SAMARTH EDUCATIONAL TRUST
SAWKAR INSTITUTES
SATARA

AGCE

GROUP-A & B

SYLLABUS FIRST YEAR

Bachelor of Technology

Syllabus and Course Structure of First Year B.Tech Engineering Programme at Arvind Gavali College of Engineering, Satara - Designed to nurture foundational knowledge, practical skills, and holistic development for future engineers

ARVIND GAVALI COLLEGE OF ENGINEERING, SATARA.

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NAAC & NBA Accredited AN AUTONOMOUS INSTITUTE ISO 9001:2015
Approved by AICTE, New Delhi, Recognised by Govt. Of Maha.,DTE Mumbai & Affiliated to Dr.Babasaheb Ambedkar Technological University (BATU), Lonere.
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Institute Code : Engg. DTE EN-6545
BCA 6545, MCA 6545, B.Voc 6545

Ref No.: Date :

As per NEP Guidelines, Proposed Scheme of Credit Distribution
First Year B. Tech-2025-26(Common to all Branches, for GROUP A & B)
SEMESTER I

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./ Week	Cr	Components	Max	Min for Passing	
1	BSC	25BSE1101	Engineering Mathematics: Calculus and Algebraic Techniques	3	1	0	4	4	CA1 MSE CA2 ESE	10 30 10 50	 20	40
2	BSC	25BSE1001/ 25BSE1002	Engineering Physics/Modern Chemistry	3	0	0	3	3	CA1 MSE CA2 ESE	10 30 10 50	 20	40
3	ESC	25BSE1102	Basic Electrical & Electronics Engineering	3	0	0	3	3	CA1 MSE CA2 ESE	10 30 10 50	 20	40
4	ESC	25BSE1103	C Programming for Problem Solving	2	0	0	2	2	CA1 MSE CA2 ESE	10 30 10 50	 20	40
5	AEC	25BSE1104	Communication Skills	2	0	0	2	2	CA1 MSE CA2 ESE	10 30 10 50	 20	40
6	BSC	25BSE1001L/ 25BSE1002L	Engineering Physics Laboratory / Modern Chemistry Laboratory	0	0	2	2	1	CA1 CA2 OE	25 25 --	 --	20
7	ESC	25BSE1102L	Basic Electrical & Electronics Engineering Laboratory	0	0	2	2	1	CA1 CA2 OE	25 25 50	 20	40
8	ESC	25BSE1103L	C Programming for Problem Solving Laboratory	0	0	2	2	1	CA1 CA2 OE	25 25 50	 20	40
9	AEC	25BSE1104L	Communication Skills Laboratory	0	0	2	2	1	CA1 CA2 OE	25 25 --	 --	20
10	VSEC	25BSE1105L	Engineering Practice Laboratory	0	0	2	2	1	CA1 CA2 OE	25 25 --	 --	20
11	CC	25BSE1106L	Yoga	0	0	2	2	1	CA1 CA2 OE	25 25 --	 --	20
			Total	**13**	**1**	**12**	**26**	**20**		**900**		
Total Contact Hours –26 Total Credits – 20												

As per NEP Guidelines, Proposed Scheme of Credit Distribution
First Year B. Tech-2025-26(Common for all Branches)

SEMESTER II

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./ Week	Cr	Components	Max	Min for Passing	
1	BSC	25BSE1201	Engineering Mathematics: Calculus and Transform Methods	3	1	0	4	4	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
2	BSC	25BSE1001/ 25BSE1002	Engineering Physics/Modern Chemistry	3	0	0	3	3	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
3	ESC	25BSE1202	Engineering Mechanics	2	0	0	2	2	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
4	ESC	25BSE1203	Python Programming	2	0	0	2	2	CA1	25		20
									MSE	--		
									CA2	25		
									ESE	--	--	
5	VSEC	25BSE1204	Computer Aided Engineering Drawing	2	0	0	2	2	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
6	PCC	25PCC1201	Fundamentals of Industry Evolution	2	0	0	2	2	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
7	IKS	25BSE1205	Energy, Ecology & Environment	2	0	0	2	2	CA1	25		20
									MSE	--		
									CA2	25		
									ESE	--	--	
8	BSC	25BSE1001L/ 25BSE1002L	Engineering Physics Laboratory / Modern Chemistry Laboratory	0	0	2	2	1	CA1	25		20
									CA2	25		
									OE	--	--	
9	ESC	25BSE1203L	Python Programming Laboratory	0S	0	2	2	1	CA1	25		40
									CA2	25		
									OE	50	20	
10	VSEC	25BSE1204L	Computer Aided Engineering Drawing Laboratory	0	0	2	2	1	CA1	25		20
									CA2	25		
									OE	--	--	
11	VSEC	25BSE1205L	Design Thinking	0	0	2	2	1	CA1	25		20
									CA2	25		
									OE	--	--	
12	CC	25BSE1206L	Community Services	0	0	2	2	1	CA1	25		20
									CA2	25		
									OE	- -	--	
			Total	**16**	**1**	**10**	**27**	**22**		**900**		
Total Contact Hours –27 Total Credits - 22												

Title of the Course: Engineering Mathematics: Calculus and Transform Methods Course Code: 25BSE1201	L	T	P	Credit
	3	1	--	4

Course Prerequisite:
Differential equations of first order and first degree, Fourier series, vector algebra.

Course Description:
In this course the students will learn topics from differential equations, special functions, and integral calculus.

Course Objectives:
By the end of this course, the students will be able to:
1. To know and apply the concept partial derivatives and their applications to Maxima/ Minima, series expansion of multi valued functions.
2. To solve different types of first-order differential equations.
3. Understand the definition and basic properties of Laplace transforms.
4. Understanding Fourier transforms to represent signals in the frequency domain.
5. Understand scalar and vector fields, their differential operators and to apply fundamental theorems of vector calculus.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Explain the concept partial derivatives and their applications to Maxima/ Minima , series expansion of multi valued functions.
CO2	Solve first-order differential equations and apply them to practical problems like orthogonal trajectories and Kirchhoff's laws.
CO3	Apply the knowledge of Laplace transform methods to solve differential equations.
CO4	Understand and apply Fourier series, Fourier integrals, and Fourier transforms including sine and cosine transforms to analyze engineering signals and systems.
CO5	Analyze scalar and vector fields and use vector calculus theorems to evaluate line, surface, and volume integrals in engineering problems.

CO-PO Mapping:

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

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	10
MSE	30
CA2	10
ESE	50

CA1 and **CA2** are based on Surprise test/ Assignment/ Quiz/Seminar/Group discussions presentation, etc.
MSE is based on 50% of course content.
ESE is based on 100% course content with 60-70% weightage for course content covered after MSE.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Partial Differentiation** Function of two and three variables, partial derivatives of first order and higher order, partial derivatives of composite function and Implicit function, Euler's theorem on homogenous function.	**08**
2	**First Order Differential Equations and Its Applications** Concept of order, degree and formation of ODEs, Linear differential equations, and equations reducible to linear form. Exact differential equations and integrating factor method. Applications to orthogonal trajectories (cartesian and polar equations), Kirchhoff's law.	**08**
3	**Laplace Transforms** Definition of Laplace transforms and its inverse, transforms of elementary function, properties of Laplace transform, transforms of derivatives and integral, Evaluation of integral using Laplace transforms.	**08**
4	**Fourier transforms** Fourier Transform (FT): Complex exponential form of Fourier series, Fourier integrals (sine and cosine forms), Fourier transform, and its inverses, Fourier Sine, and Cosine Transforms.	**09**
5	**Vector Calculus** Scalar and vector fields: Gradient, divergence, and curl, Solenoidal and Irrotational vector fields, Vector identities	**08**

	(statement only), Line and surface integrals, Green's theorem (in the plane), Gauss divergence theorem, and Stokes theorem (without proofs).	

Text Books

Sr. No.	Title	Author	Publisher
1	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publishers Delhi
2	A Text Book of Applied Mathematics Vol. I & II	P. N. Wartikar & J. N. Wartika	Pune Vidyarthi Griha Prakashan, Pune
3	A textbook of Engineering Mathematics	N.P. Bali and Manish Goyal	Laxmi Publications private limited

Reference Books

Sr. No.	Title	Author	Publisher
1	Engineering Mathematics II	G.V. Kumbojkar	C.Jamnadas and Co.
2	Advanced Engineering Mathematics	H. K. Dass	S. Chand & Company Pvt. Ltd, New Delhi
3	A text book of Engineering Mathematics	N. P. Bali, Iyengar	Laxmi Publications (P) Ltd., New Delhi
4	Engineering Mathematics	Ravish R Singh and Mukul Bhatt	McGraw Hill Education (India) Private Limited, Chennai.
5	Advanced Engineering	Erwin Kreyszi	John Wiley & Sons

Title of the Course: Engineering Physics Course Code: 25BSE1001	L	T	P	Credit
	3	--	--	3

Course Prerequisite:

To ensure that the students can fully benefit from this course, they should have:

1. Basic knowledge of Intermediate level Physics and Mathematics.
2. Familiarity with light behavior and optical phenomena.
3. To have fundamental knowledge of modern physics.

Course Description:

This course explores physics principles through an engineering lens, starting from wave optics and progressing through modern materials, quantum theory, and semiconductor devices. Each unit is carefully connected to develop scientific thinking and problem-solving for engineering applications.

Course Objectives:

By the end of this course, the students will be able to:

1. Introduce fundamental wave optics and its industrial applications.
2. Develop a basic understanding of laser and optical fiber technologies.
3. Provide foundational knowledge of quantum mechanics for nanoscale systems.
4. Understand crystal structure and X-ray applications in material science.
5. Classify solids on the basis of Band theory and to calculate carrier concentrations.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand the concepts of interference, diffraction, and polarization in engineering measurements.
CO2	Explain the working principles of laser and optical fiber technologies and their applications.
CO3	Apply quantum mechanical concepts to solve basic physical models.
CO4	Analyze crystal structures using X-ray diffraction principles.
CO5	Assess band theory and semiconductor behavior for engineering applications in sensors and devices.

CO-PO Mapping:

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

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	10
MSE	30
CA2	10
ESE	50

CA1 and **CA2** are based on Surprise test/ Assignment/ Quiz/Seminar/Group discussions presentation, etc.
MSE is based on 50% of course content.
ESE is based on 100% course content with 60-70% weightage for course content covered after MSE.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Engineering Optics** Introduction, Interference: conditions, thin film interference, wedge-shaped film, Newton's rings, Diffraction: single slit and diffraction grating, resolving power, Polarization: Polarization by reflection and refraction, double refraction, types of polarization, Optical Activity and Specific rotation, Applications: anti-reflection coatings, polarizers.	**08**
2	**Lasers and Optical Fiber** Interaction of light with matter: Spontaneous and stimulated emission, Population inversion, Pumping (conceptual), Construction and working of: Ruby laser, Nd-YAG Laser, Semiconductor Laser (basic structure and operation), Engineering applications of Lasers, Fiber Optics: Total internal reflection, Numerical aperture, Types (step-index and graded-index), Applications in sensors and communication.	**08**
3	**Quantum Mechanics** Limitations of classical mechanics; need for quantum theory, wave particle duality, de-Broglie hypothesis, Heisenberg's Uncertainty Principle(qualitative), Wave function: Physical significance, Probability interpretation Schrödinger Equation: Time-dependent form; Time-independent form (1D infinite potential well), Applications: Quantum tunnelling (qualitative), Energy levels in quantum wells.	**08**
4	**Crystallography and X-Ray Diffraction** Crystal structure basics: Unit cell, Lattice, Bravais lattices (SC, BCC,	**08**

	FCC), Crystal systems, packing factor (qualitative), Miller indices, Crystallographic planes, and directions, Interplanar spacing, X-ray production (characteristic and bremsstrahlung), Bragg's Law and Applications: Basics of material structure analysis.	
5	**Band Theory and Semiconductor Devices** Energy bands in solids: Formation of bands and classification (metal, insulator, semiconductor), Fermi level (concept), Carrier concentration (intrinsic vs. extrinsic semiconductors), Electrical Conductivity in semiconductors, Hall Effect: Principle, Significance, Measurement of carrier type and concentration, Applications: Diodes, Photodetectors, Sensors (brief, illustrative).	**08**

Text Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	A textbook of Engineering Physics	M.N. Avadhanulu and P. G. Kshirsagar	S. Chand & Company Ltd., Delhi
2	Engineering Physics	Shailendra Sharma, Jyostna Sharma	Pearson Publications.
3	Engineering Physics	R.K. Gaur & S.L. Gupta	Dhanpat Rai Publications

Reference Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Optics	Ajoy Ghatak	Tata McGraw-Hill Education
2	Engineering Physics	H K Malik| A K Singh	McGraw Hill
3	Introduction to Quantum Mechanics	David J. Griffiths	Pearson Education
4	Introduction to Solid State Physics	Charles Kittel	Wiley
5	Applied Physics	P.K. Palanisamy	Scitech Publications (India) Pvt. Ltd.

Title of the Course: Modern Chemistry Course Code: 25BSE1002	L	T	P	Credit
	3	--	--	3

Course Prerequisite:

The students should have knowledge about basic chemistry related to the periodic table, properties of elements, electrochemistry, properties of electromagnetic radiations, energy storage and energy conversion devices, physical and chemical properties of nanomaterials and advanced materials, etc.

Course Description:

This course intends to impart fundamental knowledge of advanced materials and applied knowledge of instrumental methods, energy conversion and storage devices, prevention techniques of corrosion. The students will be expected to communicate knowledge to society and industry.

Course Objectives:

By the end of this course, the students will be able to:

1. To introduce phenomenon involved in corrosion and corrosion control methods.
2. To provide and demonstrate chemistry concepts relevant to the technological field.
3. To understand the basic principles of electrochemistry and chemistry of different energy conversion devices such as batteries, fuel cells.
4. To train the students to effectively use knowledge of instrumental techniques & advanced materials and nanomaterials.
5. Design nanomaterials, and propose innovative engineering applications.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand the concepts of corrosion and its prevention methods to select appropriate materials and techniques for enhancing the durability of engineering components.
CO2	Apply the concepts of chemistry to lay the ground work for subsequent studies in various engineering fields to examine fuel and suggest alternative fuels.
CO3	Analyze the principles of electrochemistry, fuel cell, and battery technology to analyze and select suitable electrochemical systems for energy storage and conversion in industrial and engineering applications.
CO4	Evaluate the principles, working, advantages, limitations, and industrial applications of instrumental techniques to determine their effectiveness in qualitative and quantitative chemical analysis.
CO5	Create nanomaterials using appropriate top-down or bottom-up synthesis methods, review their structure through characterization techniques and propose innovative engineering applications.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011
CO1	3	2	1								
CO2	3	2	1		2						
CO3	3	2									

CO4	3	2									
CO5	3	2					1				

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	10
MSE	30
CA2	10
ESE	50

CA1 and **CA2** are based on Surprise test/ Assignment/ Quiz/Seminar/Group discussions presentation, etc.
MSE is based on 50% of course content.
ESE is based on 100% course content with 60-70% weightage for course content covered after MSE.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Corrosion and Its Prevention** Introduction, dry corrosion (corrosion due to oxygen and other gases), wet corrosion: electrochemical theory of corrosion (hydrogen evolution and oxygen absorption), differential metal corrosion, differential aeration corrosion: pitting corrosion and water line corrosion, stress corrosion, factors affecting rate of corrosion; Corrosion control: cathodic protection-Sacrificial anode and impressed current method, Anodic protection- electroplating.	**08**
2	**Chemical Fuel** Introduction, classification, characteristics of good fuel, calorific value-definition, units, gross calorific value, net calorific value, Calculation of calorific value by Dulong's formula, Bomb calorimeter, and Boy's calorimeter-basic instrumentation, working, Numerical. Petroleum- Introduction, refining, important petroleum products, non-petroleum fuels.	**08**
3	**Electrochemistry, Fuel Cell & Battery Technology** Introduction, cell potentials, electrolyte concentration cells, Nernst equation, reference electrodes, ion selective electrodes, glass electrode: pH measurement using glass electrode, applications of pH-metry. Fuel Cell - Principle, components, classification of fuel cell, H2-O2 Fuel Cell.	**08**

	Battery technology- Introduction, components of battery, Battery characteristics, Li-Ion battery: Principle, working and applications.	
4	**Instrumental techniques** Introduction to various analytical techniques such as qualitative and quantitative analysis, Ultraviolet-Visible Spectroscopy, spectrophotometer: instrumentation and working, numericals Lambert's and Beer - Lambert's Law, NMR Spectroscopy, Chromatography, numerical. advantages and disadvantages of instrumental methods.	**08**
5	**Nanomaterials and Characterization Techniques** Introduction to Nanomaterials, Synthesis of Nanomaterials (Bottom up- self-assembly and Top down approaches using methods like Ball milling, Sol-gel Process, Chemical Vapour deposition (CVD), Characterization of Nanomaterials using Scanning Electron Microscopy (SEM), Graphene, Carbon Nanotubes, Applications of nanomaterial in engineering fields.	**08**

Text Books

Sr. No.	Title	Author	Publisher
1	A Textbook of Engineering Chemistry	S. S. Dara and S. S. Umare	S.Chand and Company Ltd.,New Delhi
2	A Textbook of Engineering Chemistry	Shashi Chawla	Dhanpat Rai & Co.(Pvt.) Ltd, Delhi
3	Engineering Chemistry	Godbole, Pendse, Joshi	Nirali publication, Pune

Reference Books

Sr. No.	Title	Author	Publisher
1	Instrumental Methods of Chemical Analysis	Chatwal and Anand	Himalaya Publishing House, New Delhi
2	Engineering Chemistry	O. G. Palanna	Blackie Academic and Professional
3	Nanotechnology-Importance and Applications.	M. H. Fulekar	Wiley

Title of the Course: Engineering Mechanics Course Code: 25BSE1202	L	T	P	Credit
	2	--	--	2

Course Prerequisite:
Preliminary knowledge of Physics and Mathematics.

Course Description:
Engineering Mechanics is a fundamental course that introduces students to the principles of statics and dynamics used in the analysis engineering problems. The course emphasizes a conceptual understanding of force systems, equilibrium, structural analysis, centroids, moments of inertia, and motion of particles and bodies.

Course Objectives:
By the end of this course, the students will be able to:
1. To understand the fundamental laws and concepts of statics and dynamics applicable to engineering systems.
2. To analyse the equilibrium of force systems using free body diagrams and appropriate theorems.
3. To evaluate support reactions in beams and trusses, and determine centroid and moment of inertia.
4. To apply principles of kinematics and kinetics to solve problems involving linear motion.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Explain the fundamental principles of statics and dynamics, including laws of mechanics, force systems, and motion concepts.
CO2	Apply equilibrium conditions to solve engineering problems involving coplanar force systems, trusses, and friction.
CO3	Analyze beams for support reactions and compute centroid for standard and composite sections.
CO4	Solve problems related to kinematics and kinetics of particles using Newton's laws, work-energy, and impulse-momentum principles.

CO-PO Mapping:

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

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	10
MSE	30
CA2	10
ESE	50

CA1 and **CA2** are based on Surprise test/ Assignment/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Fundamentals of Statics** Fundamental Laws in mechanics, Force, System of Forces, Resolution and Composition of Forces, Resultant of coplanar force system, Moment, Varignon's Theorem, Law of Moments, Couple, Equivalent force couple system.	**07**
2	**Equilibrium of Forces and Friction** Equilibrium of systems/bodies (coplanar concurrent and non-concurrent), Free Body Diagram, Conditions of Equilibrium, Lamis' Theorem Friction: Friction for bodies on horizontal and inclined planes and their applications.	**07**
3	**Analysis of Beams and Centroid** Beam, Types of supports, Types of beams, Types of loads, Analysis of Simple and Continuous beams, Center of Gravity & Centroid.	**07**
4	**Fundamental of Dynamics** Kinematics: Introduction to basic terminologies. Equations of motion for uniform and variable acceleration, Motion under Gravity for Linear motion, kinetics of Linear motion:Newton's Laws, Alembert's Principle, Work- Energy Principle, Impulse Momentum Principle.	**07**

Text Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Engineering Mechanics	R.S. Khurmi	S. Chand Publications
2	Engineering Mechanics	F.L. Singer	Harper & Row
3	Engineering Mechanics: Statics and Dynamics	A.K. Tayal	Umesh Publications
4	Engineering Mechanics	D.S. Bedi	Khanna Publishers
5	Engineering Mechanics	S.S. Bhavikatti	New Age International

Reference Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Engineering Mechanics: Statics and Dynamics	J.L. Meriam & L.G. Kraige	Wiley India
2	Vector Mechanics for Engineers: Statics and Dynamics	Beer, Johnston, and Eisenberg	McGraw Hill
3	Engineering Mechanics	Irving H. Shames	Prentice Hall
4	Applied Mechanics	H.J. Shah and S.B. Junnarkar	Charotar Publishing House
5	Mechanics for Engineers: Dynamics	R.C. Hibbeler	Pearson Education

Certification Courses					
Sr. No.	**Course/Certification**	**Provider/Platform**	**Level**	**Mode**	**Certification Authority**
1	Engineering Mechanics	SWAYAM	Base	Online	NPTEL

Title of the Course: Python Programming Course Code: 25BSE1203	L	T	P	Credit
	2	--	--	2

Course Prerequisite:
Basic Programming Knowledge.

Course Description:
This course provides a comprehensive introduction to Python programming, focusing on its syntax, control structures, data types, and functions. Students will learn to write efficient programs using built-in data structures, handle files, manage exceptions, and perform string processing. The course also introduces object-oriented programming concepts and equips learners with the skills to build interactive web applications using Stream lit. Emphasis is placed on problem-solving, logical thinking, and real-world application development.

Course Objectives:
By the end of this course, the students will be able to:
1. To introduce the fundamentals of python programming for logic building.
2. To develop the ability to apply control structures, user-defined functions, and exception handling to solve logical problems.
3. To explain the use of built-in data structures and perform file, string operations.
4. To enable students to design and deploy simple interactive web applications.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Identify Python syntax, keywords, variables, data types, operators, and input/output operations.
CO2	Apply control structures including decision-making, loops, control statements, and list comprehensions to solve practical problems.
CO3	Develop Python programs using user-defined functions, recursion, and string processing techniques.
CO4	Utilize Python modules, standard libraries, and string processing techniques to develop efficient and modular programs.

CO-PO Mapping:

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

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2) will have 50% weightage, respectively.

Assessment Component	Marks
CA1	25
MSE	--
CA2	25
ESE	--

CA1 and **CA2** are based on the Practical Performance.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Python Basics: Syntax, Data Types & Operators** Python Syntax and structure, Keywords, Identifiers, naming conventions, Variables, Basic Input/output Operations, Comments and documentation Data Types and Type Conversion, Data Types: int, float, complex, bool, string Type casting. Operators: Arithmetic, relational, logical, assignment, bitwise, membership, identity.	**07**
2	**Control Structure, Functions & Error Handling** Decision Making: if, if-else, nested if, Looping: for, while, nested loops, Control Statements: break, continue, pass, Functions: Defining and calling arguments, return values, recursion. Exception handling, Error types: syntax errors, runtime errors, logical errors.	**07**
3	**Data Structure, File Handling and Object-oriented basics** Built-in data structures: Lists, tuples, sets, dictionaries, Indexing, slicing, iteration, Comprehensions: list, set dict, File Handling: Open/close files, modes, file pointers. Object-oriented programming: Classes and objects, attributes, and methods(optional):_init_, encapsulation (basic intro).	**07**
4	**Modules, Libraries & String Processing** Using modules and import statements, Standard libraries: math, random, datetime etc. String processing: accessing, slicing methods, formatting iterators, and generators (introduction).	**07**

Text Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Murach ‘s Python Programming	Michael Urban and Joel Murach	Murach's Publication, 2016.

2	Introduction to Programming in Python an Interdisciplinary Approach	Robert Sedgewick, Kevin Wayne, Robert Dondero	Pearson India Education Services Pvt. Ltd., 2016.
3	An Introduction to Python – Revised and Updated for Python	Guido van Rossum and Fred L. Drake Jr	Network Theory Ltd., 2011.

Reference Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Think Python: How to Think Like a Computer Scientist	Allen B. Downey	2nd Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/)
2	Python Programming: An Introduction to Computer Science"	John Zelle	3rd Edition https://www.krishnagudi.com/wp-content/uploads/2023/05/Python-Programming-An-Introduction-to-Computer-Science-John-M.-Zelle.pdf
3	"Learning Python	Mark Lutz	Addison-Wesley, Reading, Massachusetts, 1996.
4	MP math: A Python library for Arbitrary-Precision Floating Point Arithmetic"	Fredrik Johansson et al	December 2013. http://mpmath.org/
5	Ultimate Python Programing: Learn Python with 650+ programs,900+ practice questions and 5 projects	Deepali Srivastava	BPB Publications

Title of the Course: Computer Aided Engineering Drawing Course Code: 25BSE1204	L	T	P	Credit
	2	--	--	2

Course Prerequisite:
General Awareness, Knowledge of Geometry at SSC Level.

Course Description:
Course consists of Basics of AutoCAD, Geometrical constructions using AutoCAD & Conversion of pictorial views into orthographic view, Isometric Projections & Dimensioning techniques

Course Objectives:
By the end of this course, the students will be able to:
1. To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
2. To prepare you to communicate effectively.
3. To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand the basics of engineering graphics and its applications.
CO2	Construct the projection of Lines and planes for given conditions.
CO3	Demonstrate the Projection and solids for appropriate condition and development of lateral surface of solids by using section method.
CO4	Visual and draw the orthographic and Isometric view simple components.

CO-PO Mapping:

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

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	10
MSE	30
CA2	10
ESE	50

CA1 and **CA2** are based on Surprise test/ Assignment/ Quiz/Seminar/Group discussions presentation, etc.
MSE is based on 50% of course content.
ESE is based on 100% course content with 60-70% weightage for course content covered after MSE.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Introduction to Engineering Drawing and Computer Aided Sketching** A) Principles of Engineering Graphics and their significance, Drawing Principles and its Instruments, Lettering, Title Block, Sheet Sizes, Line Types, Dimensioning, Projection Concept, Method of Projection (First angle Vs Third angle) Orthographic Projection, Isometric Projection. B) Introduction to CAD & Graphical user interface of the AutoCAD software, standard tool bars/ menus, navigational tools. Study and use of drawing and modify commands.	**06**
2	**Projection of Lines and Planes** A) Points is situated in different quadrants, Projection of lines inclined to both the planes, True length of straight lines and its inclination with reference plane, traces of line. B) Projection of planes (Regular polygons like Triangular, Square, Pentagon, Hexagon, and circle) inclined to one plane & perpendicular to other plane (3 Stages problem).	**08**
3	**Projection of Solids and Development of Surface** A) Projection of Solids such as Prisms, pyramids, cylinder and cone with their axis inclined to one of the reference planes (Only rest on HP). B) Development of lateral surface of regular solids: Prism, Cone, Cylinder.	**07**
4	**Orthographic & Isometric Projection** A) Orthographic projection, selection and spacing of views, Orthographic views, required views from Pictorial view (Conversion of 3D view into orthographic view) B) Isometric axes, lines & planes, Isometric Scale, Isometric drawing, and isometric view. Conversion of orthographic view into	**07**

	Isometric view.	

Text Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Engineering Graphics with Auto CAD	D.M.Kulkarni,A.P. Rastogi, A.K.Sarkar	(PHI) Publisher
2	Engineering Drawing	N.D.Bhatt	Charotar Publisher

Reference Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Engineering Graphics	K. V. Nataraajan	Dhanalakshmi Publishers, Chennai
2	Engineering Graphics	K. Venugopal and V. Prabhu Raja	New Age International (P) Ltd
3	Computer Aided Engineering Drawing	Cencil Jensen, Jay D.Helsel , Dennis R. Short	TATA McGRAW HILL
4	Engineering Drawing with an Introduction to AutoCAD	Dhananjay A. Jolhe	Mc GrawHill Education

Title of the Course: Fundamentals of Industry Evolution Course Code: 25PCC1201	L	T	P	Credit
	2	--	--	2

Course Prerequisite:

None. This is an introductory course. However, basic digital literacy and a curiosity about technology and innovation will enhance the learning experience.

Course Description:

This course provides an overview of how industries have evolved into smart and intelligent systems. Students will learn the fundamentals of Industry 4.0 and Industry 5.0, daily-life applications of smart technologies, and the role of sensors, actuators, and automation. The course also focuses on human–machine collaboration, sustainability, and emerging industrial trends to build awareness of future engineering careers.

Course Objectives:

By the end of this course, the students will be able to:

1. Understand the evolution of industries from Industry 1.0 to Industry 5.0 and explain the need for smart and human-centric industrial systems.
2. Explain the fundamental concepts of Industry 4.0, including smart technologies, connectivity, sensors, actuators, and automation in simple terms.
3. Identify real-world applications of Industry 4.0 and Industry 5.0 in daily life, manufacturing, healthcare, agriculture, and smart cities.
4. Analyze the advantages, limitations, and challenges of smart and digital industries with respect to cost, skills, sustainability, and ethics.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Explain the evolution of industries and the fundamental concepts of Industry 4.0 and Industry 5.0, including smart technologies, sensors, and actuators.
CO2	Identify and describe real-life and industrial applications of smart technologies in daily life, manufacturing, healthcare, agriculture, and smart cities.
CO3	Analyze the advantages, limitations, and societal impact of Industry 4.0 and Industry 5.0 with respect to automation, sustainability, and human–machine collaboration.
CO4	Recognize emerging industrial trends and demonstrate awareness of the skills and ethical responsibilities required for future engineers.

CO-PO Mapping:

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

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	10
MSE	30
CA2	10
ESE	50

CA1 and **CA2** are based on Surprise test/ Assignment/ Quiz/Seminar/Group discussions presentation, etc.
MSE is based on 50% of course content.
ESE is based on 100% course content with 60-70% weightage for course content covered after MSE.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Industrial Revolution** What is Industry, Evolution of Industry, what is Industry 4.0, Core Concepts of Industry 4.0 – Connectivity, Automation, Data-driven decisions. Sensors and Actuators, Basic Technologies in Industry 4.0 - Internet of Things (IoT), Cloud computing, Big data, Artificial Intelligence (AI).	**07**
2	**Industry 4.0 in Real world** Applications of Industry 4.0 in Daily Life – home, agriculture, healthcare, factories, cities, Advantages of Industry 4.0, disadvantages of Industry 4.0, Limitations.	**07**
3	**Introduction to Industry 5.0** What is Industry 5.0, Difference Between Industry 4.0 and 5.0, Key Concepts of Industry 5.0 - Human–machine collaboration, Personalization of products, Sustainability, and ethics, Cobots (Collaborative Robots), Role of Sensors and Actuators in Industry 5.0.	**07**
4	**Industry 5.0 Applications and Future Emerging Trends** Applications of Industry 5.0 - Smart healthcare with human supervision, Customized manufacturing, Assistive robots for elderly and disabled, Sustainable and green industries. Future Emerging Trends, Skills Needed for Future Engineers.	**07**

Text Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Industry 4.0: The Industrial Internet of Things	Alasdair Gilchrist	Apress
2	"Shaping the Fourth Industrial Revolution: A guide to building a better world"	Klaus Schwab	Penguin Books
3	Smart Industry - Better Management	Bart L. MacCarthy	Emerald Publishing

Reference Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Artificial Intelligence Basics	Tom Taulli	Apress
2	Robotics and Industry 4.0	P. Kaliraj and T. Devi	CRC Press
3	Big Data: A Revolution That Will Transform How We Live, Work, and Think	Viktor Mayer-Schonberger & Kenneth Cukier	John Murray
4	Handbook Industry 4.0: Law, Technology, Society	Walter Frenz	Springer
5	Introduction to Industry 4.0	Dr. Amit Mehta	Taran publications

Title of the Course: Energy, Ecology and Environment Course Code: 25BSE1205	L	T	P	Credit
	2	--	--	2

Course Prerequisite:

The students will have the knowledge of basic science knowledge, basic understanding of electricity and magnetism and basic awareness of pollution types and causes.

Course Description:

The National Education Policy 2020 lays special emphasis on the promotion are Indian Languages, Arts and Culture, and tries to remove this discontinuity in the flow of Indian Knowledge System by integrating IKS into curriculums at all levels of education. The course Energy, Ecology and Environment has been adapted from the set of courses mentioned in Indian Science and Technology. The course Energy, Ecology and Environment is designed to provide students with a comprehensive understanding of the interconnections between the natural environment, human activities, and energy resources within the framework of Indian Knowledge System. This interdisciplinary course aims to foster an appreciation of ecological principles, environmental challenges, and sustainable energy solutions relevant to the Indian context.

Course Objectives:

By the end of this course, the students will be able to:

1. To understand the energy sources, energy systems, and their environmental impacts.
2. To explain ecological principles and the interdependence between human activities and natural ecosystems.
3. To create awareness about environmental issues such as climate change, pollution, and resource depletion.
4. To promote sustainable development practices through the integration of energy efficiency and environmental conservation.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand and explain the various energy sources like conventional and non-conventional and their environmental implications.
CO2	Analyze ecological systems and assess the impact of human activities on biodiversity and ecosystem services.
CO3	Identify and evaluate major environmental issues such as climate change, pollution, and resource degradation.
CO4	Demonstrate knowledge of sustainable energy practices and environmental management strategies.

CO-PO Mapping:

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

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	25
MSE	--
CA2	25
ESE	--

CA1 and **CA2** are based on Surprise test/ Assignment/ Quiz/Seminar/Group discussions presentation, etc.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Energy Sources** Introduction to Energy and its Importance, Classification of Energy Sources: Conventional: Coal, Petroleum, Natural Gas, Non-Conventional: Solar, Wind, Hydro, Biomass, Energy Conservation: Basic concepts and need.	**07**
2	**Ecology and Biodiversity** Ecosystem Basics: Structure, Types, and Components, Energy Flow: Food chains, Food webs, Ecological pyramids, Biodiversity: Definition, Importance (Ecological, Social, Economic), Threats, Conservation: In-situ and Ex-situ methods, Biodiversity hotspots in India.	**07**
3	**Environmental Pollution and Sustainability** Components of Environment; Scope and Multidisciplinary Nature Major Environmental Issues: Air, Water, and Solid Waste Pollution (sources, effects, basic control measures) E-waste and Biomedical Waste, Sustainability Concepts: 4R (Reduce, Reuse, Recycle, Recover), Sustainable Development, Environmental Movements (Chipko as case study).	**07**

4	**Energy Conservation and Sustainability** Energy Efficiency and Auditing: Importance, Case Studies, Sustainable Energy Systems: Role of BEE, Star Labeling, National Energy Conservation Policies, Carbon Footprint and Lifecycle Approach, Future Trends: Net-Zero Buildings, Green Certifications.	**07**

Text Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Non-Conventional Source of Energy	G. D Rai	Khanna, Publisher Delhi, 2006
2	Environment and Ecology	Dr. Anil Kumar Shankhwar	Uttarakhand Open University, Haldwani, Nainital, 2022
3	Essentials of Ecology and Environmental Science.	Rana, S.V.S.	PHI Learning Pvt. Ltd., 2013
4	Environment Science	Dr. Y. K Singh	New Age International (P) Ltd., Publishers, 2006

Reference Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Basics of Environmental Science	Allaby, M	Taylor & Francis e-Library, 2002.
2	Environmental Studies	Prof. Erach Bharucha	University Grants Commission, New Delhi. 2004
3	Energy technology-Non conventional, renewable and conventional	Rao S. Parulekar B.B.	Khanna Publisher, New Delhi 2005
4	Energy and the environment	Robert A.Ristinen, Jack. Kraushaar, Jeffery Brack	Wiley publisher
5	Environment and ecology	Khanduri, I., Pandey M., Maikhuri R.	Transmedia publication Srinagar garhwal, 2006

Title of the Course: Engineering Physics Laboratory Course Code: 25BSE1001L	L	T	P	Credit
	--	--	2	1

Course Prerequisite:

1. To calculate the least count of measuring instruments.
2. Ability to use standard measuring instruments and analyze data with fundamental mathematical tools.

Course Description:

This course offers hands-on experiments aligned with Engineering Physics theory. It reinforces concepts of wave optics, lasers, optical fibers, crystal structure, and semiconductor physics through experimental verification and measurements.

Course Objectives:

By the end of this course, the students will be able to:

1. To explore wave optics phenomena through laboratory demonstrations.
2. To understand characteristics and engineering applications of lasers and optical fibers.
3. To analyze crystal structure and semiconducting properties using models and instruments.
4. To enhance experimental design, data analysis, and interpretation.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Demonstrate different phenomenon of light and their applications.
CO2	Demonstrate working of the optical fiber and determine its acceptance angle.
CO3	Analyze crystal structure and electrical properties of semiconducting material and semiconducting device.
CO4	Design, develop and demonstrate experimental set up and models for tools applicable in engineering.
CO5	Interpret experimental observations to understand physical phenomena from solid-state physics.

CO-PO Mapping:

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

Assessment Scheme:
Two components of in semester evaluation (CA1 and CA2) having 50% weightage each.

Assessment Component	Marks
CA1	25
CA2	25
OE	--

CA1 and **CA2** are based on practical performance etc.

Course Contents

Practical No.	List of Experiments	Hours
1	To determine the wavelength of prominent lines of mercury by plane diffraction grating.	**02**
2	To determine radius of curvature of Plano-convex lens and to determine wavelength of sodium light by newton's ring	**02**
3	To determine the wavelength of He-Ne Laser light using a diffraction grating.	**02**
4	To calculate the Numerical Aperture and acceptance angle of an optical fibre.	**02**
5	To determine Planck's constant and to verify inverse square law of radiation using photoelectric effect	**02**
6	To analyze the crystal structure from X-ray diffraction pattern using Bragg's Law.	**02**
7	Study of planes with the help of models related Miller Indices	**02**
8	To determine the Hall coefficient and carrier concentration of a semiconductor.	**02**
9	To study forward and reverse bias I–V characteristics of a p–n junction diode.	**02**
10	To measure electrical conductivity of a semiconducting sample using the four-probe method.	**02**
11	To calculate the specific rotation of sugar solution using a polarimeter.	**02**
12	To determine Divergence of LASER beam and study directionality of LASER	**02**

***Any 10 practicals /experiments to be conducted.**

Text Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	An Advanced Course In practical physics	D. Chattopadhyay	New Central Book Agency(P) Ltd
2	Engineering Physics Laboratory Manual	Dr. A.S. Vasudeva	S. Chand

Reference Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Experiments in Engineering Physics	M.N. Avadhanulu, A.A. Dani, P.M. Pokley.	S. Chand & Company Ltd., Delhi
2	Engineering Physics Practical	S.P. Singh	Laxmi Publications

Title of the Course: Modern Chemistry Laboratory Course Code: 25BSE1002L	L	T	P	Credit
	--	--	2	1

Course Prerequisite:

The students should have basic knowledge about acid bases reactions apparatus and preparation of chemicals. The students should have basic knowledge about fundamental principles used in various analytical techniques.

Course Description:

The course intends to train the students to enhance experimental skills and apply fundamental chemical principles to solve chemistry related problems in engineering. The course provides experience to the students about qualitative and quantitative analysis of different samples using instrumental and non-instrumental techniques.

Course Objectives:

By the end of this course, the students will be able to:

1. To explore wave optics phenomena through laboratory demonstrations.
2. To understand characteristics and engineering applications of lasers and optical fibers.
3. To analyze crystal structure and semiconducting properties using models and instruments.
4. To enhance experimental design, data analysis, and interpretation.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Recall the basic principles of corrosion processes and pH measurement techniques.
CO2	Demonstrate an understanding of titrations and analytical procedures to determine chemical properties.
CO3	Analyze electrochemical reactions and spectrophotometric data to evaluate material properties and solution behavior.
CO4	Illustrate the operation of different instrumental and non-instrumental techniques for the analysis of various engineering materials.
CO5	Design and synthesize nanoparticles using conventional and green chemistry methods.

CO-PO Mapping:

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

Assessment Scheme:
Two components of in semester evaluation (CA1 and CA2) having 50% weightage each.

Assessment Component	Marks
CA1	25
CA2	25
OE	--

CA1 and **CA2** are based on practical performance etc.

Course Contents

Practical No.	List of Experiments	Hours
1	Preparation of corrosive Medium & Determination of rate of corrosion of Aluminum metal.	**02**
2	Determination of pH of different type of water using pH meter.	**02**
3	Determination of Acid dissociation constant (pKa) of acetic acid by pH metric titration with NaOH solution.	**02**
4	Determination of total hardness of water sample by EDTA method (Complexometric Titration).	**02**
5	To determine calorific value of a fuel.	**02**
6	Estimation of strong acid and weak acid from given mixture by conductometric Titration.	**02**
7	Determination of cell potential of Galvanic cell (Zn /Cu cell).	**02**
8	Determine maximum wavelength of absorption-of a given inorganic coloured sample by colorimeter.	**02**
9	Identification of basic radicals from given binary mixture of inorganic salts by paper chromatography.	**02**
10	Synthesis of Iron Oxide Nanoparticles by co-precipitation method (Fe3O4).	**02**
11	Preparation of ZnO Nanoparticles -Based Sunscreen.	**02**
12	Green Synthesis of Silver Nanoparticles Using Tulasi Extract.	**02**

***Any 10 practicals /experiments to be conducted.**

Text Books					
Sr. No.	**Title**	**Edition**	**Author/s**	**Publisher**	**Year**
1	Vogels Qualitative Inorganic Analysis	7th	Michael Urban and Joel Murach	Murach's Publication, 2016.	2012

2	Instrumental Methods of Chemical Analysis	5th	Dr.R.Nageswara Rao	Dreamtech Press, 1st Edition, 2016.	2019

Reference Books					
Sr. No.	**Title**	**Edition**	**Author/s**	**Publisher**	**Year**
1	Laboratory Manual of Engineering Chemistry	3rd	S..K..Bhasin, Sudha Rani	Dhanpat Publishing Company	2012
2	Textbook of Engineering Chemistry with Lab Manual of Chemistry and Environmental Studies	9th	Shashi Chawla	Dhanpat Publishing Company	2013
3	Engineering Chemistry Laboratory Manual	3rd	Manoj Kumar Solanki	Educreation Publishing	2019

Title of the Course: Python Programming Laboratory Course Code: 25BSC1203L	L	T	P	Credit
	--	--	2	1

Course Prerequisite:
Familiarity with basic programming concepts and syntax, preferably in another language, and an understanding of fundamental computer science principles.

Course Description:
A Python Programming laboratory typically covers the fundamentals of programming using the Python language, including data types, control flow, strings, and data structures. It aims to equip learners with the skills to write Python programs, solve computational problems, and potentially apply these skills in fields like data science, web development, or automation.

Course Objectives:
By the end of this course, the students will be able to:
1. Install and run the Python Interpreter.
2. Learn Control Structures.
3. Understand Lists, Dictionaries in Python.
4. Handle Strings and Files in Python.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Write programs using basic concepts of Python Programming
CO2	Understand Strings, Lists, Tuples, and Dictionaries in Python
CO3	Write programs using a modular approach.
CO4	Develop interactive web applications using Streamlet by integrating Python logic with user interface elements.

CO-PO Mapping:

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

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), End Semester Practical Oral Examination (POE), have 25%, 25% and 50% weightage, respectively.

Assessment Component	Marks
CA1	25
CA2	25
OE	50

CA1 and **CA2** are based on practical performance etc.
POE is based on 100% Experiments.

Course Contents

Practical No.	List of Experiments	Hours
1	**Introduction to Python** a. Demonstration of installation and configuration of Anaconda and Spyder b. Write a Python program to take user input and print it. c. Write a Python program to swap two numbers.	**02**
2	**Control Structures** a. Write a Python program to check if a year is a leap year. b. Write a Python program to find the factorial of a number using loops.	**02**
3	**Nested Loops, Function, Recursion** a. Write a Python program using nested loops to print the following pattern for n rows: 1 1 2 1 2 3 1 2 3 4 or Write a Python program using nested loops to generate a multiplication table (1 to 10) in grid format. 1 2 3 ... 10 2 4 6 ... 20 3 6 9 ... 30 ... 10 20 30 ...100 b. Write a Python program to compute simple interest using a function with parameters for principal, rate, and time. c. Write a Python program to calculate the factorial of a number using recursion.	**02**
4	**Lists** a. Write a Python program to find the sum and average of elements in a list. b. Write a Python program to reverse a given string using	**02**

	slicing. c. Write a Python program to check if a given string is a palindrome.	
5	**Dictionaries and Sets** a. Write a Python program to demonstrate basic dictionary operations: add, delete, and update key-value pairs. b. Write a Python program to find the intersection and union of two sets. c. Create a tuple containing marks of 3 subjects for a student. Find the highest and lowest marks and display them. also Calculate and display the average marks.	**02**
6	**File Handling** a. Create a text file and add course outcomes of this course. Implement file operations on it. b. Write a Python program to count the number of words in a file.	**02**
7	**Object-Oriented Programming (OOP)** a. Design an Employee class to store employee name, ID, and basic salary. Include methods to: i. Calculate and return gross salary (basic + allowances) ii. Display employee details b. Create a MovieTicket class with attributes: movie name, seat number, and customer name. Include Methods to: i. Book a ticket, ii. Cancel a ticket, iii. Display ticket info c. Create a Calculator class with methods for addition, subtraction, multiplication, and division.	**02**
8	**Exception Handling** a. Write a Python program to handle Zero Division Error and Index Error exceptions. b. Write a Python program that takes a user's age as input and checks if they are eligible to vote (18 years or older). Use try-except-else-finally blocks to: i. Handle invalid (non-integer) input, ii. Check voting eligibility, iii. Ensure a closing message is always printed. c. Write a Python program to simulate a simple bank withdrawal system. Define a custom exception Insufficient Funds Error that is raised when a user tries to withdraw an amount greater than the available balance.	**02**
9	**Modules, Libraries Strings** a. Write a Python program using the math module to calculate square root, power, and trigonometric functions. b. Write a Python program using the date time module to print the current date, time, and weekday. c. Write a Python program that takes a word or phrase as input and uses string slicing to reverse it. Then check if the original and reversed strings are the same to determine whether it is a palindrome**.**	**02**

10	**Using Streamlit** a. Use virtual environments and launch Streamlit applications. b. Accept user input via Streamlit widgets. c. Display various types of content using Streamlit display functions.	**02**

***Any 10 practicals /experiments to be conducted.**

Text Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Murach‘s Python Programming	Michael Urban and Joel Murach	Murach's Publication
2	Core Python Programming	Dr. R. Nageswara Rao	Dreamtech Press, 1st Edition
3	An Introduction to Python	2 Guido van Rossum and Fred L. Drake	Jr Network Theory Ltd

Reference Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Python for Informatics: Exploring Information	Charles Severance	University of Michigan, Version 2.7.0, 2014.
2	Core Python Programming	Dr. R. Nageswara Rao,	Dreamtech Press, 1st Edition, 2016.
3	Think Python	Allen B. Downey	O'Reilly Media, 2nd Edition, 2012.
4	Python Programming Laboratory Manual	Dr. Anita Goel	Pearson

Title of the Course: Computer Aided Engineering Drawing Laboratory Course Code: 25BSE1204L	L	T	P	Credit
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Course Prerequisite:
General Awareness, Knowledge of Geometry at SSC Level.

Course Description:
Course consists of Basics of AutoCAD, Geometrical constructions using AutoCAD & Conversion of pictorial views into orthographic view, Isometric Projections & Dimensioning techniques

Course Objectives:
By the end of this course, the students will be able to:
1. To develop the ability to draw basic elements such as lines, lettering, and dimensioning accurately using standard engineering drawing practices.
2. To enable students to perform geometrical constructions and understand the principles behind projection of points, lines, planes, and solids in space.
3. To impart knowledge and hands-on practice in generating orthographic and sectional views from given 3D objects and vice versa
4. To introduce the fundamentals of isometric drawing, enabling students to visualize and represent 3D objects in 2D isometric projections accurately.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Recall and explain the fundamental concepts of lines, lettering, dimensioning, and basic geometrical constructions used in engineering graphics.
CO2	Construct accurate projections of points, straight lines, planes, and solids using the principles of orthographic projection.
CO3	Construct and interpret the projections of solid objects (such as prisms, pyramids, cylinders, and cones) in various orientations.
CO4	Create isometric views from orthographic projections to visualize 3D objects, enhancing spatial reasoning and technical drawing skills

CO-PO Mapping:

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

Assessment Scheme:
Two components of in semester evaluation (CA1 and CA2) having 50% weightage each.

Assessment Component	Marks
CA1	25
CA2	25
OE	--

CA1 and **CA2** are based on practical performance etc.

Course Contents

Practical No.	List of Experiments	Hours
1	Submission sheet on Geometrical construction (Types lines, lettering and dimensioning) to be drawn in sketch book and redraw in Auto CAD. Introduction of AutoCAD GUI & Basic Commands: at least 4 Figures are and redraw using AutoCAD	**04**
2	Submission on sheet Projection of Lines using AutoCAD	**04**
3	Submission on sheet Projection of Planes using AutoCAD	**04**
4	Submission on Sheet projection of Solids using AutoCAD	**04**
5	Submission on Sheet Development of lateral surface using AutoCAD	**04**
6	Submission on Sheet Orthographic Projection using AutoCAD	**04**
7	Submission on Sheet Isometric Projection using AutoCAD	**04**

Text Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Engineering Graphics with Auto CAD	D.M. Kulkarni, A.P. Rastogi, A.K.Sarkar	(PHI)Publisher
2	Engineering Drawing	N.D.Bhatt	Charotar Publisher

Reference Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	A text book of Engineering Graphic	K. V. Nataraajan	Dhanalakshmi Publishers, Chennai

2	Engineering Graphics	K. Venugopal and V. Prabhu Raja	New Age International (P) Ltd
3	Computer Aided Engineering Drawing	Cencil Jensen, Jay D.Helsel , Dennis R. Short	TATA McGRAW HILL
4	Engineering Drawing with an Introduction to AutoCAD	Dhananjay A. Jolhe	Mc GrawHill Education

Title of the Course: Design Thinking Course Code: 25BSE1205L	L	T	P	Credit
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Course Prerequisite:
Students will have the knowledge of basic communication and collaboration skills**,** fundamental problem-solving ability**,** curiosity and openness to new ideas and interest in innovation and collaboration

Course Description:
The students are introduced to Design Thinking in this course as an iterative, multidisciplinary, human-centered method of innovation and problem-solving. In line with the National Education Policy 2020, it places a strong emphasis on inquiry-driven, experiential, holistic learning that develops empathy, creativity, and critical thinking. Students will investigate and apply the five steps of Design Thinking—Empathize, Define, Ideate, Prototype, and Test—to practical, interdisciplinary problems. The students will become responsible and creative problem-solvers by developing creative solutions to societal, technological, environmental, and business problems through practical projects, reflective practice, and team-based learning. As advocated by NEP 2020, the course fosters multidisciplinary and vocational integration while assisting in the development of skills necessary for lifelong learning, employability, and entrepreneurship.

Course Objectives:
By the end of this course, the students will be able to:
1. To understand the fundamental principles, process, and mindset of Design Thinking.
2. To apply structured ideation techniques such as brainstorming and mind mapping.
3. To analyze ideas into tangible prototypes using basic tools and materials.
4. To evaluate and refine product designs using user feedback and iterative development methods

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understanding of the Design Thinking framework and its application in solving real-world, user-centric problems.
CO2	Apply creative thinking and ideation techniques to generate a wide range of potential solutions.
CO3	Design and develop rapid prototypes to visualize and communicate solutions.
CO4	Evaluate the user feedback into the design process to enhance customer satisfaction and engagement.

Note: -
1. The practical lab is designed to provide students with hands-on experience in applying the theoretical concepts they have learned in the course. The session aims to enhance their understanding, critical thinking, and problem-solving skills. (1 hour for explaining the concept and 1 hour for activity/ assignment / group discussion / brainstorming session).
2. Incorporating hands-on labs with access to various lab and workshop facilities in the Institute, can enhance the practical aspect of the course and provide students with opportunities to prototype and test their designs.

CO-PO Mapping:

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

Assessment Scheme:
Two components of in semester evaluation (CA1 and CA2) having 50% weightage each.

Assessment Component	Marks
CA1	25
CA2	25
OE	--

CA1 and **CA2** are based on practical performance etc.

Course Contents

Practical No.	List of Experiments	Hours
1	**Empathy mapping, user persona development and user need identification through field interviews.** Conduct interviews or field research and create empathy maps and define user personas	**02**
2	**Problem definition using insight statements**: Convert empathy findings into insights and frame “point of view” & “how might we” questions	**02**
3	**SCAMPER technique for ideation**: Apply scamper (substitute, combine, adapt, modify, put to another use, eliminate, reverse) for idea refinement.	**02**
4	**Idea selection, prioritization matrix and brainstorming session for creative idea generation** Use feasibility-desirability-viability matrix or dot voting to choose best ideas.	**02**
5	**Low-fidelity prototyping (paper/sketch)**: Create quick, rough prototypes of selected ideas using simple materials.	**02**

6	**Storyboard development**: Illustrate the user journey or product usage scenario in a storyboard format.	**02**
7	**Digital prototyping tools**: Develop digital wireframes or mock-ups (e.g., figma, canva, adobe xd) for user interface designs.	**02**
8	**Usability testing and feedback collection**: Test prototypes with users, record observations, and collect feedback.	**02**
9	**Iteration and prototype refinement**: Refine prototypes based on user feedback and document the changes made.	**02**
10	**User testing and feedback collection**: Conduct usability tests with real users and record observations and suggestion.	**02**
11	**Storyboarding and scenario mapping**: Visualize user journeys and product interactions and create experience flows using sketches or digital tools.	**02**
12	**Final product design presentation and reflection**: Present the end-to-end design thinking journey and Reflect on team collaboration, user insights, and learnings	**02**

***Any 10 practicals /experiments to be conducted.**

Text Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Karmic Design Thinking	Prof. Bala Ramadurai.	Silverstein, DeCarlo, and Slocum 2005
2	Transforming an Idea into Business with Design Thinking,	Muhammad Mashhood Alam	First Edition, Taylor and Francis Group, 2019.
3	Thinking Design	S. Balarara,	Sage Publications, 2011.

Reference Books			
Sr. No.	**Title**	**Author**	**Publisher**
1	Design Thinking: New Product Development	Michael G. Luchs, Scott Swan, Abbie Griffin,	Essentials from the PDMA, Wiley-Blackwell; 1st edition

2	How Design Thinking Transforms Organizations end Inspires Innovation,	Tim Brown	Harper Collins e-books, 2009.
3	The Design Thinking Playbook,	Michael Lewrick, Patrick Link, Larry Leifer,	John Wiley & Sons, 2018.
4	Design Thinking for Innovation - Research and Practice	Walter Brenner, Falk Uebemickel	Springer Series, 2016.

Title of the Course: Community Services Course Code: 25BSE1206L	L	T	P	Credit
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Course Prerequisite:

A genuine interest in community service and social development, Basic communication and interpersonal skills and Willingness to participate in field activities, group tasks, and social awareness programs.

Course Description:

The National Social Service (NSS) is a community service program aimed at developing the personality of students through social service. It encourages youth to engage with real-world challenges, promote national integration, and contribute to the betterment of society. The subject includes activities like village adoption, awareness campaigns (health, hygiene, literacy), environmental conservation, disaster response, blood donation drives, and other socially beneficial programs. Through participation, students cultivate values like leadership, discipline, empathy, civic responsibility, and teamwork. NSS fosters a sense of social commitment and prepares students to be responsible citizens and agents of change.

Course Objectives:

By the end of this course, the students will be able to:

1. To understand the community in which they work and their relation
2. To identify the needs and problems of the community and involve them in problem-solving
3. To develop capacity to meet emergencies and natural disasters
4. To practice national integration and social harmony.
5. To utilize their knowledge in finding practical solutions to individual and community problems

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand the community in which they work and their relation.
CO2	Identify the needs and problems of the community and involve them in problem-solving.
CO3	Develop capacity to meet emergencies and natural disasters.
CO4	Practice national integration and social harmony.
CO5	Utilize their knowledge in finding practical solutions to individual and community problems.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011
CO1	1	1				1	1	1	1		
CO2	1	1				1	1	1	1		

CO3	1	1				1	1	1	1		
CO4	1	1				1	1	1	1		
CO5	1	1				1	1	1	1		

Assessment Scheme:
Two components of in semester evaluation (CA1 and CA2) having 50% weightage each.

Assessment Component	Marks
CA1	25
CA2	25
OE	--

CA1 and **CA2** are based on practical performance etc.

Course Contents

Practical No.	List of Experiments	Hours
1	Blood donation Camp	**02**
2	Tree Plantation	**02**
3	External Cleanliness Drive	**02**
4	Arranging Lectures on Social Issues in schools or villages	**02**
5	Demonstration of Street Plays on Social issues	**02**
6	Celebration of National Days (As per NSS list)	**02**
7	Arrangement of free medical checkup camp in villages	**02**
8	Arrangement of water conservations awareness.	**02**
9	Arrangement of rain water harvesting awareness.	**02**
10	Assisting local administration for law and order, regulation, social issues	**02**
11	Arranging Rally on Social issues (Anti-Tobacco Vysan Mukti etc.).	**02**
12	Arrangement of environment protection awareness.	**02**

***Any 10 practicals /experiments to be conducted.**

Reference Books	
Sr. No.	**Title**
1	National Service Scheme Manual, Government of India.
2	Training Programme on National Programme scheme, TISS.

3	Orientation Courses for N.S.S. Programme officers, TISS.
4	Case material as Training Aid for field workers, Gurmeet Hans.
5	Social service opportunities in Hospitals, Kapil K.Krishan,TISS.