supplies, amplifiers, oscillators for engineering applications.	**Analyse**	PO1, PO2, [L3]

CO2	**Analyse** and compare different modulation schemes evaluating their performance to various communication systems.	**Analyse**	PO2 [L4]
CO3	**Illustrate** the fundamentals of embedded systems demonstrating their purpose in developing various embedded applications	**Apply**	PO2 [L3]
CO4	**Apply** Boolean algebra and logic circuits to design an optimized digital circuit for the given specifications.	**Apply, Design**	PO2, PO3 [L3, L4]
CO5	**Design & Evaluate** for the performance of different communication systems, embedded systems and various circuit configurations.	**Design, Evaluate**	PO4, PO5 [L5]

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

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

1. Flipped Classroom
2. Problem-Based Learning (PBL)
3. Case-Based Teaching
4. Simulation and Virtual Labs
5. Partial Delivery of course by Industry expert/ industrial visits
6. ICT-Enabled Teaching
7. Role Play

Academic Year: 2025-26	**Semester:** II	**Scheme:** P25
Course Title: Essentials of Information Technology		
Course Code: P25ESC2045	**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: II**	**Scheme: P25**
Course Title: **Python Programming**		
Course Code: **P25PLC2052**	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:

- Develop scripts using primitive language constructs of python.
- Identify the methods to manipulate primitive python data structures.
- Make use of Python standard libraries for programming.
- Build scripts for performing file operations.
- Illustrate the concepts of Object-Oriented Programming as used in Python.

Unit 1	**8 Hours**

The way of the program: The Python programming language, what is a program? What is debugging? Syntax errors, Runtime errors, Semantic errors, Experimental debugging.

Variables, Expressions and Statements: Values and data types, Variables, Variable names and keywords, Statements, Evaluating expressions, Operators and operands, Type converter functions, Order of operations, Operations on strings, Input, Composition, The modulus operator.

Iteration: Assignment, updating variables, the for loop, the while statement, The Collatz 3n + 1 sequence, tables, two-dimensional tables, break statement, continue statement, paired data, Nested Loops for Nested Data.

Functions: Functions with arguments and return values.

Textbook Map: Chapters: 1.1-1.7, 2.1-2.12, 3.3, 4.4, 4.5

Unit 2	**8 Hours**

Strings: Working with strings as single things, working with the parts of a string, Length, Traversal and the for loop, Slices, String comparison, Strings are immutable, the in and not in operators, A find function, Looping and counting, Optional parameters, The built-in find method, The split method, Cleaning up your strings, The string format method.

Tuples: Tuples are used for grouping data, Tuple assignment, Tuples as return values, Composability of Data Structures.

Lists: List values, accessing elements, List length, List membership, List operations, List slices, Lists are mutable, List deletion, Objects and references, Aliasing, cloning lists, Lists and for loops, List parameters, List methods, Pure functions and modifiers, Functions that produce lists, Strings and lists, list and range, Nested lists, Matrices.

Textbook Map: Chapter: 5.1, 5.2, 5.3

Unit 3	**8 Hours**

Dictionaries: Dictionary operations, dictionary methods, aliasing and copying. **Numpy:** About, Shape, Slicing, masking, Broadcasting, dtype. **Files:** About files, writing our first file, reading a file line-at-a-time, turning a file into a list of lines, Reading the whole file at once, working with binary files, Directories, fetching something from the Web.

Textbook Map: Chapter: 5.4, 6.1-6.5, 7.1-7.8

Unit 4	8 Hours
Modules: Random numbers, the time module, the math module, creating your own modules, Namespaces, Scope and lookup rules, Attributes and the dot Operator, Three import statement variants. **Mutable versus immutable and aliasing** **Object oriented programming:** Classes and Objects — The Basics, Attributes, adding methods to our class, Instances as arguments and parameters, Converting an instance to a string, Instances as return values.	
Textbook Map: Chapter: 8.1-8.8, 9.1, 11.1	
Unit 5	**8 Hours**
Object oriented programming: Objects are mutable, Sameness, Copying. **Inheritance:** Pure functions, Modifiers, Generalization, Operator Overloading, Polymorphism. **Exceptions**: Catching Exceptions, Raising your own exceptions.	
Textbook Map: Chapter: 11.2.2-11.2.4, 11.3.2-11.3.9, 12.1, 12.2	

Suggested Learning Resources:

1	Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers	How to think like a computer scientist: learning with python 3. Green Tea Press, Wellesley	Massachusetts, 2020	https://media.readthedocs.org/pdf/howtothink/latest/howtothink.pdf

Reference Books:

1.	Al Sweigart	Automate the Boring Stuff with Python, 2nd Edition: Practical Programming for Total Beginners	2nd Edition	No Starch Press, 2022. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com
2	Kyla McMullen, Elizabeth Matthews and June Jamrich Parsons	Programming with Python		Cengage ,2023

Web links and Video Lectures (e-Resources):

https://www.learnbyexample.org/python/

https://www.learnpython.org/https://pythontutor.com/visualize.html#mode=edit

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.

- Chalk and talk
- PPT presentation
- Demonstration
- Problem-Based Learning (PBL)
- Case-Based Teaching

Academic Year: 2025-26	**Semester: II**	**Scheme: P25**
Course Title: **Python Programming Laboratory**		
Course Code: **P25PLCL206**	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.	a. Develop a python program to read 2 numbers from the keyboard and perform the basic arithmetic operations based on the choice. (1-Add, 2-Subtract, 3-Multiply, 4-Divide). b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not
2.	a. Develop a program to generate Fibonacci sequence of length (N). Read N from the console. b. Write a python program to create a list and perform the following operations • Inserting an element • Removing an element • Appending an element • Displaying the length of the list • Popping an element • Clearing the list
3.	a. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages. b. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with a suitable message.
4.	Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use a dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display the dictionary slice of the first 10 items.
5.	Develop a program to read 6 subject marks from the keyboard for a student. Generate a report that displays the marks from the highest to the lowest score attained by the student. [Read the marks into a 1-Dimesional array and sort using the Bubble Sort technique].
6.	Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].
7.	Develop a function named DivExp which takes TWO parameters a, b, and returns a value c (c=a/b). Write a suitable assertion for a>0 in the function DivExp and raise an exception for when b=0. Develop a suitable program that reads two console values and calls the function DivExp.
8.	Define a function that takes TWO objects representing complex numbers and returns a new complex number with the sum of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N (N >=2) complex numbers and to compute the addition of N complex numbers.
9.	Text Analysis Tool: Build a tool that analyses a paragraph: frequency of each word, longest word, number of sentences, etc.
10.	Develop Data Summary Generator: Read a CSV file (like COVID data or weather stats), convert to dictionary form, and allow the user to run summary queries: max, min, average by column.
11.	Develop Student Grade Tracker: Accept multiple students' names and marks. Store them in a list of tuples or dictionaries. Display summary reports (average, topper, etc.).
12.	Develop a program to display contents of a folder recursively (Directory) having sub-folders and files (name and type).

PART-A		
Academic Year: 2025-2026	**Semester:** II	**Scheme:** P25
Course Title: Applied Chemistry Laboratory (Applied Chemistry for Smart Systems)		
Course Code: P25CHCSL207	**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 effluent sample.
3. Estimation of iron in TMT bar by diphenyl amine indicator method.
4. Determination of alkalinity of given boiler water sample.
5. Green synthesis of copper nanoparticles for conductive ink applications.
6. Estimation of acid mixture by conductometric sensor (Conductometry).
7. Estimation of iron in rust sample by Potentiometric sensor (Potentiometry).
8. Determination of pKa of vinegar using pH sensor (Glass electrode).
9. Estimation of copper present in e-waste by optical sensor (Colorimetry).
10. Smartphone-Based colorimetric estimation of total phenolic content in coffee products.
11. Data analysis of pka of a week acid and its interpretation using origin software.
12. Chemical structure drawing using software: Chem Draw/ Chem Sketch.

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: Course Name: Applied Chemistry for Smart Systems
Course Code: P25CHCSL202

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 – II (Common to all branches)		
Course Code:	P25ENG208	**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: Listening Skills II	**2 Hours**
Levels of listening, Active listening, Techniques of listening. Activity: Listening for main ideas and listening for specific information	
Speaking Skills II	**6 Hours**
Language of discussion – Giving opinion, agreeing / disagreeing, asking questions, making suggestions. Sentence stress – content and structure words, Speaking situations, Intonations and Summarizing skills	
Module-2: Reading Skills II	**2 Hours**
Guessing meaning from the context, understanding graphical information, Summarizing. Activity: Book review	
Writing Skills II	**4 Hours**
Linkers and connectives, Sentence and paragraph transformation, Mind mapping techniques, Letter writing, Essay writing	
Module-3: Email Etiquette	**4 Hours**
Parts of an email, Writing an effective subject line, email language and tone. Activity: Email writing practice - Scenario based emails	
Group Presentations	**2 Hours**
Group presentations by the students.	
Module-4 Goal Setting	**2 Hours**
Defining goals, types of goals, Establishing SMART goals, Steps in setting goals, Goal setting activity	
Individual Presentations	**4 Hours**
Individual presentation by the students	
Module-5 Teamwork	**4 Hours**
Defining teams, Team vs. Group, Benefits and challenges of working in teams, Stages of team building, building effective teams, Case studies on teamwork	

Course Outcomes: On completion of this course, students will be able to,
CO1: Develop skills in listening, speaking, reading, and writing for effective communication.
CO2: Write effective emails, essays, and use proper email etiquette including subject lines, language, and tone.
CO3: Define goals (individual and team), establish SMART goals, and work effectively in teams including stages of team building and benefits/challenges of teamwork.
CO4: Develop skills for individual and group presentations

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
6. The 7 habits of highly effective people by Stephen R Covey, Simon & Schuster – 2020.
7. You Are the Team: 6 Simple Ways Teammates Can Go from Good to Great by Michael G. Rogers.

CO – PO – PSO Matrix

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

Academic Year: 2025-2026	**Semester:** II		**Scheme:** P25
Course Title: Interdisciplinary Project Based Learning			
Course Code: P25IDT209	**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:

- Basic understanding of design thinking principles
- Open-mindedness to diverse perspectives
- Effective communication, problem-solving skills and team collaboration

Course learning Objectives:

After learning this course, the student will be able to

- Design effective questionnaires and feedback forms for usability and experience evaluation.
- Create an Empathy Map to better understand the user's mindset, needs, and experiences.
- Understand the basics of early-stage business planning for social innovation projects.
- Present a fully functional Proof of Concept (PoC) to evaluators and stakeholders.

Course content

Week – 1 & 2: Introduction and first Semester Recap- Project-based learning & interdisciplinarity, User Testing Preparation & Execution - Interview Techniques and Questionnaire design, Field Visit.

Week – 3, 4 & 5: Analysis, Feedback & Prioritization- Feedback analysis, Customer Journey Mapping, Stakeholder Mapping and Empathy map.

Week – 6, 7 & 8: Iteration & Refinement- Feature improvement using SCAMPER technique, Iteration Sprint 1, Iteration Sprint 2

Week – 9, 10 &11: Presentation & Future Planning- Business Model Canvas, Pitch deck creation

Week - 12, 13 & 14: Final demo and social pitch - Prototype building, Hackathon and Demo Day

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

CO1: Analyze user feedback using empathy mapping to validate and refine problem–solution fit.

CO2: Develop the solution through iterative sprints based on validated user insights.

CO3: Develop a business plan and pitch deck articulating value proposition, feasibility, sustainability, and implementation strategy.

CO4: Demonstrate a Proof of Concept (PoC) and present a future roadmap by integrating technical, user, and business learnings during Demo Day.

Course Articulation Matrix

Course Outcomes		Program Outcomes												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	Analyze user feedback using empathy mapping to validate and refine problem–solution fit.		3		3				2	2	2				
CO2	Develop the solution through iterative sprints based on validated user insights.			3	2	2				2			2		
CO3	Develop a business plan and pitch deck articulating value proposition, feasibility, sustainability, and implementation strategy.									2	3	3			
CO4	Demonstrate a Proof of Concept (PoC) and present a future roadmap by integrating technical, user, and business learnings during Demo Day.			3	2	2				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: Analyze 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.