B.Tech. 1st Semester (Chemistry Group)

Category	Course Code	Course Title	Subject Type	Hours per week			Marks Distribution			Credits
				L	T	P	Int	Ext	Total	
Basic Sciences	26C1CHU-101	Engineering Chemistry	T	3	1	0	40	60	100	4
Basic Sciences	26C1CHU-111	Engineering Chemistry Lab	P	0	0	2	30	20	50	1
Basic Sciences	26C1EMU-101	Engineering Mathematics-I	T	3	1	0	40	60	100	4
Professional Core Course	25C1CSU-102	*Programming for Problem Solving using Python	T	3*	0	0	40*	60*	100*	3*
Professional Core Course	25C1CSU-112	*Programming for Problem Solving using Python Lab	P	0	0	2*	30*	20*	50*	1*
Professional Core Course	25C1MEU-101	# Elements of Mechanical Engineering	T	3#	0	0	40#	60#	100#	3#
Humanities and Social Sciences	25C1EPU-101	English & Professional Communication	T	3	0	0	40	60	100	3
Humanities and Social Sciences	25C1EPU-111	English & Professional Communication Lab	P	0	0	2	30	20	50	1
Professional Core Course	25C1MEU-111	Workshop/Manufacturing Practices Lab	P	0	0	4	60	40	100	2
Value Added	26C1DTU-101	Design Thinking & AI Elements	T	3	0	0	40	60	100	3
Total				**15**	**2**	**10*/ 8#**	**350 */ 320 #**	**400 */ 380 #**	**750* / 700#**	**22* /21#**

***For circuit Branches**
#For Non-Circuit Branches

B.Tech. 1st Semester (Physics Group)

Category	Course Code	Course Title	Subject Type	Hours per week			Marks Distribution			Credits
				L	T	P	Int	Ext	Total	
Basic Sciences	25C1PHU-101	Engineering Physics	T	3	1	0	40	60	100	4
Basic Sciences	25C1PHU-111	Engineering Physics Lab	P	0	0	2	30	20	50	1
Basic Sciences	26C1EMU-101	Engineering Mathematics-I	T	3	1	0	40	60	100	4
Professional Core Course	25C1ECU-101	Basic Electrical and Electronics Engineering	T	3	1	0	40	60	100	4
Professional Core Course	25C1ECU-111	Basic Electrical and Electronics Engineering Lab	P	0	0	2	30	20	50	1
Professional Core Course	25C1CSU-101	Programming for Problem Solving using C	T	3	0	0	40	60	100	3
Professional Core Course	25C1CSU-111	Programming for Problem Solving using C Lab	P	0	0	2	30	20	50	1
Professional Core Course	25C1MEU-111	*Engineering Graphics & Design	P	0	0	2*	30	20	50	1*
Professional Core Course	25C1MEU-112	#Engineering Graphics & Design	P	0	0	4#	30	20	50	2#
NCC	26C1ESU-101	Environmental Sciences and Sustainability	T	2	0	0	100		100	0
NCC	26C1ICU-101	Indian Constitution	T	2	0	0	100		100	0
Total				**16**	**3**	**8*/10#**	**480**	**320**	**800**	**19*/20#**

B.Tech. 2nd Semester (Physics Group)

Category	Course Code	Course Title	Subject Type	Hours per week			Marks Distribution			Credits
				L	T	P	Int	Ext	Total	
Basic Sciences	25C1PHU-101	Engineering Physics	T	3	1	0	40	60	100	4
Basic Sciences	25C1PHU-111	Engineering Physics Lab	P	0	0	2	30	20	50	1
Basic Sciences	26C1EMU-201	Engineering Mathematics-II	T	3	1	0	40	60	100	4
Professional Core Course	25C1ECU-101	Basic Electrical and Electronics Engineering	T	3	1	0	40	60	100	4
Professional Core Course	25C1ECU-111	Basic Electrical and Electronics Engineering Lab	P	0	0	2	30	20	50	1
Professional Core Course	25C1CSU-101	Programming for Problem Solving using C	T	3	0	0	40	60	100	3
Professional Core Course	25C1CSU-111	Programming for Problem Solving using C Lab	P	0	0	2	30	20	50	1
Professional Core Course	25C1MEU-111	*Engineering Graphics & Design	P	0	0	2*	30	20	50	1*
Professional Core Course	25C1MEU-112	#Engineering Graphics & Design	P	0	0	4#	30	20	50	2#
NCC	26C1ESU-101	Environmental Sciences and Sustainability	T	2	0	0	100		100	0
NCC	26C1ICU-101	Indian Constitution	T	2	0	0	100		100	0
Total				**16**	**3**	**8*/10#**	**480**	**320**	**800**	**19*/20#**

B.Tech. 2nd Semester (Chemistry Group)

Category	Course Code	Course Title	Subject Type	Hours per week			Marks Distribution			Credits
				L	T	P	Int	Ext	Total	
Basic Sciences	26C1CHU-101	Engineering Chemistry	T	3	1	0	40	60	100	4
Basic Sciences	26C1CHU-111	Engineering Chemistry Lab	P	0	0	2	30	20	50	1
Basic Sciences	26C1EMU-201	Engineering Mathematics-II	T	3	1	0	40	60	100	4
Professional Core Course	25C1CSU-102	*Programming for Problem Solving using Python	T	3*	0	0	40*	60*	100*	3*
Professional Core Course	25C1CSU-112	*Programming for Problem Solving using Python Lab	P	0	0	2*	30*	20*	50*	1*
Professional Core Course	25C1MEU-101	# Elements of Mechanical Engineering	T	3#	0	0	40#	60#	100#	3#
Humanities and Social Sciences	25C1EPU-101	English & Professional Communication	T	3	0	0	40	60	100	3
Humanities and Social Sciences	25C1EPU-111	English & Professional Communication Lab	P	0	0	2	30	20	50	1
Professional Core Course	25C1MEU-111	Workshop/Manufacturing Practices Lab	P	0	0	4	60	40	100	2
Value Added	26C1DTU-101	Design Thinking & AI Elements	T	3	0	0	40	60	100	3
Total				**15**	**2**	**10*/ 8#**	**350 */3 20#**	**400 */3 80#**	**750*/ 700#**	**22* /21#**

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1MEU-101	Elements of Mechanical Engineering	PCC	1	3	0	0	40	60	100

Pre-requisite: Basic knowledge of Engineering Physics and Mathematics

Course Outcomes:

At the end of this course, students will be able to	
CO1	Discuss the basic concepts of simple, compound stresses, strains and strain energy.
CO2	Explain the concept of simple mechanisms and different types of kinematic pairs.
CO3	Apply static and dynamic force analysis to determine forces, couples, and inertia effects in mechanical systems.
CO4	Interpret the physical significance of fluids with their properties.
CO5	Demonstrate the concept of Hydraulic Turbines, Pumps and Hydraulic devices.

Detailed contents

Unit 1: Simple, Compound Stresses and Strains: Stress and Strain and their types, Hook's law, longitudinal and lateral strain, Poisson's ratio, Stress–Strain Behaviour of Ductile and Brittle Materials using Virtual Simulation Tools, stress in a bar, elastic constants and their significance, relation between elastic constants, Young's modulus of elasticity, modulus of rigidity and bulk modulus. Introduction to strain energy, energy of dilation and distortion. Resilience, stress due to suddenly applied loads. **(8 Hrs.)**

Unit 2: Kinematics of Machines: Basic Concepts of Machines: Link, Mechanism, Visualization of Kinematic Link, Kinematic Chain and Mechanisms using Simulation Tools, Principles of Inversion: Inversion of a Four-Bar Chain, Slider-Crank Chain, and Double Slider- Crank Chain, Lower and Higher Pairs: Universal Joint, Calculation of Maximum Torque, Steering Mechanisms (Ackerman and Davis Approximate Steering Mechanisms). **(8 Hrs.)**

Unit 3: Dynamics of Machines: Static Force Analysis: Concept of Force and Couple, Free Body Diagram, Condition of Equilibrium, Static Equilibrium of Mechanisms, Methods of Static Force Analysis of Simple Mechanisms. Dynamic Force Analysis, Dynamically Equivalent System. **(10 Hrs.)**

Unit 4: Fundamentals of Fluid Mechanics**:** Concept of fluid, Difference between solids, liquids and gases, Concept of continuum, Ideal and real fluids, Study of Fluid Properties using Fluid Mechanics Virtual Labs, Fluid properties: density, specific volume, specific weight, specific gravity, viscosity (dynamic and kinematic), vapour pressure, compressibility, bulk modulus, Mach number, surface tension and capillarity, Newtonian and non-Newtonian fluids. Concept of static fluid pressure, Pascal's law and its engineering applications. **(9 Hrs.)**

Unit 5: Hydraulic Turbines, Pumps and Hydraulic devices: Introduction to turbines: types of turbines, component parts, operation and applications of various turbines through experiential learning, Introduction to pump, classification of pump, Centrifugal Pumps, Main elements and their

functions. Introduction to hydraulic devices, Construction, operation and utility of simple and differential accumulator, intensifier, Hydraulic lift, Hydraulic crane, Hydraulic press.

(10 Hrs.)

Text Books

S. No	Name of the Book	Author	Publisher	Edition (Publication Year.)
1	Mechanics of Materials	R. C. Hibbeler	Pearson Education	11th Edition (2023)
2	Fluid Mechanics: Fundamentals and Applications	Yunus A. Cengel, John M. Cimbala	McGraw-Hill Education	4th(2018)
3	Theory of Machines and Mechanisms	John J. Uicker Jr., Gordon R. Pennock, Joseph E. Shigley	Oxford University Press	5th(2021)

Reference Books

S. No	Name of the Book	Author	Publisher	Edition (Publication Year.)
1	Mechanics of Materials	James M. Gere and Barry J. Goodno	Cengage Learning	9th(2018)
2	Fluid Mechanics and Thermodynamics of Turbomachinery	S. L. Dixon, Cesare Hall	Butterworth-Heinemann	7th(2014)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
26C1 EMU-101	**Engineering Mathematics - I**	**Basic Sciences**	**4**	**3**	**1**	**0**	**40**	**60**	**100**

Pre-requisite: Knowledge about Calculus of One Variable Functions.

Course Outcomes:

At the end of this course, students will be able to:	
CO1	Analyse the convergence or divergence of sequences and infinite series using appropriate convergence tests.
CO2	Apply integral calculus techniques to evaluate arc lengths, volumes and surface areas of solids of revolution.
CO3	Interpret convergence or divergence of improper integrals: Beta and Gamma functions.
CO4	Examine the functions of several variables using partial derivatives tooptimize engineering problems.
CO5	Evaluate areas and volumes in real-world engineering applications using multiple integrals.

Detailed Syllabus

Unit 1: Sequences and Series: Sequences, limits of sequences, Infinite series, series of positive terms, Convergence and Divergence of sequence and series, Tests for convergence: Comparison test, Ratio test, Integral test, Root test, Alternating series, Absolute convergence and Conditional convergence, Leibnitz test, Taylor's series and Maclaurin's series of one variable (without proof). **(12Hrs.)**

Unit 2: Integral Calculus: Introduction to Cartesian curves, Polar curves, Parametric curves, Length of curves: Cartesian form, Polar form and Parametric form, Volume and Surface Area of the solids generated by revolution of curves. **(7 Hrs.)**

Unit 3: Improper Integrals: Improper integrals: First kind, Second kind, Absolute convergence of improper integrals, Beta and Gamma functions, Properties of Beta and Gamma functions, Relationship between Beta and Gamma functions. **(7 Hrs.)**

Unit 4: Functions of Several Variables: Concept of limit and continuity of a function of two and three variables: Limits along different paths, Non-existence of limits (path dependency), Partial derivatives, Total derivative and differentiability, Derivatives of composite function and implicit function, Chain rule, Homogeneous functions, Euler's theorem for homogeneous functions, Maxima and minima for function of two variables. **(12 Hrs.)**

Unit 5: Multiple Integral: Double integrals and Triple integrals, change of order of integration, Change of variables in integration: Cartesian form, Polar form, Spherical form and cylindrical form, Application of double and triple integrals to area and volumes. **(12 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year.)
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley	11th(2025)
2	A text book of Engineering Mathematics	N.P Bali and Dr. Manish Goyal	Laxmi Publications (P) Ltd	9th(2014)
3	Higher Engineering Mathematics	B.S Grewal	Khanna Publications	42nd(2012)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year.)
1	Advanced Engineering Mathematics	R.K. Jain and S.R.K. Iyengar	Narosa Publications	5th (2016)
2	Calculus and Analytic Geometry	G.B. Thomas	Pearson Education	10th(2001)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1EPU-101	**English & Professional Communication**	**Basic Sciences**	**3**	**3**	**0**	**0**	**40**	**60**	**100**

Pre-requisite: Foundational English language skills, including basic grammar, vocabulary, and sentence construction

Course Outcomes:

At the end of the course, the student will be able to:	
CO1	Utilize their ideas effectively in a creative written form.
CO2	Apply grammatical rules to identify and correct common errors in sentences.
CO3	Interpret texts at literal and contextual levels and choose effective writing strategies to draft concise, well-structured responses.
CO4	Examine vocabulary choices to construct precise and meaningful sentences.
CO5	Evaluate different forms of business correspondence and professional documents for official reporting.

Detailed Syllabus

Unit 1: Mechanics of Writing& Basic Writing Skills**:** Writing introduction and conclusion, Describing, Defining, Classifying, providing examples or evidence, Content writing (short speech, blogs, social media posts etc), Writing practices on the lives of prominent Engineers, creating coherence, Organizing principles of paragraphs in documents, Essay Writing **(8 Hrs.)**

Unit 2: Identifying Common Errors in Writing:Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Verbal Aptitude- Error Analysis based on corpus of Exercises: Spotting Errors, Selecting Words, Ordering of words, Sentence Structures, Importance of proper punctuation (**9 Hrs.)**

Unit 3: Reading & Writing Practices: Comprehension, Techniques for writing precisely, Precis, Cohesive Devices **(5 Hrs.)**

Unit 4: Vocabulary Building: The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations, Vocabulary Quiz, Use of phrases and clauses in sentences, Cliches **(8 Hrs.)**

Unit 5: Professional Communication: Professional Communication, its need and importance, barriers to effective communication; Presentation skills**,** its importance, Time management during presentations, Audience analysis and engagement tactics**;** Business Writing-Business letters, Business Emails, Report Writing, Resume/CV **(9 Hrs.)**

Text Books

S. No	Name of the Book	Author	Publisher	Edition (Publication Year.)
1	Business Communication Today	Courtland L. Bovéeand John V. Thill	Pearson	15th Edition
2	Study Writing	Liz Hamp-Lyons and Ben Heasly	Cambridge University Press	2nd edition

Reference Books

S. No	Name of the Book	Author	Publisher	Edition (Publication Year.)
1	English Grammar in Use	Raymond Murphy	Cambridge	5thEdition
2	On Writing Well	William Zinsser	Harper Perennial	Paperback 2020 Edition

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1EPU-111	**English & Professional Communication Lab**	**Basic Sciences**	**1**	**0**	**0**	**2**	**30**	**20**	**50**

Course Outcomes:

At the end of the course, the student will be able to:	
CO1	Build their listening and speaking skills by acquiring new forms of expressions for lucid communications.
CO2	Make use of oral communication skills to produce structured, coherent, and fluent spoken responses with confidence.
CO3	Analyze and differentiate the use of appropriate language in general, academic, and professional contexts.
CO4	Compare industry expectations with their own competencies to determine areas for improvement.
CO5	Evaluate and synthesize effective presentations on a given topic choosing the appropriate voice modulation techniques and professional body language.

List of Practicals

Sr. No.	Name of the Practical
1.	Listening Comprehension
2.	Self-Introduction
3.	Group Discussion
4.	Role Play
5.	Common Everyday Situations: Conversations and Dialogues
6.	Communication at Workplace
7.	Interviews
8.	Formal Presentations

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
26C1 EMU-201	Engineering Mathematics - II	Basic Sciences	4	3	1	0	40	60	100

Pre-requisite: Knowledge about algebra of matrices, differentiation and integration.

Course Outcomes:

At the end of this course, students will be able to:	
CO1	Apply linear algebra techniques to solve system of linear equations.
CO2	Illustrate the concept of vector spaces and compute Eigenvalues and Eigenvectors to diagonalize matrices.
CO3	Solve first order ordinary differential equations using appropriate analytical methods.
CO4	Interpret analytical methods to obtain solutions of higher order differential equations for solving engineering problems.
CO5	Formulate and find analytical solutions of linear partial differential equations of different orders.

Detailed Syllabus

Unit 1: Matrices and System of Linear Equation: Elementary transformation, Rank of a matrix, Echelon form of matrix, Homogenous and Non-homogenous system of linear equations, Consistency and Inconsistency of system of equations, Gauss elimination method, Inverse of a matrix, Gauss-Jordon method. **(10 Hrs.)**

Unit 2: Vector Spaces: Introduction to Scalar field and Vectors, Basics of Vector spaces and Vector subspaces, Linear Independence and Linear Dependence, Linear Combination of vectors Linear Span, Dimension and basis, Eigen values, Eigen vectors and their properties, Cayley-Hamilton theorem(without proof), Algebraic Multiplicity, Geometric Multiplicity, Similar and Diagonalizable matrices. **(10 Hrs.)**

Unit 3: First Order Ordinary Differential Equations: Formation of Differential Equations, Solution of Differential Equations, Solution of equations in separable form, equations reducible to separable form, Solution of Exact differential equations, Linear first order equations, Bernoulli'sequation. **(10 Hrs.)**

Unit 4: Higher Order Ordinary Differential Equations**:** Higher order differential equation with constant coefficients and variable coefficients, Method of variation of parameters, Method of undetermined coefficients, findingcomplementary function andparticular integrals, Applications to electric RLC circuit and Simple Harmonic Motion. **(10 Hrs.)**

Unit 5: Linear Partial Differential Equations: Formation of Partial Differential Equations, Solution of First order Linear Partial Differential Equations (Lagrange's method), Linear Partial Differential Equationsof Second and Higher order with constant coefficients including complementary function and particular integral. **(10 Hrs.)**

Text Books

S. No	Name of the Book	Author	Publisher	Edition (Publication Year.)
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley	11th(2025)
2	A text book of Engineering Mathematics	N.P Bali and Dr. Manish Goyal	Laxmi Publications (P) Ltd	9th(2014)
3	Higher Engineering Mathematics	B.S Grewal	Khanna Publications	42nd(2012)

Reference Books

S. No	Name of the Book	Author	Publisher	Edition (Publication Year.)
1	Advanced Engineering Mathematics	R.K. Jain and S.R.K. Iyengar	Narosa Publications	5th (2016)
2	Calculus and Analytic Geometry	G.B. Thomas	Pearson Education	10th(2001)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
26C1ESU-101	Environmental Sciences and Sustainability	Basic Sciences	0	2	0	0	100	-	100

Course Outcomes:

At the end of the course, the student will be able to:	
CO1	Identify environmental problems associated with forest, water and food resources with the help of case studies.
CO2	Analyze the impacts of mineral, energy and land resources in the context of conservation and equitable resources for sustainable lifestyles.
CO3	Explain the types and the functions of an ecosystem, including food chain, ecological pyramids and energy flow.
CO4	Interpret the concept of biodiversity and its conservation.
CO5	Explain the impact of climate change and environmental disaster.

Detailed Syllabus

Unit 1: Biological and Renewable Natural Resources: Natural resources and associated problems: a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. **(4 Hrs.)**

Unit 2: Non-renewable Resources, Energy and Sustainable Resource Management: Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. b) Energy resources: Growing energy needs, renewable and non- renewable energy sources, use of alternate energy sources. Case studies. c) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles. **(4 Hrs.)**

Unit 3: Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems: a. Forest ecosystem b. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) **(6 Hrs.)**

Unit 4: Biodiversity and its conservation: Introduction – Definition: genetic, species and ecosystem diversity, Biodiversity at global, National and local levels. India as a mega-diversity nation, Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India **(5 Hrs.)**

Unit 5: Social Issues and Environmental Sustainability: From Unsustainable to Sustainable development, sustainability development goals (SDGs) and compliance, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible

solutions. Climate change, global warming, acid rain, ozone layer depletion, Nuclear accidents and holocaust. Case Studies. Public awareness **(5 Hrs.)**

Activities **(6 Hrs.)**

- Nature club (bird watching, recognizing plants at institute/at home, recognizing local animals, appreciating biodiversity.
- Impart knowledge and inculcate the habit of taking interest and understanding biodiversity in and around the college campus.
- Identify a tree fruit flower peculiar to a place or having origin from the place.
- Making high resolution big photographs of small creatures (bees, spiders, ants. mosquitos etc.) especially part of body so that people can recognize (games on recognizing animals/plants).
- Videography/ photography/ information collections on specialties/unique features of different types of common creatures. Search and explore patents and rights related to animals, trees etc.
- Studying miracles of mechanisms of different body systems.
- Campus Water Audit and Water Conservation Plan.
- Rooftop Rainwater Harvesting System Design for Institutional Buildings.
- Wastewater Treatment and Reuse Feasibility Study.
- Solar Energy Potential Assessment of Campus.
- Departmental Energy Audit and Energy Efficiency Improvement Plan.
- Carbon Footprint Assessment of Engineering Students.
- Life Cycle Assessment of a Common Engineering Product.
- Campus Biodiversity Mapping and Documentation.
- Ecological Health Assessment of a Local Pond/River.
- Construction of Food Web and Ecological Pyramid of a Local Ecosystem.
- Study of Endangered Species in India and Conservation Strategies.
- Documentation and Impact Assessment of Invasive Plant Species.
- Urban vs Rural Biodiversity Comparative Study.
- Solid Waste Audit and Sustainable Waste Management Plan.
- Design and Performance Evaluation of a Composting Unit.
- Plastic Consumption and Reduction Strategy Assessment.
- E-Waste Generation and Management Study in Campus.
- Microclimate Analysis and Urban Heat Island Effect Study.
- Air Quality Trend Analysis Using CPCB Data.
- Design and Fabrication of a Low-Cost Water Filtration System.
- Smart Water Level Indicator Using Sensor Technology.
- Biogas Production Feasibility Study from Hostel Food Waste.
- Sustainable Campus Transportation and Emission Reduction Plan.

Text Books

S. No	Name of the Book	Author	Publisher	Edition (Publication Year.)
1	Textbook of Environmental Studies for Undergraduate Courses	Erach Bharucha	Pearson Education	4th Edition
2	Basic Concepts of Environmental Science & Engineering	Anubha Kaushik and C.P. Kaushik	Shashwat Publication	2nd Edition

Reference Books

S. No	Name of the Book	Author	Publisher	Edition (Publication Year.)
1	Environmental Science	Botkin and Keller	Willey Publishing House	8th Edition
2	Environmental Science	Bradley Smith and Eldon Enger	McGraw-Hill Education	2nd Edition

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1MEU-111	**Engineering Graphics & Design**	**PCC**	**1**	**0**	**0**	**2**	**30**	**20**	**50**

Course Outcomes:

At the end of this course, students will be able to	
CO1	Apply basic CAD tools to draw lines, shapes, and scales as per standards.
CO2	Analyze front, top, and side views of different objects using CAD software.
CO3	Use CAD software to generate planes and solids in different positions using various tools.
CO4	Create three dimensional models into two-dimensional isometric and orthographic drawings of various parts with dimensions.
CO5	Implement standard drafting conventions with precise dimensional control using CAD tools.

List of Activities for Engineering Graphics & Design Lab

Note: Students are expected to perform at least 10 experiments from the following list.

S.No	Activity Title
1.	Introduction to Engineering drawing and AutoCAD.
2.	To study the various commands of Draw tool bar, Modify tool bar and Status bar used in AutoCAD.
3.	To study the various co-ordinate systems used in AutoCAD with examples.
4.	To study rectangle command using various co-ordinate system used in AutoCAD with examples.
5.	To study the uses of layers, dimensioning styles, text and annotation tools in AutoCAD.
6.	To Create Orthographic view creation: front, top, and side views of different objects in AutoCAD.
7.	To draw the projection of given Points using AutoCAD.
8.	To draw the projection of Lines in various cases using AutoCAD.
9.	To draw the projection of Circular Plane using AutoCAD.
10.	To draw the projection of Solid Cone when its axis is inclined to H.P using AutoCAD.
11.	To draw the Isometric projection of a Hexagonal Prism in vertical or horizontal axis using AutoCAD.
12.	To create a 2D view of the given diagram using Auto CAD as per dimensions given.
13.	To create a 2D view of the given diagram using Auto CAD as per dimensions given.
14.	To create a 2D view of the given diagram using Auto CAD as per dimensions given.
15.	To create an Isometric view of the given diagram using Auto CAD as per dimensions given.
16.	To draw the floor plan of Classroom of sides are (20, 20 ft), Using Relative Coordinate System. Note- The figure starts from the point (3,1)
	Content Beyond Syllabus
1.	Use of extrude and revolve command to design the machine parts.

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1MEU-112	Engineering Graphics & Design	PCC	1	0	0	2	30	20	50

Course Outcomes:

At the end of this course, students will be able to	
CO1	Apply basic CAD tools to draw lines, shapes, and scales as per standards.
CO2	Analyze front, top, and side views of different objects using CAD software.
CO3	Use CAD software to generate planes and solids in different positions using various tools.
CO4	Create three dimensional models into two-dimensional isometric and orthographic drawings of various parts with dimensions.
CO5	Implement standard drafting conventions with precise dimensional control using CAD tools.

List of Activities for Engineering Graphics & Design Lab

Note: Students are expected to perform at least 10 experiments from the following list.

S.No	Activity Title
1.	Introduction to Engineering drawing and AUTOCAD.
2.	To study the various commands of Draw tool bar, Modify tool bar and Status bar used in AutoCAD.
3.	To study the various co-ordinate systems used in AutoCAD with examples.
4.	To study rectangle command using various co-ordinate system used in AutoCAD with examples.
5.	To study the uses of layers, dimensioning styles, text and annotation tools in AutoCAD.
6.	To Create Orthographic view creation: front, top, and side views of different objects in AutoCAD.
7.	To draw the projection of given Points using AutoCAD.
8.	To draw the projection of Lines in various cases using AutoCAD.
9.	To draw the projection of Circular Plane using AutoCAD.
10.	To draw the projection of Solid Cone when its axis is inclined to H.P using AutoCAD.
11.	To draw the Isometric projection of a Hexagonal Prism in vertical or horizontal axis using AutoCAD.
12.	To create a 2D view of the given diagram using Auto CAD as per dimensions given.
13.	To create a 2D view of the given diagram using Auto CAD as per dimensions given.
14.	To create a 2D view of the given diagram using Auto CAD as per dimensions given.
15.	To create an Isometric view of the given diagram using Auto CAD as per dimensions given.
16.	To draw the floor plan of Classroom of sides are (20, 20 ft), Using Relative Coordinate System. Note- The figure starts from the point (3,1)
	Content Beyond Syllabus
1.	Use of extrude and revolve command to design the machine parts.

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1PHU-101	Engineering Physics	Basic Sciences	4	3	1	0	40	60	100

Pre-requisite: Higher secondary level physics and mathematics

Course Outcomes:

At the end of this course, students will be able to	
CO1	Apply concepts of crystallography and X-ray diffraction for crystal structure study.
CO2	Examine the characteristics of semiconductor devices like P-N junction and special P-N diodes.
CO3	Make use of Maxwell's equations in electromagnetic wave propagation and superconductors.
CO4	Explain the fundamentals of quantum mechanics and nanotechnology.
CO5	Analyze the working principles, characteristics and application of laser systems and optical fibres.

Detailed Syllabus

Unit 1: Elements of crystallography: Unit cell, Basis, Space lattice, Crystal Systems, Miller Indices of Planes: notation system and calculation method, Origin of X-rays, Continuous & Characteristic X- Rays, X-Ray Diffraction & Bragg's law in Crystals, Bragg's spectrometer. **(6 Hrs.)**

Unit 2: Semiconductor materials: Bonding in semiconductors, Origin of bands in solids (Qualitative idea), Metals, semiconductors & insulators, intrinsic and extrinsic semiconductors, p-type, and n-type semiconductors; Fermi level in semiconductors; Current conduction in semiconductors,I-V characteristics of p-n junction diode. Some special p-n diodes: Zener diode, Tunnel diode, Photo diode, and Light emitting diode **(8 Hrs.)**

Unit 3: Electromagnetic waves and Superconductivity**:** Electromagnetic Spectrum (Basic ideas of different region). Physical significance of Gradient, Divergence & Curl, Maxwell's Equations, electromagnetic wave propagation in free space and isotropic dielectric medium, Poynting vector. Superconductivity; Superconductors as ideal diamagnetic materials, Signatures of Superconducting state, Meissner Effect, Type I & Type II superconductors, London Equations. **(10 Hrs.)**

Unit 4: Fundamentals of Quantum Mechanics and Nanotechnology: Need and origin of quantum concept, Wave - particle duality, Matter waves, Group & Phase velocities; Wave function and Born interpretation;(energy and momentum operator), uncertainty Principle; Schrodinger wave equations (time independent & dependent); Particle in a box Problem. Nanotechnology, Nanomaterials; Classifications of nanomaterials (3D, 2D, 1D and 0D), electron confinement, Nanocomposites, Carbon nanotubes (CNTs), Properties of nanomaterials. **(14 Hrs.)**

Unit 5: Lasers and Fibre Optic communication: Lasers: Basic principle of Laser; Spontaneous & Stimulated emissions, Einstein's Coefficients, Population Inversion, Pumping Mechanisms,

Components of a laser System, Three & four level laser systems; Ruby, He -Ne, and semiconductor Lasers, Application of Lasers. Optical Fibre: Introduction, Acceptance Angle, Numerical Aperture, Normalized frequency, Modes of propagation, material dispersion & pulse broadening in optical fibres, fibre connectors: Expanded Beam and Butt joint, splicer: Fusion and Mechanical splicer and couplers: Star and Beam splitter, Applications of optical fibres. **(14 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year.)
1	Introductory Engineering Physics	Devraj Singh	Dhanpat Rai & Co.	Vol. I , 4th Edition
2	Engineering Physics	HK Malik, AK Singh	Tata McGraw Hill	2nd Edition

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year.)
1	Concepts of Modern Physics	A. Beiser, S. Mahajan, SR Choudhary	Tata McGraw Hill.	7th Edition
2	Laser Fundamentals & Applications	K Thygrajan, AK Ghatak	Laxmi Publications.	2nd Edition

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1PHU-111	**Engineering Physics Lab**	**Basic Sciences**	**1**	**0**	**0**	**2**	**30**	**20**	**50**

Pre-requisite: Higher secondary level physics and mathematics

Course Outcomes:

At the end of this course, students will be able to:	
CO1	Measure the frequency of AC current using an electrical vibrator.
CO2	Perform experiments to study VI characteristics and different parameters of some P-N diodes.
CO3	Apply suitable experimental technique to energy band gap measurements.
CO4	Apply the principle of diffraction grating and divergence to verify laser beam characteristics.
CO5	Determine the numerical aperture, attenuation, and propagation losses in optical fibres using appropriate experimental techniques.

Note: Students are expected to perform about 8-10 experiments from the proposed list of 12 experiments, selecting a minimum of 6-7 from the Physical Lab and 2-3 from the Virtual lab.

List of experiments

S. No.	Name of the Experiment
1	To study the characteristics of different p-n junction diode - Ge and Si.
2	To analyse the suitability of a given Zener diode as voltage regulator.
3	To find out the intensity response of a solar cell.
4	To study the laser beam characteristics like; wavelength and grating element using diffraction grating & divergence.
5	To determine numerical aperture, attenuation & propagation losses in optical fibres.
6	To find out the frequency of AC mains using an electric vibrator/sonometer in transverse arrangement.
7	To find out the intensity response of LEDs.
8	To study the laser beam characteristics like divergence.
9	To find out the frequency of AC mains using an electric vibrator/sonometer in longitudinal arrangement.
10	To determine the energy band gap of Semiconductor.

Virtual / Simulation Lab

S. No.	Name of the Experiment
1	To determine the resistivity of semiconductors by Four probe Method.
2	To understand the phenomenon of the Photoelectric effect.
3	To determine Planck's constant.
4	To study the Hall effect and hence to determine the hall coefficient for the given sample of semiconductor.

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1CSU-102	**Programming for Problem Solving using Python**	**PCC**	**3**	**3**	**0**	**0**	**40**	**60**	**100**

Pre-requisite: Computer fundamentals, logical reasoning, and algorithmic problem-solving skills to support modular learning of programming concepts using Python.

Course Outcomes:

At the end of this course, students will be able to	
CO1	Interpret fundamental problem-solving concepts and core Python programming features including syntax, data types, operators, and input/output operations.
CO2	Apply control structures and looping statements to process and structure data using mutable and immutable data types in Python.
CO3	Utilize Python functions, modules, and packages, along with recursion and variable scope concepts, to develop modular and structured Python programs.
CO4	Analyze pre-defined and user-defined exception handling methods and file handling operations, including directory management, to develop reliable Python programs.
CO5	Design and develop basic GUI applications in Python.

Detailed Syllabus

Unit 1: Basic Python's Constructs: Introduction to Python Programming Language: Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages. Python Data Types & Input/Output**:** Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command. Operators and Expressions: Operators in Python, Expressions, Precedence, Associativity of Operators, Non-Associative Operators. **(8 Hrs.)**

Unit 2: Control Statements and Native Data types in Python Control Structures: Decision making statements, Python loops, Python control statements. Python Native Data Types: Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations). **(8Hrs.)**

Unit 3: Functions and Modules in Python, Python Functions**:** Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables. Python Modules: Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages. Python packages- Introduction, Writing python packages, using standard packages (NumPy, matplotlib) and user defined package statements.

(8 Hrs.)

Unit 4: Exception Handling in Python and File Processing: Exception Handling: Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python. File processing**:** Concept of

Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file. File handling functions e.g open(), close(), read(), readline(), write( ), tell ( ), seek ( ) methods. Renaming & deleting files in Python, directories in Python. **(6 Hrs.)**

Unit 5: Creating the GUI Form and Adding Widgets using Tkinter library: Widgets: Button, Canvas, Check button, Entry, Frame, Label, List box, Menu button, Menu, Message, Radio button, Scale, Scrollbar, text, Top level, Spin box, Paned Window, Label Frame, tk Message box. Handling Standard attributes and Properties of Widgets. (3 Lectures)Layout Management: Developing GUI applications with proper Layout Management features. Look and Feel Customization: Enhancing Look and Feel of GUI using different appearances of widgets. **(8 Hrs.)**

Text Books

S No.	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Fundamentals of Python: First Programs	Kenneth Lambert	Cengage Learning	2nd(2019)
2	The Complete Reference Python	Martin C. Brown	McGraw Hill Education	2nd(2018)

Reference Books

S No.	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Python Programming: An Introduction to Computer Science	John Zelle	Franklin, Beedle& Associates	3rd(2016)
2	Learning Python	Mark Lutz	O'Reilly Media	5th(2013)
3	Programming in Python	Pooja Sharma	BPB Publications	1st(2017)
4	Core Python Programming	R. NageswaraRao	Dreamtech Press	2nd(2021)
5	Python in a Nutshell	Alex Martelli, Anna Ravenscroft, Steve Holden	O'Reilly Media	4th(2023)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1CSU-102	Programming for Problem Solving using C	PCC	3	3	0	0	40	60	100

Course Outcomes:

At the end of this course, students will be able to:	
CO1	Explain the components of a computer system and illustrate the structure and execution flow of a C program.
CO2	Apply operators and control structures to develop C programs.
CO3	Evaluate arrays and strings in C and apply searching and sorting algorithms for efficient data handling.
CO4	Analyse functions and recursion in C using appropriate parameter passing techniques to develop efficient programs.
CO5	Implement structures, pointers, and file handling in C to organize data and perform memory operations.

Detailed Syllabus

Unit 1: Introduction to Programming: Introduction to Computer Fundamentals: Introduction to components of a computer system, operating system, compilers. Basics of C Programming: Structure and Life cycle of a C Program, Data types, Identifiers, Variables, Keywords, Constants, input/output statements, type casting. From algorithms to programs: Representation of algorithm: flowchart and pseudocode, source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code**.** **(4 Hrs.)**

Unit 2: Arithmetic expressions and precedence: Operators in C: Arithmetic, Relational, Logical, Assignment, Increment, Decrement, Unary, Bitwise, Ternary Operators, Type conversion. Decision making- if, if-else, Nested if-else, Multiple if, else if, switch, Handling multiple conditions, Iteration and loops-While, do-while, for, Nesting of Loops, break, continue and go to statements **(12 Hrs.)**

Unit 3: Arrays and Strings: Arrays: 1-D and 2-D array with arithmetic operations, Strings: Input and output operations of a string, string inbuilt functions, Character arrays. Searching: Linear and Binary Searching. Sorting: Basic Sorting Algorithms (Bubble, Insertion and Selection), notion of order of complexity through example programs (no formal definition required). **(9 Hrs.)**

Unit 4: Function: Functions types, Parameter passing in functions, call by value, call by reference. Passing of array into a function. Recursion: Recursion study as Direct and indirect recursion. Example of programs, such as Finding Factorial, Fibonacci series, Ackerman function, Quick Sort, Merge Sort. **(7 Hrs.)**

Unit 5: Structures: Declaration and Initialization of structures, accessing structure elements using (.) operator, Array of structure variables, comparison of Structure and Union. Introduction to Pointers: Pointer arithmetic, Pointer argument Passing, Use of pointer in Self-referential structure, Dynamic memory allocation (malloc(), calloc(), realloc() and free()). File Handling: File handling (only if time is available, otherwise should be done as part of the lab) **(6 Hrs.)**

Text Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Schaum's Outline of Theory and Problems of Programming with C	Byron Grifted	McGraw- Hill	2nd (2022)
2	Programming in ANSI C	E. Balaguruswamy	Tata McGraw-Hill	9th (2024)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Beginning C	Ivor Horton	Apress	6th (2020)
2	Let us C: Authentic guide to C Programming Language	YashavantKanetkar	BPB Publications	20th (2024)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1CSU-112	**Programming for Problem Solving Lab using Python**	**PCC**	**1**	**0**	**0**	**2**	**30**	**20**	**50**

Course Outcomes:

At the end of this course, students will be able to	
CO1	Solve basic engineering problems using Python programs
CO2	Demonstrate the basic data types and operators in Python.
CO3	Apply the use of selection control statements, iteration control statements and loop control statements in Python.
CO4	Analyse user defined functions, modules, and packages for solving basic engineering problems.
CO5	Build python programs for file handling, exception handling methods and creating GUI in Python.

List of Experiments

S.No.	Name of the Experiment
1.	a) Install and configure Python IDE. b) Write a Python program to display messages on screen. c) Develop a Python program that accepts a float value and converts it into an integer using explicit type casting.
2.	a) Write a program to check whether entered frequency is radio frequency or audio frequency. b) Write a program to display various radio frequency bands using if. else if ladder. c) Write a Python program that accepts a value from the user and asks for the target data type (int, float, str, or bool).Using the match–case statement, convert the given value into the selected data type and display the converted value along with its type.
3.	a) Create a simple program, to demonstrate use of for and while loop in Python (e.g.: various pattern building, printing multiplication table, checking palindrome number etc.) b) Create a Python program to input marks of students sequentially and demonstrate the use of loop control statements (continue, break, and pass) to skip absent students, terminate the loop, ignore invalid inputs, and calculate the total number of students who passed.
4.	Write Python program to perform following operations on List: a) Create b) Access c) Update d) Delete elements from list.
5.	Develop Python program to perform following operations on Tuples: a) Create b) Access c) Update d) Delete Tuple elements
6.	Write Python program to perform following operations on Set: a) Create b) Access c) Update d) Delete Access Set elements

7.	Create a program to perform following operations on Dictionaries in Python: a) Create b) Access c) Update d) Delete e) Looping through Dictionary
8.	a) Create a Python application that reads a student's name and marks, uses string built-in functions for text manipulation (uppercase, lowercase, length, trimming, etc.) and math built-in functions (sum, round, sqrt, etc.) for numerical calculations, and displays the final result. b) Create a Python program to perform arithmetic operations and list processing using anonymous (lambda) functions without defining regular functions.
9.	Design a Python program to simulate an ATM withdrawal system that accepts account balance and withdrawal amount from the user. Handle possible errors such as invalid input, insufficient balance, and division errors using exception handling mechanisms.
10.	a) Write Python Program to Count the Number of words and lines in a Text File. b) Write Python Program to Read a String from the User and Append it into a File.
11.	Create a NumPy array and find its dimensions using NumPy's built-in functions. Further, use Matplotlib to graphically represent the array values for better visualization.
12.	Create a Tkinter-based GUI program that includes a Menu Bar and a Progress Bar to perform and display task progress interactively.

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1MEU-113	**Workshop/Manufacturing Practices Lab**	**PCC**	**2**	**0**	**0**	**4**	**60**	**40**	**100**

Course Outcomes:

At the end of this course, students will be able to:	
CO1	Describe the basic manufacturing processes and workshop practices used in industry for fabrication of components from different engineering materials.
CO2	Perform basic workshop operations using appropriate tools and equipment safely.
CO3	Examine dimensional accuracy and tolerances achievable through different workshop processes using standard measuring instruments.
CO4	Design and fabricate a small workshop-based Job by applying appropriate workshop practices and tools.

List of Workshops and Job Work

Note: Students must prepare one job for each shop listed below and maintain a practical file

S. No.	Name of the Shop	Job Work Aim	Operation Involved
1	Machine shop	**1.** To make the multi operation job as per given drawing by the technology process in the Machine Shop.	• Marking and measuring • Facing • Turning • Step turning • Knurling • Chamfering • Drilling • Parting off
2	Fitting shop	1. Perform the various operations of Fitting shop.	• Marking and measuring • Hacksaw cutting • Filing • Chipping • Drilling • Tapping • Reaming

3	Plastic Moulding& Glass Cutting	1. To make a Curtain Ring (Injection Moulding) 2. Perform the Glass cutting with the help of Glass Cutter.	• Preparation of mould • Heating and melting of plastic granules • Injection of molten plastic into the mould • Cooling and solidification • Ejection of the curtain ring • Trimming and finishing • Marking the required dimensions • Scoring the glass with a glass cutter • Breaking along the scored line • Edge smoothing and finishing
4	Carpentry Shop	1. To make a T Half Lap Joint in Carpentry Shop.	• Marking and measuring • Cutting with hand saw • Chiselling • Filing and smoothing • Assembling the T half lap joint • Sanding and finishing
5	Casting Shop	1. To prepare a v-block mould by cop and drag mouldings process.	• Sand preparation • Pattern placing • Sand ramming • Pattern removal • Runner and gate making • Metal pouring • Cooling • Casting removal • Cleaning and finishing
6	Smithy Shop	1. Making a flat chisel/ Rode Circle with the help of smithy tool and perform	• Heating the metal in the forge • Forging and shaping the flat chisel • Cutting to required size • Flattening and straightening • Hardening and tempering • Grinding and finishing

7	Welding shop	1. To make a Butt joint, Lap joint, using the given two M.S pieces by arc welding/gas welding	• Edge preparation and cleaning • Marking and alignment of M.S. pieces • Tack welding • Performing Butt/Lap/Corner welding • Cooling and slag removal • Finishing and inspection
8	Electrical & Electronics Lab	1. Simple wiring 2. Stair case Wiring 3. Go down Wiring 4. Circuit for the Light Bulb	• Marking and layout of wiring • Fixing switches, holders, and boards • Cutting and stripping of wires • Connecting wires as per circuit • Testing the wiring circuit • Placing the breadboard and components • Connecting wires on the breadboard • Inserting the light bulb/LED in the circuit • Connecting the power supply • Testing the light bulb circuit

Project Work **(4 Hrs.)**

- Development and fabrication of a simple product/assembly or item from scrap materials using the workshop practices learned, demonstrating practical engineering applications.

Free Visualization / Innovative Tools – Workshop Practices

Workshop Shop	Tool / Platform	Link	Purpose
Machine Shop	CAMotics	camotics.org	Simulate machining
Fitting Shop	Tinkercad	tinkercad.com	3D parts visualization
Carpentry Shop	SketchUp Free	app.sketchup.com	Visualize joints
Plastic / Glass Shop	FreeCAD	freecad.org	Model components
Casting Shop	YouTube	youtube.com	Watch casting demos
Smithy Shop	YouTube	youtube.com	Watch forging demos
Welding Shop	YouTube	youtube.com	Watch welding demos
Electrical / Electronics	Tinkercad Circuits	tinkercad.com/circuits	Simulate circuits

Text Books

S No.	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Workshop Practice	Swarn Singh	S. K. Kataria& Sons, New Delhi.	2nd, Reprint 2024
2	Manufacturing Practices (Workshop Practice)	R. K. Singal	S. K. Kataria& Sons, New Delhi.	1st, Reprint 2022

Reference Books

S No.	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Elements of workshop technology: Vol. 1	Choudhury, S. K. H., Choudhury, A. K. H., & Roy, N.	Media Promoters & Publishers	17th (2024)
2	A course in workshop technology: Vol. 1	Raghuwanshi, B. S.	DhanpatRai& Co.	Revised Edition (2024)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
26C1DTU-101	Design Thinking and AI Elements	Value Added	3	3	0	0	40	60	100

Course Outcomes

At the end of the course, the student will be able to:	
CO1	Explain the principles of Design Thinking and identify user needs and design problems
CO2	Apply ideation, prototyping, testing, and feasibility analysis to develop innovative solutions
CO3	Explore the basic concepts of Artificial Intelligence, data types and machine learning approaches
CO4	Analyse fundamental AI techniques and tools used for solving real-world problems
CO5	Interpret ethical issues, responsible AI and emerging trends in AI

Detailed Syllabus

Unit 1: Introduction to Design Thinking and Problem Identification: Introduction to Design Thinking, Importance and applications, Design Thinking Framework: Five Phase Design: Empathize, Define, Ideate, Prototype and Test, understanding user needs and discovering design problems, identifying project stakeholders, Empathize Phase: Methods for understand user needs, Define Phase: Framing the design problem and identifying key challenges. **(8 Hrs.)**

Unit 2: Prototyping, Testing and Business Planning: Feasibility Analysis & Techno - Economic Analysis, Ideate Phase: Brainstorming and generating multiple innovative solutions, Prototype Phase: designing and developing solution prototypes; methods for rapid prototyping, Test Phase – testing, validating and refining solutions through user feedback, Software Development Life Cycle (SDLC). **(6 Hrs.)**

Unit 3: Basic Concepts of Artificial Intelligence: Definition and Scope of AI, Types of AI, Applications of AI, AI in Everyday Life, Current Industry Leaders in AI, AI Prompt Writing. Data Literacy, Importance of Data in AI, Types of Data (Structured, Unstructured, Semi-Structured Data), Steps of Data Preprocessing, Types of Learning: Supervised Learning, Unsupervised Learning, Reinforcement Learning, AI-Driven Development Life Cycle. **(10 Hrs.)**

Unit 4: AI Techniques and Algorithms: Problem Solving in AI, Basic Conceptual Understanding of: Machine Learning (ML), Deep Learning (DL), Robotics, Data Science, AI in Cybersecurity, IoT, Computer Vision, Large Language Models (LLMs). Hardware for AI, Data Centers, Cloud Computing for AI, Demonstration of No-Code AI Tools, Text, Images, Audio, Video and Code generation using AI. **(10 Hrs.)**

Unit 5: Responsible AI and Future Trends: Ethical and Responsible use of AI, Societal Impact of AI, Bias in AI models, Data privacy and security, AI Hallucinations, AI Governance and Regulations. Future Trends: Autonomous Systems, Human–AI Collaboration, Quantum AI. **(6 Hrs.)**

Text Books

S. No	Name of the Book	Author(s)	Publisher	Edition (Publication Year)
1.	The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems	Michael Lewrick, Patrick Link, Larry Leifer	Wiley	1st (2018)
2.	Artificial Intelligence Basics: A Non-Technical Introduction	Tom Taulli	A Press	1st (2018)

Reference Books

S. No	Name of the Book	Author(s)	Publisher	Edition (Publication Year)
1.	Systems thinking: Managing chaos and complexity: A platform for designing business architecture., Chapter Seven: Design Thinking	Jamshid Gharajedaghi	Morgan Kaufmann	3rd (2011)
2.	Artificial Intelligence: A Guide for Thinking Humans	Melanie Mitchell	Pelican	1st (2020)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
26C1ICU-101	Indian Constitution	NCC	0	2	0	0	100	-	100

Course Outcomes:

At the end of the course, the student will be able to:	
CO1	Summarize the emergence, evolution, structure, and composition of the Indian Constitution.
CO2	Analyze the concept and functioning of federalism in the India as provided in the Constitution.
CO3	Classify the Panchayati Raj institutions as instruments of decentralization and the roles of the three organs of the state in the contemporary scenario.
CO4	Explain the Indian political scenario in the context of emerging challenges.
CO5	Elaborate Indian foreign relations under the cold war and post-cold war era.

Detailed Syllabus

Unit 1: Introduction to Indian Constitution: Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947, Composition of the Constituent Assembly, Functions of the Constituent Assembly, Various Committees of the Constituent Assembly, Enforcement of the Constitution, Indian Constitution and its Salient Features**.** **(8 Hrs.)**

Unit 2: The role of B R Ambedkar in the making of the Indian Constitution, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Gandhian Principles, Liberal Principles, Socialistic Principles. **(8 Hrs.)**

Unit 3: Indian Federalism: Meaning and Definition of Federalism, Structure and Features of Indian Federalism, Difference between Indian and Federation of other states, Difference between federal and unitary features, Critical Evaluation of the Indian Federal System, Decentralization of Powers, Centre-State Relations, 73rd Amendment, Panchayath Raj Institutions. **(8 Hrs.)**

Unit 4: Union Government: Powers of Indian Parliament, Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister. **(8 Hrs.**)

Unit 5: India's External Relations - Cold War and Post-Cold War era: What is Foreign Policy? Basic Determinants of Foreign Policy, Indian and its Neighbours, India's Extended Neighbourhood in West Asia and South-East Asia, India's relations with the United States and Russia, India and the World Organisations, India in the 21st century. **(8 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Constitution of India	The Constitution of India, 1950 (Bare Act)	Government Publication.	-
2	Working of a Democratic Constitution of India.	Granville Austin	Oxford University Press, New Delhi	1st(2003)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Contemporary India: Economy, Society, Politics	N. Chandhoke& Priyadarshini	Pearson Education India	1st (2009)
2	Understanding Contemporary India: Critical Perspectives	A. Vanaik& R. Bhargava	Orient Blackswan	1st (2010)