



Tungabhadra Education Health & Rural Development (TEHRD) Trust®, Ballari

ಕಿಷ್ಕಿಂಧ ವಿಶ್ವವಿದ್ಯಾಲಯ

KISHKINDA UNIVERSITY

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CHEMISTRY CYCLE



ENGINEERING MATHEMATICS -II

Course Code	25MAT210	CIE Marks (Theory)	50
		CIE Marks (Practical)	25
Teaching Hours/Week (L:T:P:SL)	3:0:2:3	SEE Marks	50
Total Hours of Pedagogy (L:T:P:SL)	120 (45:0:30:45)	Total Marks	125
Credits	04	Exam Hours	03

Pre-requisites:

1. Differentiation and Integration
2. Differential Equations of first order First degree

Course objectives:

1. To Apply the knowledge the calculus to solve problems related to polar curves
2. To Demonstrate various physical models through higher order differential equations.
3. To Apply numerical integration to find area under curve.
4. To apply Laplace transform in solving differential equations arising in network analysis.
5. To apply inverse Laplace transform in solving integral equation arising in engineering problems.

Module-1

	Page No.	From: 01-33 (Textbook-1)				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic:	Polar Curves Polar coordinates, Polar curves, angle between the radius vector and tangent, angle between two curves. Pedal equation. Curvature and Radius of curvature – Cartesian and Polar forms (with proof).					
Practical	• Program to find an angle between the radius vector and the tangent. • Program to find the angle between the two curves. • Program to find curvature and radius of curvature for different types of curves.					
Team work and self-learning	Assignment	1. Problems on Converting Cartesian coordinates to polar coordinates and vice versa. 2. Derive the expression for the angle between the radius vector and the tangent to a polar curve. 3. Determine the condition for orthogonality of two polar curves. 4. Apply the curvature formula to find the radius of curvature at a specific point on a curve.				
	Seminar	• Explore how engineers use polar curves in antenna design, gear shapes, cam profiles, and mechanical linkages. • Demonstrate how polar coordinates simplify motion planning in robots, especially for circular or radial movement.				



		Explain the role of polar coordinates in CT scans, MRI, and ultrasound image reconstruction.				
	Self-learning	Radius of curvature in parametric coordinates, Center of curvature, Evolutes.				
	Applications	- In electromagnetic fields, problems involving circular symmetry, like radiation patterns or waveguides, are more easily modelled using polar coordinates. - Fluid dynamics problems in cylindrical geometries (pipes, tanks) are simplified using polar coordinates. - Rotational motion or problems involving angular velocities and accelerations are best described in polar form.				
Module-2						
	Page No.	From: 87-131 (Textbook: 1)				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic:	Higher Order Differential Equations Higher order linear ODEs with constant coefficients-Inverse differential operator, method of variation of parameters, Cauchy’s and Legendre homogeneous differential equations, Applications to LCR Circuits.					
Practical	Program to solve homogenous differential equations. Program to solve non-homogenous differential equations.					
Team work and self-learning	Assignment	- Solve homogeneous linear differential equations with constant coefficients. - Solve non-homogeneous linear differential equations using the method of undetermined coefficients. - Apply the inverse differential operator method to solve a non-homogeneous linear ODE. - Derive the governing differential equation for a series LCR circuit using Kirchhoff’s laws. - Apply initial conditions to solve practical problems in LCR circuits.				
	Seminar	- Explore how second-order differential equations model voltage and current in series and parallel LCR circuits. - Present real-world engineering problems where the method helps solve non-homogeneous ODEs. - Demonstrate how inverse differential operators simplify solving linear time-invariant systems.				
	Self-learning	- Method of undetermined coefficients. - Formation of a differential equations.				
	Applications	- Vibration Analysis & Mechanical Systems - Modeling of Springs & Damping Systems - Control Engineering, Electrical Circuits etc.				



Module-3						
	Page No.	From: 304-323 (Textbook-1) 946-997 (Textbook-2)				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic:	Interpolation, Numerical Differentiation and Integration Interpolation: Newton's forward and backward Interpolation formula, LaGrange's Interpolation method, Newton's divided difference method, Numerical Integration: Trapezoidal rule, Simpsons 1/3rd rule, Simpsons 3/8th rule. Numerical Differentiation: Using Forward and Backward interpolation formula					
Practical	• Program to apply interpolation technique. • Program to apply numerical integration techniques.					
Team work and self-learning	Assignment	1. Problems on Newton’s forward interpolation formula: Newton’s backward interpolation formula and program, Comparing the solution, analytically and practically. 2. Problems on Newton’s forward interpolation formula: Newton’s backward interpolation formula, Lagrange interpolation formula, Newton’s divided difference formula. 3. Problems on Trapezoidal, Simpson’s 1/3rd, and 3/8th rules.				
	Seminar	• Show how interpolation helps in upscaling images or reconstructing pixel values in digital imaging. • Use of Trapezoidal and Simpson’s rules in solving integrals for physical quantities like work, energy, fluid volume, and thermal analysis. • Structural engineers using integration to estimate area under stress-strain curves, or mechanical loads.				
	Applications	• To find the area under a curve, Volume of a solid shape • to find velocity, acceleration and distance numerical Integration is used. • Interpolation: Weather forecasting, missing values in dataset, Determines deformation in materials, rate of change of stock prices, etc				
	Self-learning	1. Weddle's rule, find second order derivative using Newton’s forward and backward difference method.				
Module-4						
	Page No.	From: 425-453 (Textbook-1) 726-765 (Textbook-2)				
	Number of	L	T	P	SL	Total



	hours of engagement	9	0	6	9	24
Topic:	Laplace Transforms Existence and Uniqueness of Laplace Transform (LT), transform of elementary functions, region of convergence, Properties-Linearity, Scaling, t-shift property, s-domain shift, differentiation in the s-domain, division by t, differentiation and integration in the time domain, LT of special functions-periodic functions (square wave, saw-tooth wave, triangular wave, full & half wave rectifier), Heaviside Unit step function.					
Practical	Program to find the Laplace transform of standard functions.					
Team work and self-learning	Assignment	1. Find the Laplace Transform of basic functions such as constants, t^n, e^{at}, $\sin(at)$, $\cos(at)$ 2. Derive the Laplace Transform of $\sinh(at)$ and $\cosh(at)$ 3. Find the Laplace Transform of periodic functions like: - Square wave - Saw-tooth wave - Triangular wave - Full-wave rectified sine - Half-wave rectified sine 4. Problems on Laplace Transform of the Heaviside unit step function				
	Seminar	1.Explore how Laplace Transforms simplify the analysis of LCR circuits, filters - Application of LT in analyzing square, triangular, and sawtooth waveforms common in digital electronics. 3. Real-world examples of solving ODEs in thermal systems, fluid dynamics, and electrical systems using LT.				
	Self-learning	1. Laplace transform of Unit Impulse Function, Laplace transform of derivatives.				
	Applications	Circuit Analysis & Signal Processing Solving Electrical Circuits (RLC Circuits): The Laplace transform converts time-domain differential equations of resistor (R), inductor (L), and capacitor (C) circuits into algebraic equations in the s-domain, making analysis simpler. Medical Imaging & Signal Analysis - Electrocardiogram (ECG) & EEG Signal Processing: - Laplace transforms help analyze and filter heart and brain signals.				
Module-5						
	Page No.	From: 456-472 (Textbook-1)				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24



Topic:	Inverse Laplace Transform: Definition, properties, evaluation using different methods, convolution theorem (without proof), problems, and applications to solve ordinary differential equations.	
Practical	• Program to find the inverse Laplace transform of standard functions.	
Team work and self-learning	Assignment	1. State and explain the properties of the Inverse Laplace Transform: • Linearity • First shifting theorem • Second shifting theorem • Scaling property 2. Differentiation in the s-domain 3. Evaluate inverse Laplace Transforms using partial fraction decomposition. 4. Apply the convolution theorem to evaluate the Inverse Laplace Transform of a product of transforms. 5. Solve first-order ODEs using Laplace Transform and its inverse.
	Seminar	1. Analyze the motion of spring-mass-damper systems with varying damping conditions using ILT techniques. 2. Show how the convolution theorem is applied to compute the response of linear time-invariant systems subjected to arbitrary inputs. 3. How frequency-domain operations using Laplace transforms are reversed to recover original image/signal data.
	Self-learning	Solving simultaneous equations with constant coefficients using Laplace transforms.
	Applications	Circuit Analysis & Signal Processing • Solving Electrical Circuits (RLC Circuits): The Laplace transform converts time-domain differential equations of resistor (R), inductor (L), and capacitor (C) circuits into algebraic equations in the s-domain, making analysis simpler. Medical Imaging & Signal Analysis • Electrocardiogram (ECG) & EEG Signal Processing • Laplace transforms help analyze and filter heart and brain signals.
Course Outcomes: CO-1: Apply the knowledge the calculus to solve problems related to polar curves.		



- CO-2: Demonstrate various physical models through higher order differential equations.*
CO-3: Apply numerical integration to find area under curve.
CO-4: Use Laplace transform in solving differential equations arising in network analysis.
CO-5: Use inverse Laplace transform in solving integral equation arising in engineering problems.

Text Books and References:

1. Dr. K. S. C: Engineering Mathematics, Sudha Publications
2. B. S. Grewal: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.

E-References:

<https://youtu.be/mdvJlptTDP8?si=DKk8ZeVky9AtqbH>

https://youtu.be/tHqx1qx8q4?si=ucrVjw_LZ8rfeUNI

<https://youtu.be/rWyTk9eubKM?si=j7KZ8e8jH3uiKKxP>

https://youtu.be/qCLyihqatg?si=t_B-wTWDSncfxs2l

<https://youtu.be/lbZMRxfLpog?si=GAMxRFUH3aezsY15>

<https://tutorial.math.lamar.edu/classes/calci/polarcoordinates.aspx?>



ENGINEERING CHEMISTRY

Course Code	25CHE120/220	CIE (Theory)	50
		CIE (Practical)	25
Teaching Hours/Week (L:T:P:SL)	3:0:2:3	SEE Marks	50
Total Hours of Pedagogy	120 (45:0:30:45)	Total Marks	125
Credits	04	Exam Hours	03

Pre-requisites:

- Knowledge of basic chemistry and mathematics.
- Basics of electrochemistry

Course objectives:

1. To enable students to understand the foundational knowledge of electrochemistry and application of electrochemical sensors.
2. To provide students with a comprehensive understanding of chemical analysis and apply analytical technique for chemical estimations.
3. To familiarize students with modern energy storage systems including batteries and supercapacitors and the significance of sustainable e-waste management and recycling practices.
4. To develop an in-depth understanding of corrosion phenomenon and its control methods.
5. To deliver students with a broad understanding of polymers and advanced polymer-based materials.

Module-1

	Page No.	From: 1 To 36 (Text book: Chemistry for Engineering Students by B. S. Jai Prakash)				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24

Topic: Electrochemistry Sensors, AI Assisted Sensors	Electrochemistry: Introduction, EMF of cell, Free Energy, Single electrode potential-Derivation of Nernst equation, Numerical problems based on Nernst Equation (E, E_o & E_{cell}). Reference Electrodes: Introduction, construction, working and applications of calomel electrode, ion selective electrodes: Introduction, construction, working and applications of Glass electrode, determination of pH using Glass electrode. Sensors: Introduction, working principle of electrochemical sensors, Application of electrochemical sensors for detection and measurement of dissolved oxygen, oxides of sulphur and oxides of nitrogen. AI Assisted Sensors: AI Assisted titration systems, AI applications in real time environmental monitoring.
Practical	• Determination of pK_a of vinegar using pH sensor. • Evaluation of acidity and pH in beverages by using pH sensors.



Activity	• Numerical Problems Based on Nernst Equation • https://chem.libretexts.org/Bookshelves/General_Chemistry/Chemistry_1e_(OpenSTAX)/17%3A_Electrochemistry/17.04%3A_The_Nernst_Equation • Electrochemical Sensors • https://www.mdpi.com/2227-9040/10/9/363 • AI in Electrochemistry: Sensors & Smart Systems • https://pubs.acs.org/doi/10.1021/acs.jchemed.9b00802					
Team work and self-learning	Assignment 2 hr	1. Discuss the relationship between free energy and EMF of a cell. Derive the equation $\Delta G=-nFE$ and explain its application. 2. Application of Nernst equation to solve numerical problems involving concentration and electrode potentials. 3. Discuss the application of electrochemical sensors in detecting oxides of sulfur (SO_x) and oxides of nitrogen (NO_x) in industrial or environmental settings. 4. Provide case studies or examples where AI-assisted environmental monitoring has been successfully implemented. 5. Analyze the challenges and limitations of integrating AI in laboratory systems and environmental monitoring.				
	Seminar 4hr	Reference Electrodes: Introduction, construction, working and applications of calomel electrode, ion selective electrodes: Introduction, construction, working and applications of Glass electrode. AI in Chemistry instrumentation				
	Self-reading	Nernst equation practice set Determination of pH of soft drinks and its impact on health: https://www.youtube.com/shorts/u6Utex8Q8-w , https://www.youtube.com/watch?v=Vspwcss4tU8 Referring various journals to understand the AI assistance in environmental monitoring. https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2833619 , https://link.springer.com/article/10.1007/s44194-023-00020-7 , https://pubs.acs.org/doi/full/10.1021/acs.jchemed.1c00810				
Module-2						
	Page No.	From: 20-658 (Text book: Fundamentals of Analytical Chemistry, 10th Edition)				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic:	Methods of Chemical Analysis: Volumetric Analysis: Introduction, principles of titrimetric analysis, requirement of titrimetric analysis, primary and secondary					



Chemical and instrumental methods of analysis	standards. Requirement of a primary standard solution, units of standard solutions. Types of titrations: Acid base titration, Complexometric titration, Precipitation titration and Redox titration. Numerical problems on preparation of Molar and Normal solutions. Instrumental Methods of Analysis: Introduction, principle and instrumentation of Colorimetric method; its application in the estimation of copper, Introduction, principle and instrumentation of Potentiometric method; its application in the estimation of iron, Introduction, principle and instrumentation of Conductometric method; its application in the estimation of mixture of strong and weak acid. Concept of Viscosity and its importance in industrial /chemical process.	
Activity	• Understanding the Concepts: • Definition of normality, molarity, molality, mole fraction, ppm • Standard solution • Primary standard • Molarity • Equivalence point • Titration • Instrumental Methods of Analysis • Diagram labeling activity (colorimeter, conductivity cell, etc.,) • Case study discussion on sensor-based estimations, https://www.sciencedirect.com/science/article/pii/S0378429021001519, • https://www.sciencedirect.com/science/article/pii/S2213846324000890 • QUIZ and short assignment on industrial application of the methods discussed	
Practical	• Conductometric estimation of strong and weak acid in a given acid mixture. • Determination of Chemical Oxygen Demand (COD) of industrial waste water sample. • Potentiometric estimation of FAS using $K_2Cr_2O_7$. • Determination of Coefficient of Viscosity of lubricant (Ostwald's viscometer). • Estimation of total hardness of water by EDTA method.	
Team work and self-learning	Assignment	1. Define primary and secondary standards. Discuss the requirements and characteristics of primary standard solutions. 2. Explain the different units of standard solutions: • Normality • Molarity • Molality • Mole fraction • Parts per million (ppm) 3. Describe the principle and application of conductometric, potentiometric and colometric methods



	Seminar	Methods of chemical analysis: Quantitative and qualitative methods of analysis Volumetric analysis				
	Self-reading	• Testing nearby area water sample to understand the practical methods of analysis, • Explain the principles of titrimetric analysis. Why is it considered a reliable method for quantitative analysis? • Estimation of acetic acid content in commercially available vinegar samples. https://pubs.acs.org/doi/10.1021/acsfoodscitech.1c00169 https://www.sciencedirect.com/science/article/pii/S0039914024006337 • List primary and secondary standards available in the chemistry lab.				
Module-3						
	Page No.	From: 1 To 36 (Text book: A text book of Engineering Chemistry by P C Jain and Monica Jain)				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic: Energy storage systems and e-waste management	Energy Storage Systems: Introduction, Classification of batteries (primary, secondary and reserved batteries). Construction, working and applications of Li-ion batteries / Na- ion battery. Advantages of Li-ion battery as an electrochemical energy system for electric vehicles. Energy density and power density, Numerical problems on energy density and power density. Supercapacitors: Introduction, basic working principle: Pseudocapacitive (Carbon-based materials) and EDLC type (MnO₂) energy storage, applications. Differences between supercapacitors and batteries. E-waste Management: Introduction, sources, composition, effects of e-waste on environment and human health, methods of disposal: Recycling: separation, hydro-metallurgical extraction, pyro-metallurgical methods. Recycling of Lithium-ion batteries by direct cycling Method. Role of stake holders in E-waste management.					
Practical	• Determination of strength of an acid in Lead-acid battery					
Activity	• Discussion comparing and contrasting batteries and supercapacitors based on key parameters: • Energy Density • Power Density • Charging/Discharging Rate • Cycle Life • Cost • Safety • Applications					



	• Prepare a visual aid to summarize the key differences. • Discussion on concept of hybrid energy storage systems that combine batteries and supercapacitors to leverage the advantages of both (e.g., in electric vehicles for both range and power). https://www.sciencedirect.com/science/article/pii/S2590123024018413 https://www.mdpi.com/2032-6653/15/8/342 https://www.sciencedirect.com/science/article/pii/S2666202723001921 https://www.intechopen.com/chapters/1219526 • Designing a circular economy model for smartphone batteries as an example for waste utilization and submit the report to authorities in the city.					
Team work and self-learning	Assignment	1. Discuss the construction and working principle of the following batteries: • Li-ion batteries • Na-ion batteries 2. Explain the basic working principle of supercapacitors. How do they store energy and what makes them different from batteries?3. Explain the significance of recycling lithium-ion batteries.4. Explain the importance of energy storage systems in electric vehicles (EVs)				
	Seminar	Applications of batteries, supercapacitors Impact of e-waste on ecosystem. E-waste management				
	Self-reading	History of batteries/super capacitors, development and latest updates, challenges faced in the development of batteries.				
Module-4						
	Page No.	From: 63-89 & 91-117 (Text book: Chemistry for Engineering Students by B. S. Jai Prakash)				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic: Corrosion and metal finishing	Corrosion: Introduction, electrochemical theory of corrosion, Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of corrosion product, nature of medium – pH, conductivity and temperature. Types of corrosion – differential metal and differential aeration corrosion – pitting and waterline. Corrosion control: Anodizing – anodizing of aluminium, cathodic protection – sacrificial anode and impressed current methods, metal coatings – Galvanization. Corrosion penetration rate (CPR) – Introduction and numerical problems. Metal Finishing: Introduction, Electroplating: Meaning and Process, Electroplating of chromium (Hard and Decorative). Electro less plating: Introduction, electro less plating of copper. Manufacturing of double-sided Printed Circuit Boards (PCB's), Distinction between electroplating and electro less plating process.					
Practical	• Estimation of iron in TMT bar solution.					



	• Estimation of copper in the given brass sample. • Estimation of Copper present in electroplating effluent by optical sensor (colorimetry).					
Activity	• Provide corrosion scenarios (e.g., aluminum exposed to coastal air). And identify factors accelerating corrosion and efforts to prevent. • Provide different real-world corrosion problems with best corrosion control practices and justify the choice. • Discussion on Recent advances in printed circuit board (PCB) technology include High-Density Interconnect (HDI) PCBs, flexible PCBs, and 3D printing for PCB fabrication. https://www.youtube.com/watch?v=HhCElxMGEkQ https://www.youtube.com/watch?v=1SOtM_Vq8es https://www.youtube.com/watch?v=WljqVpJISVc					
Team work and self-learning	Assignment	1. Define corrosion and describe how it occurs through an electrochemical reaction between the metal surface and the surrounding environment. 2. Explain the different methods of corrosion control • Anodizing • Cathodic Protection • Galvanization 3. Describe the electroplating of chromium 4. Describe the process of manufacturing double-sided PCBs using electroless plating.				
	Seminar	Types of corrosion Corrosion control Creating a group of students to demonstrate concepts of corrosion like stimulation of corrosion, differential aeration corrosion, Electroplating of metals etc				
	Self-reading	Reading on Impact of corrosion by considering real life incidents. Reading articles on real-life applications of: • Galvanization in automobiles • Electroless plating in electronics Cathodic protection in marine environments https://www.youtube.com/watch?v=f6WYxkhum-s https://irispublishers.com/gjes/fulltext/global-impact-of-corrosion-occurrence-cost-and-mitigation.ID.000618.php				
Module-5						
	Page No.	From: 162-182 & 183-191 (Text book: Chemistry for Engineering Students by B. S. Jai Prakash)				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic:	Polymers: Introduction, Molecular weight of polymers: Weight average molecular weight and number average molecular weight of polymers – numerical problems.					



Engineering materials	Introduction to Conducting Polymers, Mechanism of conduction in poly-acetylene, Applications of conducting polymers. Polymer Composites: Preparation, properties and applications of Kevlar and carbon fiber. Applications of graphene-reinforced polymers for lightweight cars. Biodegradable Polymers: Preparation, properties and applications of Polylactic acid. Smart Polymers: pH/Temperature-Responsive Hydrogels	
Practical	- Synthesis of Iron-oxide Nanoparticles Developing pH-Sensitive Hydrogels	
Activity	- Listing and distinguishing natural and synthetic fibers used in daily life - Highlighting the recent advances in polymer-based materials for energy and environmental applications. https://www.sciencedirect.com/science/article/pii/S2772443324000540 - Critical discussion on need of biodegradable polymers and approaches towards enzyme discovery and engineering that can degrade non-biodegradable polymers. https://www.nature.com/articles/s41529-022-00277-7, https://www.sciencedirect.com/topics/materials-science/biodegradable-polymer , https://www.sciencedirect.com/science/article/pii/S0167779921000408 - Preparing a critical review on chemical recycling methods to convert plastic waste into valuable feedstock materials, https://www.tandfonline.com/doi/full/10.1080/19397038.2024.2409162#d1e280	
Team work and self-learning	Assignment	- Solve numerical problems based on the Mn and Mw - Discuss the mechanism of conduction in poly-acetylene - Discuss the preparation and properties of Kevlar - Discuss the preparation and properties of Polylactic Acid (PLA) - Analyze the challenges and potential of graphene-reinforced nanocomposites in future applications
	Seminar	Polymers, polymer composites, Biopolymers, nanocomposites and Smart polymers
	Self-reading	Literature survey or case study on: - Conducting polymers in batteries/sensors - Biodegradable packaging - Graphene nanocomposites in automotive or aerospace - Exploring case study like - PLA packaging by Coca-Cola - Graphene-reinforced panels in BMW - Smart hydrogels in drug delivery
Course Outcomes: CO-1: Students will be able to understand the principles of electrochemistry and evaluate the role of electrochemical and AI-assisted sensors in real-time environmental monitoring. CO-2: Students will be able apply the principles of volumetric and instrumental methods of analysis in chemical estimations as well as explain the concepts and their industrial relevance.		



CO-3: Students will be able to compare various energy storage systems and analyze the environmental impact of e-waste and its management and recycling.

CO-4: Students will be able to understand the mechanisms, types and control of corrosion.

CO-5: Students will be able to understand various polymers, and evaluate the role of polymer composites and nanocomposites in advanced energy applications.

Text Books and References:

Chemistry for Engineering Students by B. S. Jai Prakash

A text book of Engineering Chemistry by P C Jain and Monica Jain

Fundamentals of Analytical Chemistry, 10th Edition by Douglas A. Skoog

A text book of quantitative inorganic analysis theory and practice by Vogel Arthur I.

E-References:

<https://pubs.acs.org/doi/10.1021/acs.jchemed.9b00802>

<https://archive.org/details/internetarchivebooks>

<https://archive.org/details/dli.ernet.15759/page/67/mode/2up>



ESSENTIALS OF PYTHON FOR PROBLEM SOLVING

Course Code	25PYT230	CIE Marks	50
Teaching Hours/Week (L:T:P:SL)	3:0:2:3	SEE Marks	50
		CIE Practical	25
Total Hours of Pedagogy (L:T:P:SL)	120 (45:0:30:45)	Total Marks	125
Credits	04	Exam Hours	03

Pre-requisites:

- Basic knowledge of Computers.
- Problem solving skills.

Course Objectives:***This course will enable students to:***

1. Explore the fundamentals of Python programming including syntax, variables, operators, and control flow.
2. Develop modular programs using functions, understand function arguments, and perform string operations.
3. Implement different built-in data structures of python lists, dictionaries, tuples, and sets.
4. Demonstrate file handling operations including working with text, binary, and CSV files using Python.
5. Apply object-oriented programming concepts such as classes, objects, inheritance, polymorphism and encapsulation.

Module-1

	Page No. /Chapters	Chapters: 2,3				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic	Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type () Function and Is Operator, Dynamic and Strongly Typed Language. Control Flow Statements: The if Decision Control Flow Statement, The if...else Decision Control Flow Statement, The if...else if...else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements, Catching Exceptions Using try and except Statement.					
Activities	1. Practice tracing Python code involving if, if-else, and for/while loops. 2. Debug and format expressions with input(), print(), type(), 3. Exception handling: Catch and explain divide-by-zero errors using try-					



	except.					
Practical	1. Write a program to print Fibonacci series up to n terms. 2. Develop a simple calculator using if-elif-else for arithmetic operations. 3. Program to Demonstrate the Use of *args and **kwargs. 4. Write a program to find the largest of three numbers using functions. 5. Write a program using functions to display Pascal's triangle.					
Team work and self-learning	Assignment	1. Write a Python program to check whether a number is positive, negative, or zero. 2. Demonstrate type conversion between string, int, float using int(), str(), and float(). 3. Develop a program using nested if and while loops to find the sum of digits of a number. 4. Write a program to demonstrate the use of break and continue inside a loop. 5. Handle divide-by-zero exception using try-except.				
	Seminar	1. Dynamic Typing in Python vs Static Typing in Other Languages. 2. Importance of Indentation in Python Compared to Other Languages.				
	Self-reading /Certification	1.Explore the math module for advanced mathematical operations https://www.w3schools.com/python/python_math.asp				
Module-2						
	Page No. /Chapters	Chapters: 4,5				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic	Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The <i>return</i> Statement and <i>void</i> Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments. Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.					
Activities	1. Trace the flow of arguments: *args, **kwargs, and keyword/default arguments. 2. Analyse string operations like slicing, indexing, and formatting with various methods. 3. Convert traditional function calls to modular forms using custom-defined functions.					



Practical	1. Program to Find the Area of Trapezium Using the Formula $\text{Area} = (1/2) * (a + b) * h$ Where a and b Are the 2 Bases.					
	2. Program to Demonstrate the Return of Multiple Values from a Function Definition.					
	3. Program to Demonstrate the Use of *args and **kwargs.					
	4. Write a program to find the largest of three numbers using functions.					
	5. Write a program using functions to display Pascal's triangle.					
Team work and self-learning	Assignment	1. Define a function to find factorial using recursion. 2. Create a function with default arguments and keyword arguments. 3. Write a function that accepts student names and marks using **kwargs. 4. Implement a program to count vowels and consonants in a string. 5. Demonstrate string slicing and concatenation operations.				
	Seminar	1. Understanding *args and **kwargs in function calls. 2. String methods and their practical applications.				
	Self-reading	1. Read about scope and lifetime of variables in functions. https://www.geeksforgeeks.org/python-scope-of-variables/ 2. Explore string immutability and formatting techniques. https://www.geeksforgeeks.org/why-are-python-strings-immutable/				
Module-3						
	Page No. /Chapters	Chapters: 6,7,8				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic	Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, The <i>del</i> Statement. Dictionaries: Creating Dictionary, Accessing and Modifying <i>key:value</i> Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The <i>del</i> Statement. Tuples and Sets: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Using <i>zip()</i> Function. Sets: Set Methods, Frozenset.					
Activities	1. Build and manipulate dictionaries using comprehension and looping. 2. Analyse tuple packing/unpacking and set theory concepts with real-world examples. 3. Demonstrate data structure conversions: list- >dict, list -> set.					
Practical	1. Find Mean, Variance and Standard Deviation of List Numbers					



	2. Write Python Program to create a dictionary of key value pairs where key is item name and value is frequency an Item Appears in the List. 3. Program to Illustrate Traversing of key:value Pairs in Dictionaries Using for Loop. 4. Write a Program That Accepts a Sentence and Calculate the Number of Digits, Uppercase and Lowercase Letters 5. Write Python Program to create a dictionary of key value pairs where key is item name and value is frequency an ItemAppears in the List. 6. Write Python Program to Swap Two Numbers Without Using Intermediate/Temporary Variables. Prompt the User for Input.					
Team work and self-learning	Assignment	1. Write a program to insert, update, and delete items in a list. 2. Program to Illustrate Traversing of key:value pairs in Dictionaries Using for Loop 3. Demonstrate tuple packing and unpacking. 4. Perform set operations like union, intersection, and difference. 5. Convert a list of tuples to a dictionary.				
	Seminar	1. Performance Comparison: Lists vs Tuples in Python. 2. Applications of Sets in Data Deduplication.				
	Self-reading	1.Study the collections module for advanced data structures. https://www.geeksforgeeks.org/python-collections-module/				
Module-4						
	Page No. /Chapters	Chapters: 9				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic	Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules					
Activities	1. Analyse CSV file structure and parsing using csv.reader() and csv.DictReader(). 2. Explore object serialization and deserialization using the pickle module. 3. Practice using os and os.path to list files, create folders, and navigate directories.					
Practical	1. Write Python Program to Read and Print Each Line in "sample.txt" file. Sample Content of "sample.txt" File is Given at the time of execution. 2. Write Python Program to Reverse Each Word in "secret_societies.txt" file. Sample Content of "secret_societies.txt" is Given at the time of experiment execution. 3. Write Python Program to Save Dictionary in Python Pickle. 4. Write Python program to read and display each row in "biostats.csv" CSV					



	file. Sample content of "biostats.csv" is given below. 5. Write Python Program to Read Data from "pokemon.csv" csv File Using DictReader. Sample Content of "pokemon.csv" is Given Below.					
Team work and self-learning	Assignment	1. Read a text file and count the number of lines. 2. Write a program to copy content from one file to another. 3. Store a dictionary in a binary file using pickle. 4. Read a CSV file and calculate the average of a numeric column. 5. List all file 6. s in a directory using os module.				
	Seminar	1. Comparing text vs binary file operations in Python. 2. Comparison of CSV, JSON, and XML for Data Storage.				
	Self-reading	1. Read about file modes (r, w, a, rb, wb) and practice. 2. Explore with open () as a context manager for file operations. https://www.geeksforgeeks.org/file-handling-python/				
Module-5						
	Page No. /Chapters	Chapters: 11				
	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
Topic	Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, The Polymorphism.					
Activities	1. Trace class and object creation with attributes and methods. 2. Simulate inheritance and method overriding with base and derived classes. 3. Identify use cases of encapsulation and polymorphism in real-life applications.					
Practical	1. Write Python Program to Simulate a Bank Account with Support for depositMoney, withdrawMoney and showBalance Operations. 2. Program to Demonstrate the Overriding of the Base Class Method in the Derived Class. 3. Program to Demonstrate the Overriding of the Base Class Method in the Derived Class. 4. Define a Class Called Cart that Contains Data Attributes Apples and Oranges. Write Methods that Return Appropriate Messages If the Number of Apples is Greater than 5 or When the Number of Oranges are Greater than 10.					



Team work and self-learning	Assignment	1. Create a class Book with attributes title, author, and price and methods to display info. 2. Implement a constructor and destructor in a Student class. 3. Write a program to demonstrate single inheritance. 4. Create multiple objects of a class and compare their attributes. 5. Show polymorphism using a base class and two derived classes with overridden methods.
	Seminar	1. Benefits of OOP over Procedural Programming. 2. Real-World Applications of Polymorphism in Python.
	Self-reading	1. Study magic methods (<code>__str__</code>, <code>__init__</code>) in Python https://www.geeksforgeeks.org/dunder-magic-methods-python/ 2. Compare procedural and object-oriented paradigms with examples https://www.geeksforgeeks.org/differences-between-procedural-and-object-oriented-programming/

Course Outcomes:

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

CO-1: Identify and apply Python programming fundamentals to solve basic computational problems.

CO-2: Develop efficient functions and handle string processing using built-in features and modules.

CO-3: Organize and manipulate data using Python's built-in data structures.

CO-4: Implement file operations to read/write different formats and manage file data effectively.

CO-5: Design object-oriented Python applications using principles like Encapsulation, Inheritance, and Polymorphism.

Text Book:

1. Introduction to Python Programming Gowrishankar S. and Veena A, 2019, CRC press.

Reference Book:

1. Automate the Boring Stuff with Python, Al Sweigart, 2015, no Starch Press, San Francisco.
2. Allen B Downey, "Think Python: How to think like a computer scientist", 2nd edition, Green Tea Press.

E-References:

1. spoken-tutorial.org
2. <https://www.tutorialsteacher.com/python>

**BASIC ELECTRICAL ENGINEERING**

Course Code	25ELE140/240	CIE Marks	50
Teaching Hours/Week(L:T:P:SL)	3:0:2:3	SEE Marks	50
Total Hours of Pedagogy (L:T:P:SL)	120 (45:0:30:45)	Total Marks	100
Credits	04	Exam Hours	03

Pre-requisites: Basic knowledge of physics and mathematics, including concepts of voltage, current, resistance, and simple algebra. Familiarity with measuring instruments and electrical safety practices is also expected.

Course Learning Objectives (CLOs)

1. To understand and apply basic electrical laws and network theorems to analyze DC circuits.
2. To learn the principles of electromagnetism and electromagnetic induction in electrical systems.
3. To analyze single-phase AC circuits using phasor techniques and evaluate power components.
4. To understand the construction, working, and performance of transformers and induction motors.
5. To develop practical knowledge of domestic wiring, energy consumption, and electrical safety measures.

Module-1

	Page No.	From: 67-75; 185-194				
	Number of hours of engagement	L	T	P	SL	Total
		08	00	04	12	24
Lecture	DC Circuits: Ohm's Law and its limitations. KCL & KVL, series, parallel, series-parallel circuits. Electromagnetism: Faraday's Laws of Electromagnetic Induction, Lenz's Law, Fleming's rules, Statically and dynamically induced EMF; concepts of self and mutual inductance.					
Practical	Experiment 1 – Verification of Ohm's Law Experiment 2 – Kirchhoff's Current and Voltage Laws (KCL & KVL)					
Team work and self-learning	Example PBL Task: <i>Design a low-cost torch circuit suitable for rural students using basic electronic components such as resistors, switches, and a battery. The design should prioritize brightness, safety, and energy efficiency.</i> In a similar manner, course coordinators are granted the flexibility to define other contextually relevant and application-oriented PBL examples, aligned with course outcomes and local needs, to enhance practical understanding and problem-solving skills among students.					

Module-2

	Page No.	From: 273-285				
	Number of hours of engagement	L	T	P	SL	Total
		08	00	04	12	24
Lecture	A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor. (Only definitions) Voltage and current relationship with phasor diagrams in pure R, L, and C circuits. Concept of Impedance. Analysis of R-L, R-C, R-L-C Series circuits. Active power, reactive power and apparent power. Concept of power factor.					
Practical	Experiment 3 – Measurement of Voltage, Current, and Power in Single Phase Circuit Experiment 4 – Series and Parallel Resistive Circuits					



Team work and self - learning	Example PBL Task: <i>Your college wants to reduce electricity bills. Analyze the impact of poor power factor in labs and propose a practical solution.</i> In a similar manner, course coordinators are granted the flexibility to define other contextually relevant and application-oriented PBL examples, aligned with course outcomes and local needs, to enhance practical understanding and problem-solving skills among students.					
Module-3						
	Page No.	From: 485-507; 589-592				
	Number of hours of engagement	L	T	P	SL	Total
		08	00	04	12	24
Lecture	3-phase A.C. circuits: Concept of balanced 3 phase systems, star and delta connected systems, relation between line and phase quantities, measurement of 3-phase by two wattmeter methods. Three Phase Synchronous Generators: Construction details, principle of operation, EMF equation (Excluding derivations of pitch factor and distribution factor).					
Practical	Demo 1 – Working of a Brushless DC (BLDC) Motor					
Team work and self - learning	Example PBL Task: <i>Imagine your school has a power cut. Which devices will stop working and why? Which of those have motors or transformers inside?"</i> In a similar manner, course coordinators are granted the flexibility to define other contextually relevant and application-oriented PBL examples, aligned with course outcomes and local needs, to enhance practical understanding and problem-solving skills among students.					
Module-4						
	Page No.	From: 546-570				
	Number of hours of engagement	L	T	P	SL	Total
		08	00	04	12	24
Lecture	Transformers: Necessity of transformer, principle of operation, Types and construction of single-phase Transformers, EMF equation, losses, variation of losses with respect to load. Condition for maximum efficiency. Three-phase induction Motors: Concept of the rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance. Need for starter and star delta starter.					
Practical	Experiment 5 – Solar Panel Output Measurement (Miniature Panel) Experiment 6 – Measurement of Earth Resistance					
Team work and self - learning	Example PBL Task: <i>Design a mini hybrid power station for your college bus stop using any two renewable sources. Justify your mix.</i> In a similar manner, course coordinators are granted the flexibility to define other contextually relevant and application-oriented PBL examples, aligned with course outcomes and local needs, to enhance practical understanding and problem-solving skills among students.					
Module-5						
	Page No.	From: 782-797				
	Number of hours of engagement	L	T	P	SL	Total
		08	00	04	12	24
Lecture	Domestic Wiring: Requirements, Types of wiring: Conduit wiring. Two-way and three-way control of Load. Electrical Energy Utilization: Power rating of household appliances. Definition of “unit” used for consumption of electrical energy, two-part electricity tariff, calculation of electrical energy consumption for domestic loads. Equipment Protection Measures: Working principle of Fuse and Miniature circuit breaker					



	(MCB), Residual Current Circuit Breaker (RCCB) merits and demerits. Types of Lights: Incandescent, CFL, LED, Halogen, Tube lights. Comparison: Power consumption, lifespan, brightness, cost. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.
Practical	Experiment 7 – Staircase (Two-way) and Godown Wiring Practice Experiment 8 – Fault Diagnosis and Repair of a Junction Board with 3 Switches and 1 Fan Regulator Demo 2 – Types of wires useful for different appliances Demo 3 – Battery Charging and Discharging Setup (with LED Load or Fan) Demo 4 – Demonstration of Electrical Shock Hazard Using a Test Lamp & Insulation Fault
Team work and self - learning	Example PBL Task: <i>Your hostel block faces frequent tripping. Conduct a mock safety audit and propose a rewiring + safety plan.</i> In a similar manner, course coordinators are granted the flexibility to define other contextually relevant and application-oriented PBL examples, aligned with course outcomes and local needs, to enhance practical understanding and problem-solving skills among students.
Course Outcomes: CO-1. Solve problems related to DC circuits using Ohm's Law, KCL, and KVL. CO-2. Explain the laws of electromagnetism and calculate induced EMF in electrical systems. CO-3. Analyze single-phase AC circuits and determine power components and power factor. CO-4. Describe the working principles of transformers and induction motors and compute their performance. CO-5. Demonstrate knowledge of domestic wiring, energy utilization, protective devices, and electrical safety.	
Text Books: 1. Basic Electrical Engineering, D. C. Kulshreshtha, McGraw-Hill Education, 1st Edition, 2019 References 1. Electrical and Electronic Technology, Edward Hughes Pearson, 12th Edition, 2016 2. A Textbook of Electrical Technology, B. L. Theraja, S Chand and Company, Reprint Edition, 2014	



PROFESSIONAL WRITING SKILL IN ENGLISH

Course code	25PWS 160/260	CIE Marks	50
Teaching Hours/Week (L:T:P:SL)	2:0:0:2	SEE Marks	50
Total Hours of Pedagogy (L:T:P:SL)	30:0:0:30	Total Marks	100
Credits	02	Exam Hours	02

Pre-requisites:

1. Basic understanding of English grammar and vocabulary.
2. Familiarity with digital tools (e-Mail, Word, PPT).
3. Willingness to engage in group and practical activities.

Course objectives:

1. To develop students' ability to write clearly, concisely, and professionally.
2. To enhance the ability to identify and avoid common grammar errors in writing.
3. To improve students' skills in writing professional and digital letters.
4. To develop the ability to write effective technical project proposals and reports.
5. To enhance Strategies for self-editing and peer review.

Module-1

	Page No.	From: 277 - 283				
	Number of hours of engagement	L	T	P	SL	Total
		06	00	00	06	12
Fundamentals of Professional Writing	Importance of professional writing in engineering and business Characteristics of effective writing (clarity, conciseness, correctness)					
Practice	Practice on different kinds of effective professional writings.					
Team work and self-learning	Assignment	Describe how clarity, conciseness, and correctness contribute to effective professional writing. Include examples.				
	Seminar	Seminar on importance of professional writing and its usages.				
	Self-reading	What are the primary goals of professional writing in engineering? Citing sources and references. Writing project proposals. Problem statement and objectives. Feasibility and expected outcomes.				



Module-2						
	Page No.	From: 229 - 273				
	Number of hours of engagement	L	T	P	SL	Total
		06	00	00	06	12
Common errors in writing	Common errors in grammar (Verb-Tenses, Subject verb agreement, Prepositions, Articles). Common errors in punctuation and Common errors in Sentence structure.					
Practice	Write all rules of subject verb agreement.					
Team work and self-learning.	Assignment	Write all types of sentences with examples. Write a paragraph while using different punctuation marks.				
	Seminar	Seminar on Articles- Usage and omission of articles.				
	Self-reading	Identifying common errors in grammar.				
Module-3						
	Page No.	From: 177 - 196				
	Number of hours of engagement	L	T	P	SL	Total
		06	00	00	06	12
Professional letters, Email and Digital Communication	Formal email writing (structure, tone, subject line, etiquette). Writing professional letters (Structure of letters, leave letters, cover letters, complaint letters, inquiries). Use of abbreviations, salutations, and closings.					
Practice	Kinds of professional letters (Leave letter, Email writing, etc.).					
Team work and self-learning	Assignment	List 10 commonly used abbreviations in professional correspondence (e.g., FYI, ASAP) and explain their usage. Compare formal and informal salutations. Provide suitable examples for different professional scenarios.				
	Seminar	Writing professional letters, Emails, and Business Etiquette.				
	Self-reading	On professional letters, abbreviations, salutations, and closings.				
Module-4						
	Page No.	From: 205 -214				
	Number of hours of engagement	L	T	P	SL	Total
		06	00	00	06	12
Technical, Project Report	Types and structure of technical reports					



Writing and Research Proposal	Elements: Abstract, Introduction, Methodology, Results, Conclusion Use of visuals, tables, and charts Citing sources and references. Writing project proposals Problem statement and objectives Feasibility and expected outcomes					
Activity	Prepare a mini technical report (2–3 pages) on a topic of your choice.					
Team work and self-learning	Assignment	Define a technical report . Explain its importance in engineering and scientific fields. Write a short technical report (200–250 words) on a recent laboratory experiment or industrial visit.				
	Seminar	Technical Reporting and Project Proposals: Skills for Engineers and Innovators".				
	Self-reading	What is the difference between a technical report and a project proposal ? How can charts and tables make your report more effective?				
Module-5						
	Page No.	From: 347 -380				
	Number of hours of engagement	L	T	P	SL	Total
		06	00	00	06	12
Editing & Proofreading	Strategies for self-editing and peer review Tools for grammar checking (Grammarly, Hemingway Editor) Tools for plagiarism checking (Trunitin, DrillBit)					
Practice	Self-Editing Practice: Take a paragraph you wrote earlier (from an essay or report). Highlight grammar, spelling, and punctuation errors. Revise the paragraph for clarity, tone, and sentence structure. Peer Review Activity: Exchange a written piece with a classmate. Provide constructive feedback on structure, grammar, and clarity using a checklist.					
Team work and self-learning	Assignment	1. Define self-editing. Why is it an essential skill in academic and professional writing? 2. List and explain five strategies for effective self-editing.				
	Seminar	On usage of Trunitin and DrillBit.				
	Self-reading	1. What features does Grammarly offer besides grammar checking? 2. How does the Hemingway Editor help in improving sentence clarity?				
Course Outcomes:						



CO-1: Apply active listening strategies for academic, professional, and cross-cultural understanding.

CO-2: Read, interpret, and analyze texts using appropriate strategies and critical thinking.

CO-3: Apply grammatical rules and sentence structures in written and spoken English.

CO-4: Produce clear, coherent academic, technical, and professional writing.

CO-5: Create effective job application documents and demonstrate essential communication skills.

Text Books:

1. *English for Technical Communication* – S.V. Gajendra Singh
2. *Communication Skills* by Sanjay Kumar & Pushp Lata



INDIAN CONSTITUTION

Course Code	25ICO170/270	CIE Marks	50
Teaching Hours/Week (L:T:P:SL)	1:0:0:1	SEE Marks	50
Total Hours of Pedagogy (L:T:P:SL)	30 (15:0:0:15)	Total Marks	100
Credits	01	Exam Hours	01

Course Objectives:

The course Indian Constitution will enable the students,

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

Module-1

	Page No.	From:				
	Number of hours of engagement	L	T	P	SL	Total
		3	0	0	3	6

Indian Constitution	Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian Constitution, Making of the Constitution, Role of the Constituent Assembly.
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Team work and self-learning	Watch	Short documentary or explainer video on “What is a constitution?”
	Read	Short notes on pre-constitutional societies (tribal/customary laws, monarchy, colonial rule) Post-constitutional changes (rule of law, rights, institutions. Salient features: Preamble, Fundamental Rights & Duties, Secularism, Federalism, Parliamentary system. Brief on how the Constitution affects everyday life
	Final Checkpoint	Encourage students to submit a summary sheet or presentation of their learning. This could include: 5 key takeaways Question they still have Real-life example of constitutional impact

Module-2

	Page No.	From:				
	Number of	L	T	P	SL	Total



	hours of engagement	3	0	0	3	6
Salient features of India Constitution	Preamble of Indian Constitution & Key Concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations building.					
Team work and self-learning	The Preamble – Meaning and Key Concepts	Overview of the 6 Fundamental Rights : Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to Constitutional Remedies				
	Read & Reflect	Understand reasonable restrictions under Article 19 and limitations on rights during: Emergency situations National security concerns Public order or morality				
	Write a short note	“ <i>Why Fundamental Rights must be balanced with responsibility</i> ” Create a poster: “ <i>Preamble values in action</i> ” (Justice, Equality, etc.)				
Module-3						
	Page No.	From:				
	Number of hours of engagement	L	T	P	SL	Total
		3	0	0	3	6
Directive Principles of State Policy	Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties And its Scope and significance in Nation, Union Executive: Parliamentary System, Union Executive–President, Prime Minister, Union Cabinet.					
Team work and self-learning	Directive Principles of State Policy (DPSPs)	Origin of DPSPs (inspired by Irish Constitution) Types of DPSPs: <i>Socialist, Gandhian, and Liberal-intellectual</i> Difference between DPSPs and Fundamental Rights Short video or explainer on “ <i>Directive Principles Explained with Examples</i> ”				
	Fundamental Duties of Citizens	Overview of Article 51A : List and meaning of the 11 Fundamental Duties. Context of inclusion (42nd Amendment).Relation between rights and duties				
	Union Executive –	Features of Parliamentary system in India				



	Structure & Functions	Roles and powers of: President (ceremonial head, emergency powers) Prime Minister (executive head, policy leader) Union Cabinet (collective responsibility, policymaking)
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Module-4

	Page No.	From:				
	Number of hours of engagement	L	T	P	SL	Total
		3	0	0	3	6

Parliament-LS and RS	Parliament-LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism.					
Team work and self-learning	Self-Learning	Here's a comprehensive 3-hour self-learning module focused on the Parliamentary system (Lok Sabha, Rajya Sabha, Committees, Terminologies) and the Judicial System of India (Courts, Judicial Review, Judicial Activism) . It's designed for independent student learning using a mix of watching, reading, reflecting, and small tasks to reinforce understanding.				

Module-5

	Page No.	From:				
	Number of hours of engagement	L	T	P	SL	Total
		3	0	0	3	6

State Executive and Governor	State Executive and Governor, CM, State Cabinet, Legislature-VS & VP, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions.					
Team work and self-learning	Self-Learning	The State Executive, Election Commission and Elections, Constitutional Amendments, and Emergency Provisions in India. The module is designed to help learners grasp key concepts independently through multimedia, structured reading, and simple activities.				

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

C01 Analyze the basic structure of Indian Constitution.

C02 Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.

C03 Know about our Union Government, political structure & codes, procedures.

C04 Understand our State Executive & Elections system of India.

C05 Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Text Books:

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru-2022.
2. "Introduction to the Constitution of India" (Students Edition) by Durga Das Basu (DD Basu): Prentice-Hall, 2008.

Reference Books:

1. "The Constitution of India" by Merunandan KB: published by Merugu Publication, Second Edition, Bengaluru.
2. "Samvidhana Odu" for Students & Youths by Justice H N Nagamohan Dhas, Sahayana, kerekon



FOUNDATION OF CYBER SECURITY AND AI

Course Code	25CAI 180/280	CIE Marks	50
Teaching Hours/Week (L:T:P:SL)	1:0:0:1	SEE Marks	50
Total Hours of Pedagogy (L:T:P:SL)	30 (15:0:0:15)	Total Marks	100
Credits	01	Exam Hours	01

Course Objective:

COB1: To provide learners with a foundational understanding of cybersecurity principles.

COB2: To equip learners with essential knowledge and skills in network and data security.

COB3: To introduce learners to the fundamentals of Artificial Intelligence, its evolution.

COB4: To provide learners with foundational knowledge of AI techniques including search algorithms & ML.

COB5: To familiarize learners with popular AI tools and platforms, explore real-world applications of AI in NLP.

Module-1

	Page No.	From:				
	Number of hours of engagement	L	T	P	SL	Total
		3	0	0	3	6
Introduction to Cybersecurity	What is Cybersecurity? Definition and importance and CIA Triad (Confidentiality, Integrity, Availability). Types of Cyber Threats. Malware (viruses, worms, trojans). Phishing, Social engineering. Ransomware, spyware, adware. Common Cyber Attacks Denial of Service (DoS), DDoS Man-in-the-Middle (MitM) SQL Injection, Zero-day attacks					
Team work and self-learning	Watch	CS50's Introduction to Cybersecurity - YouTube				
	Read	https://www.ibm.com/topics/cia-triad . Contents.				
	Final Checkpoint	https://www.cisco.com/c/en/us/products/security/what-is-cybersecurity.html CIA Triad overview https://www.ibm.com/topics/cia-triad . Study the following contents.				

Module-2

	Page No.	From:				
	Number of hours of engagement	L	T	P	SL	Total
		3	0	0	3	6
Cybersecurity Practices and Tools	Network Security Basics. Firewalls, VPNs, Intrusion Detection Systems (IDS). Secure Wi-Fi and encryption. Authentication and Access Control. Multi-factor authentication (MFA). Role-based access control (RBAC)					



	Data Security. Data encryption (at rest & in transit). Backup strategies and disaster recovery. Security Policies & Best Practices. Password policies. Acceptable Use Policy (AUP). Cyber laws.					
Team work and self-learning	Watch	CS50's Introduction to Cybersecurity - YouTube				
	Learn	Learn how firewalls, VPNs, and Intrusion Detection Systems (IDS) protect data from unauthorized access, and understand Wi-Fi security and encryption standards like WPA3.				
	Explore	Authentication and Access Control: Explore Multi-Factor Authentication (MFA) for secure logins and Role-Based Access Control (RBAC) for structured user permissions.				
Module-3						
	Page No.	From:				
	Number of hours of engagement	L	T	P	SL	Total
		3	0	0	3	6
Introduction to Artificial Intelligence	What is AI?. Definition and scope. Difference between AI, ML, and Data Science Brief History and Evolution of AI. Milestones in AI development Types of AI. Narrow AI vs General AI vs Super AI. Reactive machines, limited memory, theory of mind, self-aware AI Applications of AI. In healthcare, finance, transportation, education, and entertainment Types of AI Artificial Intelligence Type What Is Artificial Intelligence (AI)? Types, and Advantages					
Team work and self-learning	Watch	https://www.youtube.com/watch?v=fBncbUmO-L4				
	Assignment	List the application of AI				
Module-4						
	Page No.	From:				
	Number of hours of engagement	L	T	P	SL	Total
		3	0	0	3	6
Core Concepts and Techniques in AI	Search Algorithms. Uninformed search: BFS, DFS. Knowledge Representation and Reasoning. Logic-based representation (propositional and first-order logic). Expert systems and rule-based systems. Introduction to Machine Learning. Types of learning: Supervised, Unsupervised, Reinforcement. Concept of training data, features, labels Neural Networks (Overview). Uninformed Search Algorithms in AI GeeksforGeeks Uninformed Search Algorithms BFS DFS Depth Limited Search Bidirectional Search First-Order Logic in Artificial Intelligence GeeksforGeeks					



Team work and self-learning	Assignment	Compare Breadth-First Search (BFS) and Depth-First Search (DFS) in terms of completeness, time complexity, and suitability for finding the shortest path. Explain the differences between supervised, unsupervised, and reinforcement learning with examples. How do training data, features, and labels play a role in supervised learning?
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Module-5

	Page No.	From:				
	Number of hours of engagement	L	T	P	SL	Total
		3	0	0	3	6

AI Tools, Trends	Popular AI Tools and Platforms. ChatGPT, Google AI, IBM Watson. TensorFlow, PyTorch (overview only) Natural Language Processing (NLP) Examples: Chatbots, sentiment analysis, facial recognition. Trends in AI. Generative AI (text, image, video). Autonomous systems (robots, vehicles). AI in smart assistants and IoT. Artificial Intelligence Full Course Artificial Intelligence Tutorial for Beginners Edureka https://www.youtube.com/watch?v=bPpwZxasJo0 https://www.youtube.com/watch?v=Ao4-ZIPOGJI					
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Team work and self-learning	Self-Learning	Compare the roles of ChatGPT, Google AI, and IBM Watson in natural language processing applications such as chatbots and sentiment analysis. What is Generative AI, and how is it transforming industries through text, image, and video creation.
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At the end of the course the student will be able to:

CO1: Identify various types of cyber threats, understand the principles of the CIA Triad.

CO2: Understand basic network and data protection measures.

CO3: Distinguish between AI, ML, and Data Science.

CO4: Understand and apply basic search algorithms, understand logical reasoning in AI, differentiate between types of machine learning.

CO5: Identify key AI tools and platforms, explain how AI is used in natural language processing

Text Books:

1.FUNDAMENTALS OF CYBER SECURITY: Principles, Theory and Practices Paperback.

by [Mayank Bhushan](#) (Author), [Rajkumar Singh Rathore](#) (Author), [Aatif Jamshed](#) (Author).

2.AI for Everyone: A Common Man's Guide to Artificial Intelligence Paperback – 30 September 2024. by [Sridhar Seshadri](#) (Author), [Shreeram Iyer](#) (Author).

**COURSE TITLE: VYAVAHARIKA KANNADA_ ವ್ಯವಹಾರಿಕ ಕನ್ನಡ (ಸಂವಹನಕ್ಕಾಗಿ ಕನ್ನಡ)**

Course Code	23KVK170/270	CIE Marks	100
Tutorial contact Hours/Week	01	SEE Marks	--
Credits	01	Exam Hours	--

Course Learning Objectives:

The course will enable the students to understand Kannada and communication in Kannada Language.

Module-1 06 Hours

Chapter-1: Vyavaharika Kannada – Parichaya (Introduction to Vyavaharika Kannada)

Module-2 06 Hours

Chapter-2: Kannada Aksharamale haagu uchacharne (Kannada Alphabets and Pronunciation)

Module-3 06 Hours

Chapter-3: Sambhashanegagi Kannada Padagalu (Kannada Vocabulary for Communication)

Module-4 06 Hours

Chapter-4: Kannada Grammar in Conversations (Sambhashaneyalli Kannada Vyakarana)

Module-5 06 Hours

Chapter-5: Activities in Kannada



COURSE TITLE: ADALITHA KANNADA_ಆಡಳಿತ ಕನ್ನಡ

Course Code	23KAK170/270	CIE Marks	100
Tutorial contact Hours/Week	01	SEE Marks	--
Credits	01	Exam Hours	--

ಆಡಳಿತ ಕನ್ನಡ ಭಾಷಾ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

- ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಆಡಳಿತ ಕನ್ನಡದ ಪರಿಚಯ ಮಾಡಿಕೊಳ್ಳುವುದು.
- ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾ ರಚನೆಯಲ್ಲಿನ ನಿಯಮಗಳು ಮತ್ತು ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿ ಕಂಡು ಬರುವ ದೋಷಗಳು ಹಾಗೂ ಲೇಖನ ಚಿಹ್ನೆಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
- ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು.
- ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆಯ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ ಮತ್ತು ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಪರಿವಿಡಿ

ಘಟಕ-1 (Module-1)

ಬೋಧನಾ ಅವಧಿ: 6 ಗಂಟೆ

ಅಧ್ಯಾಯ-1	ಕನ್ನಡ ಭಾಷೆ - ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ
ಅಧ್ಯಾಯ-2	ಭಾಷಾ ಪ್ರಯೋಗದಲ್ಲಾಗುವ ಲೋಪದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ

ಘಟಕ-2 (Module-2)

ಬೋಧನಾ ಅವಧಿ: 6 ಗಂಟೆ

ಅಧ್ಯಾಯ-3	ಲೇಖನ ಚಿಹ್ನೆಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ
ಅಧ್ಯಾಯ-4	ಪತ್ರ ವ್ಯವಹಾರ

ಘಟಕ-3 (Module-3)

ಬೋಧನಾ ಅವಧಿ: 6 ಗಂಟೆ

ಅಧ್ಯಾಯ-5	ಆಡಳಿತ ಪತ್ರಗಳು
ಅಧ್ಯಾಯ-6	ಸರ್ಕಾರದ ಆದೇಶ ಪತ್ರಗಳು

ಘಟಕ-4 (Module-4)

ಬೋಧನಾ ಅವಧಿ: 6 ಗಂಟೆ

ಅಧ್ಯಾಯ-7	ಸಂಕ್ಷಿಪ್ತ ಪ್ರಬಂಧ ರಚನೆ
ಅಧ್ಯಾಯ-8	ಕನ್ನಡ ಶಬ್ದ ಸಂಗ್ರಹ

ಘಟಕ-5 (Module-5)

ಬೋಧನಾ ಅವಧಿ: 6 ಗಂಟೆ

ಅಧ್ಯಾಯ-9	ಕಂಪ್ಯೂಟರ್ ಹಾಗೂ ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ
ಅಧ್ಯಾಯ-10	ಪಾರಿಭಾಷಿಕ ಆಡಳಿತ ಕನ್ನಡ ಪದಗಳು ಮತ್ತು ತಾಂತ್ರಿಕ / ಕಂಪ್ಯೂಟರ್ ಪಾರಿಭಾಷಿಕ ಪದಗಳು
