



AGCE

**ARVIND GAVALI
COLLEGE OF ENGINEERING**
An Autonomous Institute



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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Panmalewadi, Varye, Satara 



SAMARTH EDUCATIONAL TRUST
ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
 ▪ **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	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
2	BSC	25BSE1001/ 25BSE1002	Engineering Physics/Modern Chemistry	3	0	0	3	3	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
3	ESC	25BSE1102	Basic Electrical & Electronics Engineering	3	0	0	3	3	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
4	ESC	25BSE1103	C Programming for Problem Solving	2	0	0	2	2	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
5	AEC	25BSE1104	Communication Skills	2	0	0	2	2	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
6	BSC	25BSE1001L/ 25BSE1002L	Engineering Physics Laboratory / Modern Chemistry Laboratory	0	0	2	2	1	CA1	25	--	20
									CA2	25		
									OE	--		
7	ESC	25BSE1102L	Basic Electrical & Electronics Engineering Laboratory	0	0	2	2	1	CA1	25	20	40
									CA2	25		
									OE	50		
8	ESC	25BSE1103L	C Programming for Problem Solving Laboratory	0	0	2	2	1	CA1	25	20	40
									CA2	25		
									OE	50		
9	AEC	25BSE1104L	Communication Skills Laboratory	0	0	2	2	1	CA1	25	--	20
									CA2	25		
									OE	--		
10	VSEC	25BSE1105L	Engineering Practice Laboratory	0	0	2	2	1	CA1	25	--	20
									CA2	25		
									OE	--		
11	CC	25BSE1106L	Yoga	0	0	2	2	1	CA1	25	--	20
									CA2	25		
									OE	--		
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,for Group A & B)**

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	20	40
									MSE	30		
									CA2	10		
									ESE	50		
2	BSC	25BSE1001/ 25BSE1002	Engineering Physics/Modern Chemistry	3	0	0	3	3	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
3	ESC	25BSE1202	Engineering Mechanics	2	0	0	2	2	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
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	20	40
									MSE	30		
									CA2	10		
									ESE	50		
6	PCC	25PCC1201	Fundamentals of Industry Evolution	2	0	0	2	2	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
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	0	0	2	2	1	CA1	25	20	40
									CA2	25		
									OE	50		
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 Algebraic Techniques Course Code: 25BSE1101	L	T	P	Credit
	3	1	--	4

Course Prerequisite: Basics of matrices, complex algebra, Indefinite and definite integrals, standard integration formulas.

Course Description:

In this course the students will learn linear algebra techniques, eigenvalues and eigenvectors with applications, complex numbers and hyperbolic functions, and the use of multiple integrals to solve real-world problems involving areas, volumes, and surface areas.

Course Objectives:

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

1. To provide the knowledge of linear algebra for solving linear system equations
2. To calculate eigenvalues, eigenvectors and apply it to diagonalize a matrix.
3. To study the applications of De Moivre's theorem and elementary properties of hyperbolic functions.
4. To understand and estimate errors and approximations using Taylor's expansion.
5. To evaluate multiple integrals and their applications to area and volume.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand the nature of solutions and solve the system of linear homogeneous and non-homogeneous equations.
CO2	Apply Cayley-Hamilton theorem to find inverse and higher powers of a matrix.
CO3	Analyze the properties of complex numbers and their functions and find powers and roots of complex numbers by using De-Moivre's theorem..
CO4	Evaluate the behavior of sequences and series using convergence tests and apply power series and Taylor/Maclaurin expansions for approximation and error analysis.
CO5	Apply multiple integrals to evaluate areas and volumes of given regions.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2		2	1						1
CO2	3	2		2							1
CO3	3	2		2							1
CO4	3	2		3							1
CO5	3	2		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	Matrices and Linear Systems of Equations Rank of a matrix (Echelon and Row-reduced Echelon Forms), Linear dependence and independence of vectors, Consistency of linear systems (homogeneous and non-homogeneous), Solution of systems of linear equations using matrix methods, Applications in circuit theory, mechanics, and engineering systems.	07
2	Eigenvalues and Eigenvectors Eigenvalues and Eigenvectors: Definition, properties, and computation, Cayley-Hamilton Theorem (statement only), Application of Cayley-Hamilton to find inverse and powers of matrices, Diagonalization of matrices (conceptual overview), Applications in dynamic systems and stability analysis.	09
3	Complex Numbers and Hyperbolic Functions Complex numbers in Cartesian and polar form, De Moivre's Theorem and its applications, Roots of complex numbers, Circular and hyperbolic functions: Definitions and inter-relations, Inverse hyperbolic functions, Functions of a complex variable (definition only), Separation of real and imaginary parts, Applications: AC circuits, wave phenomena.	08
4	Sequences and Series Sequences and convergence, Infinite series, tests of convergence (comparison test, ratio test), Power series: Radius and interval of convergence, Taylor and Maclaurin series (with examples), Errors and approximations using Taylor's expansion (first-order).	07

5	<p>Multiple Integral Double integration in cartesian and polar co-ordinate, Evaluation of double integrals by changing the order of integration and changing to polar form, triple integral, Application of multiple integrals to find area as double integral, volume as triple integral and surface area.</p>	09
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Text Books			
Sr. No.	Title	Author	Publisher
1	Engineering Mathematics	G.V. Kumbhojekar	C. Jammadas and Co.
2	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publishers, Delhi
3	Engineering Mathematics (Vol-1)	H.K. Dass & Er. Rajnish Verma	S. Chand Publishing
4	A Text Book of Applied Mathematics Vol. I	P. N. Wartikar & J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune

Reference Books			
Sr. No.	Title	Author	Publisher
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Willey & Sons
2	Advanced Engineering Mathematics	H. K. Dass	S. Chand & Company Pvt. Ltd, New Delhi
3	Higher Engineering Mathematics	B. S. Grewal	Laxmi Publications (P) Ltd., New Delhi
4	A Textbook of Engineering Mathematics	N.P. Bali and Manish Goyal	Laxmi Publications
5	Engineering Mathematics	B.V. Ramana	Tata McGraw-Hill Education

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	PO11
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 tunneling (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.

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

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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, Numericals. 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, H ₂ -O ₂ Fuel Cell. Battery technology- Introduction, components of battery, Battery characteristics, Li-Ion battery: Principle, working and applications.	08
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

CO4	3	3	2	2	2						
CO5	2	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	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	DC Circuit DC Electric Circuit: Kirchhoff's laws, Concept of constant voltage and current source, Analysis of series and parallel DC circuit with resistance and capacitance, Voltage rating, Power rating of resistive devices, DC circuit with R-C & R-L (Charging and discharging of capacitor, Time constant for RC & R-L circuit.), Numerical treatment on DC electric circuit.	08
2	AC Fundamentals Generation of Sinusoidal Voltage, Representation of Sinusoidal Waveforms, RMS value, Average value, Form factor, Peak factor, Phasor representation, Impedance of AC circuit, Powers- Active, Reactive & Apparent, Power Factor and its Significance, Analysis of single phase AC circuits consisting of R,L,C, R-L,R-C,R-L-C combinations (Series and Parallel) Resonance. Basic concept of Three phase circuits.	08
3	Single Phase Transformer and DC Motor Principle, Construction, Classifications, EMF equation, voltage ratio, current ratio, working at No Load & with Load, Losses in Transformer, Efficiency and Voltage Regulation, Applications. DC Motor: Basic principle of any electric motor, Construction and Working of DC motor, Types of DC motors and their Speed-Torque characteristics with applications.	08

4	<p>Diodes and Circuits: Diodes and Rectifiers: Review of PN junction diode, Review of Zener Diodes, Light-Emitting Diodes, Photo Diodes, Load-Line Analysis of diode, Types of Rectifiers (Half Wave & Full Wave), Equation for IDC, VDC, VRMS, I RMS, Efficiency and Ripple Factor for each configuration. Block diagram of RPS.</p>	08
5	<p>Semiconductor Devices and Applications: Transistors: Introduction, Construction of BJT, type of biasing-fixed bias and self-bias circuit, BJT characteristics for CE, CB, CC configuration, α, β, Relationship between alpha (α) & beta (β), concept of gain and bandwidth, BJT as an Amplifier, BJT as switch. Introduction to Digital Electronics: Number System, Logic Gates, Universal Gates, Boolean Postulates, De- Morgan's Theorem.</p>	08

Text Books			
Sr. No.	Title	Author	Publisher
1	Basic Electrical and Electronics Engineering	D.P. Kothari and I.J. Nagrath	McGraw Hill 4 th Education, 2019
2	Principles of Electrical Engineering and Electronics	V.K. Mehta and Rohit Mehta	S. Chand Publications., 2019
3	Electrical Technology Vol-II	B.L. Theraja	S. Chand, 24 th edition, 2024

Reference Books			
Sr. No.	Title	Author	Publisher
1	Fundamentals of Electrical Engineering and Electronics	J.B.Gupta	S.K. Kataria & Sons, 10 th edition, 2019
2	Electronic Devices and Circuits 4 th edition	David A.Bell	PHI, 2 nd edition, 2015
3	Basic Electrical and Electronics Engineering	R Muthusubramanian, S.S Salivahanan	TMH, 2 nd edition 2024
4	Basic Electrical and Electronics Engineering	S.K. Bhattacharya	Pearson Education, 10 th edition, 2010
5	Basic Electrical and Electronics Engineering	Ritu Sahdev	Khanna Publishing House., 2021
6	Fundamentals of Electrical Engineering	Rajendra Prasad	PHI 3 RD Edition
7	Fundamentals of Electrical Engineering	Charles A. Gross and Thaddeus A. Roppel	CRC press.

Title of the Course: C Programming for Problem Solving Course Code: 25BSE1103	L	T	P	Credit
	2	--	--	2

Course Prerequisite: Basic Understanding of Computers.

Course Description:

This course provides a comprehensive introduction to the C programming language, focusing on foundational programming concepts and structured programming techniques. The students will learn how to write efficient, readable, and error-free C programs, with an emphasis on developing problem-solving skills through algorithm design and implementation.

The course covers core topics such as variables, data types, operators, control structures, functions, arrays, pointers, strings, structures, file handling, and dynamic memory management. Through hands-on lab sessions and assignments, the students will gain practical experience and be prepared to work on system-level software, embedded systems, and application development.

By the end of the course, the students will have a strong understanding of C programming fundamentals, enabling them to develop robust programs and transition to more advanced languages like C++ and Java.

Course Objectives:

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

1. Understand the Fundamentals of C: Grasp the basic structure, syntax, and semantics of the C programming language.
2. Apply Programming Logic and Control Structures: Implement conditional statements, loops, and branching techniques to solve computational problems to prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice.
3. Use Functions for Modular Programming: Design and use user-defined and library functions to build modular, reusable, and organized code.
4. Work with Arrays and Strings: Handle one-dimensional and multi-dimensional arrays, and manipulate strings using both the built-in and user-defined methods.
5. Understand and Use Pointers Effectively: Apply pointers for direct memory access, dynamic memory allocation, and as function arguments.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Explain features of “C” programming language.
CO2	Select “C” programming constructs for program writing.
CO3	Develop programming solution for given problem.
CO4	Implement programs using arrays, strings, and user-defined data types such as structures and unions.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1			1	1				
CO2	3	3	1	1		1	1				
CO3	1	3		1							
CO4	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	Introduction to C Importance of programming, Algorithms, Flowchart, Pseudocode, Structure of C Program, Compilation and Execution, Data Types (user defined, pre-defined), Variables, Constants, Reading and printing variable values, Preprocessor Directive.	07
2	Operators and Control Flow Operators in C: Arithmetic Operators, Relational Operators, Logical Operators, Unary Operators, Bitwise Operators, Ternary Operator, size of operator. Control Flow: Statements & Blocks, Decision Controls, If-else statements, Nested if-else, Switch Case, Loops (for loop, while loop, do-while loop), Loop interruption (break, continue, exit functions).	07

3	Functions and Arrays Functions: Fundamentals of function, Function declaration and prototype, Function definition, Function call, Return type and return statement. Arrays: Single Dimensional Array, Multi-Dimensional Array, Character Array, Strings, Built-in String functions (strcpy, strcmp, strlen).	07
4	Pointers, Structures and File Handling Pointers: Pointer variables, Pointer to functions, Pointer to array Structure: Basics of structures File. handling: Defining and opening the file, Closing the file, Operations on file.	07

Text Books			
Sr. No.	Title	Author	Publisher
1	The Complete Reference, 4th Edition	Herbert Schildt	McGraw Hill Education
2	The C Programming Language	E. Balagurusamy	McGraw Hill Education
3	C Programmer's Companion	R.S. Jone	Universities Press Pvt. Ltd.
4	Programming In C	Pradip Dey	Oxford University Press

Reference Books			
Sr. No.	Title	Author	Publisher
1	Let Us C	Yashavant Kanetkar	17th Edition (2023) BPB Publications
2	Programming in ANSI C	E. Balagurusamy	8th Edition (2019), McGraw Hill Education
3	Practical "C" Programming	Steve Oualline	Third Edition, Oreilly, 2013
4	Introduction to C programming	Reema Thareja	Oxford University press (2nd edition),2015
5	The C Puzzle book	Alan R. Feuer	Pearson,1999

Reference Books					
Sr. No.	Course/ Certification	Provider/Platform	Level	Mode	Certification Authority
1	Problem Solving Through Programming in C	https://onlinecourses.nptel.ac.in/noc23_cs53/preview	UG	Online	NPTEL
2	Introduction to Programming in C	https://onlinecourses.nptel.ac.in/noc25_cs119/preview	Beginner	Online	NPTEL

Title of the Course: Communication Skills	L	T	P	Credit
Course Code: 25BSE1104	2	--	--	2

Course Prerequisite: English subject at HSC

Course Description:

The course intends to make learners understand and develop various communication skills required in day-to-day life as well as in professional contexts. As domain knowledge and skills have become equally important in today's technology-driven world, the current course and the one being offered in the Third Year will provide the learners a great opportunity to strengthen their English communication and soft skills. Keeping in mind the current competence of the learners, the course aims to provide them with revision and ample practice in the skills essential for their professional life. It includes four modules that cover basic concepts and theory of communication, business communication, verbal aptitude (English grammar), language learning skills, letter writing, and comprehension. In addition to Listening, Speaking, Reading, and Writing (LSRW) the course sees Thinking as an essential language learning skill.

Course Objectives:

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

1. To understand the fundamentals of communication theory and its relevance in a professional context.
2. To apply the listening and reading comprehension skills.
3. To summarize the techniques to improve Spoken English and to provide the students with a platform for practicing these skills.
4. To prepare the students to write correct and effective business letters, official letters, and covering letters with resume, and to participate in Group Discussion (GD) and face the interviews.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Demonstrate the communication process, methods of communication, and flow of Communication in a business context.
CO2	Apply acquired LSRW skills in real-life situations and in a professional context.
CO3	Compose effective business and cover letters using standard language, style, and structure.
CO4	Apply the techniques for effective participation in GD and tips to face interviews successfully.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1									3		1
CO2							2	2	3		1

CO3							2		3		1
CO4							2	2	3		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	Communication Theory Communication basics: Importance, process, levels, forms, methods: verbal and non-verbal, Barriers and solutions, Flow/channels of business communication (Internal, External, Vertical, Horizontal, Diagonal, Grapevine), Problems and Solutions.	08
2	Enhancing Language Learning Skills (LSRW) Effective listening: Process and advantages of listening, poor listening habits, types of listening, strategies for effective listening, listening barriers Effective speaking: Importance of telephonic conversation, various oral business contexts/situations, group communication, Preparing effective public communications Effective reading: Importance, types, overcoming common obstacles, tips and strategies Effective Writing: Mastering English Essentials and Fundamentals, paragraph and essay writing techniques, diary/blog writing Art of précis writing, Techniques to comprehend and summarize a given technical, scientific, or industry-oriented text Thinking is intricately with the LSRW skills.	08
3	Formal Business Correspondence Principles, structure (elements), Layout (complete block, modified block, semi-block), Types (enquiry and replies, claim and	06

	adjustment).	
4	Employability Skills Covering letter and resume, Group Discussion, Interviews (Online / Offline) Introduction to soft skills (Etiquettes, Team Work, Empathy, Problem Solving etc.)	06

Text Books			
Sr. No.	Title	Author	Publisher
1	Developing Communication Skills	Krishna Mohan Meera Banerji	Macmillan Publishers India Ltd.
2	Communication Skills for Engineers and Scientists	Sangeeta Sharma Binod Mishra	PHI Learning Private Limited.

Reference Books			
Sr. No.	Title	Author	Publisher
1	Professional Communication Skills	Er. A.K.Jain, Dr.Pravin S.R.Bhatia, Dr. A.M.Shaikh	S.Chand
2	Personality Development and Soft skills	Barun K.Mitra	Oxford University Press
3	Communication Skills for Engineers	Sunita Mishra C.Muralikrishna	Pearson Education
4	Effective Technical Communication	M.Ashraf Rizvi	McGraw Hill Education Pvt.Ltd.

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	PO11
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

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 (Fe ₃ O ₄).	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: Basic Electrical & Electronics Engineering Laboratory Course Code: 25BSE1102L	L	T	P	Credit
	--	--	2	1

Course Prerequisite: Basic theoretical concepts of electrical circuits and semiconductor devices.

Course Description:

This laboratory course is designed to complement the theoretical concepts covered in the Basic Electrical and Electronics Engineering course. It introduces students to hands-on experimentation with fundamental electrical and electronic components, circuits, and instruments. The students will gain practical experience in circuit wiring, testing of semiconductor devices, and selection of appropriate logic gate for given applications.

Course Objectives:

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

1. To reinforce the theoretical knowledge of electrical and electronics engineering through experiments.
2. To familiarize students with electrical circuit components, measuring instruments, and wiring methods.
3. To develop skills in constructing and analyzing basic circuits and systems.
4. To understand the characteristics and applications of electrical machines and semiconductor devices.
5. To introduce the use of Logic Gates, Boolean algebra in engineering applications.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Demonstrate the use of safety electrical equipment.
CO2	Identify the use DC motors and single-phase transformers in daily life.
CO3	Verify Kirchhoff's law and determine voltage and current ratios of single-phase transformers through experiment.
CO4	Analyze the performance of rectifiers, filters circuits
CO5	Understand the logic gates with their truth tables and verify Demorgan's theorem

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	3			1	1	
CO2	2	1	2			2					
CO3	3	3	2	2						1	
CO4	3	3	2	2	2						

CO5	2	2	2	1	2				1		
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Assessment Scheme:

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

Assessment Component	Marks
CA1	25
CA2	25
OE	50

CA1 and CA2 are based on practical performance etc.

Course Contents

Practical No.	List of Experiments	Hours
1	Determine frequency, time period, peak value, rms value, peak factor of a Sinusoidal ac waveform on CRO/DSO	02
2	Identify switches , fuse, switch fuse and fuse switch, MCB, MCCB	02
3	Study and verify Kirchoff's current and voltage law.	02
4	Determine current and voltage ratio of single phase transformers.	02
5	Load test on DC shunt/ compound motor.	02
6	Speed Control of the DC Shunt Motor using Three point starter.	02
7	Study of Half Wave Rectifier (HWR) with & without filter.	02
8	Study of Full Wave Rectifier (FWR) with & without filter	02
9	Study of output characteristics of transistors.	02
10	Verify Truth Table of Logic Gates (AND, OR, NOT, NAND & NOR Gates).	02
11	Design Basic Gates Using NOR/ NAND gates.	02
12	Verify Demorgan's theorem.	02

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

Text Books			
Sr. No.	Title	Author	Publisher
1	Basic Electronics	B.L. Theraja	S. Chand
2	Principles of Electrical and Electronics Engineering	V.K. Mehta & Rohit Mehta	S. Chand

3	Electronic Devices and Circuits	Millman and Halkias	McGraw Hill Education.
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Reference Books			
Sr. No.	Title	Author	Publisher
1	Basic Electrical and Electronics Engineering	D.P. Kothari and I.J. Nagrath	McGraw Hill Education
2	A Course in Electrical and Electronic Measurements and Instrumentation	J.B.Gupta	S.K. Kataria & Sons.
3	Electronic Devices and Circuits	Millman and Halkias	McGraw Hill Education.
4	Electronics Lab Manual (Volume I and II)	K. A. Navas	Rajath Publishers.
5	Basic Electrical and Electronics Engineering	S.K. Bhattacharya	Pearson Edition
6	Basic Electrical and Electronics Engineering	Ritu Sahdev	Khanna Publisher

Title of the Course: C Programming for Problem Solving Laboratory Course Code: 25BSE1103L	L	T	P	Credit
	--	--	2	1

Course Prerequisite: Basic understanding of computers and logic building.

Course Description:

This laboratory course provides hands-on experience in solving engineering and real-life problems using the C programming language. It is designed to complement the theoretical foundations of C programming by engaging the students in implementing structured, modular, and efficient code. The students will learn to apply programming constructs such as variables, data types, control structures, functions, arrays, strings, pointers, and dynamic memory management through practical problem-solving. The course also focuses on debugging, compiling, and testing C programs using modern development tools and IDEs. Emphasis is placed on developing logical thinking, structured programming habits, and effective algorithmic approaches to real-world computational problems.

Course Objectives:

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

1. To familiarize students with the syntax and semantics of C programming language.
2. To develop the ability to write programs using fundamental programming constructs.
3. To implement modular programming and memory management using pointers.
4. To enhance logical reasoning and problem-solving abilities.
5. To prepare students to use C programming in engineering applications and further Programming courses.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Explain 'C' Language Constructs
CO2	Select Constructs of 'C' to develop programming solution
CO3	Use Memory Management techniques for dynamic memory management
CO4	Develop "C" program to solve problem
CO5	Create a C program to implement modular programming and memory management using pointers.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3		1	1				1			
CO2	3	1	2	2	1			1			
CO3	3	1	2	2	2			1			

CO4	3	2	3	2	2	1	1	1	2	2	2
CO5	1	2	2	1	1				2	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	50

CA1 OE based on 50% of course content, attendance, lab overall performance.

CA2 OE based on 100% of course content, attendance, lab overall performance.

Intent of this laboratory is to build the logic development and problem-solving skills of students and build proficiency and competency in C language. For this purpose, a sample list of assignments is grouped into Group A, Group B and Group C with increasing levels of difficulty and understanding.

Group A assignments are based on real life problems using language constructs such as constant, variable, data type, operator, array, string, expressions, decision, iteration etc.

Group B assignments are based on the applications of language constructs and combination of language constructs, control structures, String, Arrays, Pointers, Structures, Functions.

Group C assignments are a little more challenging. Assignments will be open ended which can either be a mini project or simulation of real- l i f e problems/scenarios/applications. It can also include

Debugging and Feature enhancement / Alternative solution/ testing / Code-refactoring of given problem statements or analyze the given code and comment on the output.

Instructors can conduct a total of 10 assignments, six from Group A, three from Group B, one from Group C. Other assignments can be considered as extra assignments.

Suggestive List of Assignments

Assignment 0: Get acquainted with Windows/Linux Platform, C environment, structure of basic C program, compilation, debugging and execution of C program. Group A - Language constructs

For Group A problem statements, students should draw flowchart/ algorithm/ pseudo code

and convert it into a C program. Problems are based on constructs such as concepts of constant, variable, data type, operator and expressions, arrays, strings, iteration, decision making and others.

Course Contents

Practical No.	List of Experiments	Hours
1	To Study Basic Linux commands used for programming: i. Hands on Basic Linux Commands.	02

	Command Line based compilation and execution of program.	
2	Convert measurement units such as feet to inches, inches to centimeters, Kilograms to grams, Dollar to Rupees, temperature conversion Degree to Fahrenheit, days into years, weeks and days.	02
3	Number conversion (decimal to binary, binary to decimal, binary to octal, octal to binary).	02
4	i. Find the maximum/minimum of given numbers. Obtain the first 25 numbers of a Fibonacci sequence/prime numbers with and without recursion etc.	02
5	Search the data from an array of numbers/ characters/ string.	02
6	Calculate the total number of characters in the string and the total number of vowels in the string with the number of occurrences in the string.	02
7	Swap two data elements using pass by value, pass by reference and without using a third variable.	02
8	Operations on matrices.	02

Applications of Language Constructs

Group B problem statements address the applications of language constructs such as Loops for iteration, Arrays, Strings, Structures, and Functions for modularity wherever required. They should implement the application using a function (call by reference/ call by value) wherever appropriate. Problems are based on real life applications/ scenarios.

Practical No.	List of Experiments	Hours
1	Perform employee operations such as accept, display, search by name, and search by number, update a record. Explore the possibility of modularity for implementation.	02
2	For a class an examination is conducted and the results for the students of all the 5 subjects are recorded. Write a C program to display the record of students. On the basis of the record compute: ii. The average score of class iii. Highest score and lowest score of class.	02
3	Create a structure to specify data of customers in a bank. The data to be stored is: Account number, Name, Balance in account. Assume a maximum of 200 customers in the bank. Write a C program to display details of customers.	02
4	Write a C program that simulates an ATM machine. The user should be able to choose an operation such as balance inquiry, deposit, withdrawal, or exit using a switch-case structure. Within each operation, use if-else statements to check conditions such as sufficient balance for withdrawal or valid deposit amount.	02

Group C

Group C problem statements address big real-life problem solving. Students are expected to apply the learnt concepts to solve these problems. Students should choose any one of the following: -

Practical No.	List of Experiments	Hours
1	Micro Project – Students should implement a micro project which simulates real life problems/scenarios/applications. They are expected to make use of the appropriate constructs of C language.	02
2	Game - Students should develop a game which simulates real life problems/scenarios/applications. They are expected to make use of the appropriate constructs of C language.	02

Text Books			
Sr. No.	Title	Author	Publisher
1	The Complete Reference	Fourth	Herbert Schildt
2	The C Programming Language	Eighth	E. Balagurusamy
3	C Programmer's Companion	First Edition	R.S. Jones

Reference Books			
Sr. No.	Title	Author	Publisher
1	C Programming Language	Second Edition	Brian Kernighan, Dennis Ritchie
2	Practical "C" Programming	Third	Steve Oualline
3	Programming in ANSI C	Eight Edition	E. Balagurusamy

Title of the Course: Communication Skills Laboratory Course Code: 25BSE1104L	L	T	P	Credit
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Course Prerequisite: English subject at HSC, Communication Skills Theory

Course Description:

This is a practice-oriented course, laying importance on application of various skills being learnt in the Communication Skills theory course such as grammar, techniques and strategies for improving English sub-skills and vocabulary, etc. In addition, this course focuses on English speaking, reading, writing skills, effective presentation and building confidence.

Course Objectives:

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

1. To exhibit confident and effective communication skills in presentations, group discussions, and role-plays.
2. To design clear, concise, and persuasive messages in written and oral formats, applying principles of effective communication.
3. To analyze the students' own communication strengths and weaknesses, identifying areas for improvement.
4. To deliver engaging presentations, incorporating visual aids and effective delivery techniques.
5. To assess the effectiveness of communication strategies, providing constructive feedback and suggestions for improvement.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Demonstrate confidence in public speaking, group discussions, and other communication settings.
CO2	Create engaging and informative content for presentations, reports, and other written assignments.
CO3	Use nonverbal communication effectively, including body language, tone of voice, and facial expressions.
CO4	Practice active listening skills, including paraphrasing, summarizing, and asking clarifying questions.
CO5	Adapt their communication style to different audiences, purposes, and contexts, demonstrating flexibility and effectiveness.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1								2	3		1
CO2								2	3		2
CO3							2		3		2
CO4							2	2	3		2

CO5							2		3		1
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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	Icebreaking: Introducing yourself and others Adjectives, phrases, and clauses to describe yourself and others Introducing yourself and others demonstration.	02
2	Introduction to English Building Blocks -1 Grammar fundamentals: parts of speech, tenses, prepositions, articles, modals, Vocabulary building: synonyms, antonyms, prefixes/suffixes, idioms, phrases.	02
3	Verbal Aptitude1(Discussion on applications of grammar) Using proper tenses, correct use of articles, conjunctions and prepositions.	02
4	Verbal Aptitude 2(Watching videos and solving grammar exercises) Using proper tenses, correct use of articles, conjunctions and prepositions.	02
5	Listening practice Listening comprehension, Strategies for effective listening with audio/ video samples.	02
6	Speaking practice-1 Video samples of effective and ineffective public speeches, Extempore (JAM), prepared speeches.	02
7	Speaking practice-2 Prepared speeches.	02
8	Group Discussion-1 Group discussion tips, Dos and Don'ts, video samples Mock GD-1 analysis and comments on individual performances.	02
9	Group Discussion-2 Final GD participation.	02
10	Interview1 Discussing interview FAQs in detail, video samples.	02
11	Interview2 Mock interviews (prepared and formal).	02

12	Incident Narration or Storytelling Practicing narration methods and techniques for effective narration.	02
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***Any 10 practicals /experiments to be conducted.**

Text Books					
Sr. No.	Title	Edition	Author/s	Publisher	Year
1	Better English Pronunciation	Second	J.D. O'Connor	OUP	1980
2	A Practical Course in Spoken English	First	J.K. Gangaj	PHI Learning Pvt. Ltd	2014
3	English Language Laboratories	Second	Nira Konar	PHI Learning	2014

Software
Orell Talk Digital Language Lab Software – Professional Version with 1+50 users' subscription.

Title of the Course: Engineering Practice Lab	L	T	P	Credit
Course Code: 25BSE1105L	--	--	2	1

Course Prerequisite: Basic engineering drawing, equipment's and safety rules.

Course Description:

The Engineering Practice Lab course is designed to provide first-year engineering students with hands-on experience and fundamental knowledge of various manufacturing practices, tools, and machining processes. The course introduces students to basic fabrication methods, enabling them to understand the practical aspects of engineering, materials, and processes used in industry.

Students will engage in practical sessions involving fitting, carpentry, welding, sheet metal work, plumbing, plastic injection, metal forming, and machining. Emphasis is placed on safety protocols, tool handling, measurement techniques, and the working principles of workshop machines and tools. This course lays the foundation for core mechanical and manufacturing subjects in later semesters.

Course Objectives:

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

1. To familiarize students with basic manufacturing techniques and tools.
2. To develop manual skills and technical understanding of fabrication processes.
3. To encourage safe workshop practices and working discipline.
4. To prepare students for real-world engineering tasks requiring practical knowledge.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand the work culture, how to use tools and safety in the workshop.
CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry, sheet metal working, metal forming, and welding.
CO3	Demonstrate practical skills in household wiring, electronic circuit assembly, soldering, and testing of electrical and electronic components through hands-on experiments.
CO4	Acquire skills in basic engineering practices and enhance their skill set using hands on experience and their teamwork.

CO-PO Mapping:

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

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	Safety precaution while working in workshop (Fire, Electric, Accidental prevention) and introduction of workshop tools.	02
2	Wood sizing (pattern making) exercises in planning, marking, sawing, chiseling and grooving to make half lap joint and cross lap joint.	04
3	A job fitting includes cutting, filing to saw cut, filing sides and faces, drilling and tapping on M. S. plates. Measure accuracy of dimension.	08
4	Demonstration of different piping connection, Threading dies, and pipe fitting.	02
5	Introduction to metal forming process and common tools required are anvil, hammers, forging dies, furnace etc.	02
6	Making a small parts using GI sheet involving development, marking, cutting, bending, brazing and soldering operations- i) Tray ii) Pan iii) Box and similar articles.	04
7	Demonstration of Arc welding process to make a square butt joint.	02
8	Demonstration of household wiring connection, wiring of experiments assembly and disassembly.	02
9	Demonstration of soldering and testing of electronics components. Demonstration of Use of electronic circuits.	02

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

Text Books			
Sr. No.	Title	Author	Publisher
1	Work Shop Technology – Vol. 1	S.K. Hajra Choudhury, A.K. Hajra Choudhury, Nirjhar Roy	Media Promoters and Publishers Pvt Ltd.
2	Mechanical Workshop Practice	K. C. John	Prentice Hall Publication, New Delhi, 2010.

3	Elements of Workshop Technology – Vol. 1	S.K. Hajra Choudhury & A.K. Hajra Choudhury	Media Promoters
4	Engineering Workshop Practice	H.S. Bawa	McGraw Hill Education

Reference Books			
Sr. No.	Title	Author	Publisher
1	Workshop Technology (Vol. 1 & 2)	R.S. Khurmi & J.K. Gupta	S. Chand Publishing
2	Manufacturing Technology: Foundry, Forming and Welding	P.N. Rao	McGraw Hill Education
3	Workshop Practice	B.S. Raghuwanshi	Dhanpat Rai & Co.
4	Production Technology	H.M.T. (Hindustan Machine Tools)	Tata McGraw Hill

Certification Courses				
Course/ Certification	Provider/Platform	Level	Mode	Certification Authority
1	NPTEL “Manufacturing Processes I & II”	IITs/IISc (via NPTEL)	UG	Online
2	SWAYAM "Introduction to Engineering Workshop"	IITs/IISc (via SWAYAM)	UG	Online
3	Skill India / NSDC Courses (Pradhan Mantri Kaushal Vikas Yojana)	NSDC / Skill India	Base	Online + offline hands-on (at training centers)
4	Coursera / edX – Fundamentals of Manufacturing Processes	Coursera / edX	Base	Online
5	TCS iON Career Edge – Young Professional	TCS iON	Base	Online

Title of the Course: Yoga	L	T	P	Credit
Course Code: 25BSE1106L	--	--	2	1

Course Prerequisite: No prior knowledge required; only willingness to participate and awareness of personal health conditions.

Course Description:

This course helps the students achieve physical fitness, mental clarity, and emotional balance through asanas, pranayama, and meditation. It promotes stress management, concentration, and a healthy lifestyle, supporting overall well-being.

Course Objectives:

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

1. To introduce students to the foundational concepts and philosophy of Yoga.
2. To familiarize students with various yogic practices such as asanas, pranayama, and meditation.
3. To develop physical flexibility, strength, and mental clarity through regular yoga practice.
4. To understand the connection between breath, body, and mind in achieving holistic well-being.
5. To reinforce the importance of discipline, mindfulness, and a balanced lifestyle

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand the science and philosophy behind yogic practices and their relevance to holistic health.
CO2	Demonstrate proficiency in performing basic asanas, breathing techniques (pranayama), and meditation.
CO3	Use yogic techniques to enhance focus, emotional balance, and stress management in daily life.
CO4	Analyze the physical and psychological impacts of regular yoga practice on the human body and mind.
CO5	Demonstrate the ability to integrate yogic discipline and mindfulness into personal and professional.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011
CO1							1	2			2
CO2							1	2			2
CO3							2	2			2
CO4							2	2	1		2
CO5							2	2	1		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	Conduct Physical Activities.	02
2	Conditioning Exercise	02
3	Warming and cooling down exercises.	02
4	Conduct different style of yoga. (Hatha, Vinyasa, Ashtang)	02
5	Conduct yoga for alignment and balance, Shitalikarna, Vyayama, Suryanamaskar.	02
6	Basic yoga postures (Asanas).	02
7	Practice of Suryanamaskar & Pranayama, Anulom Vilom.	02
8	Practice basic yoga postures & Pranayama, Kapalabhati.	02
9	Practice Asanas & Pranayama Bhramari	02
10	Breath control for physical and mental health.	02
11	Types of Dhyan.	02
12	Perform sitting in Dhyan Mudra and meditating.	02

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

Text Books				
Sr. No.	Title	Author		Publisher
1	Asanas	2nd	Swami Kuvalyananda Pioneer in scientific Yoga	Kaivalyadhama samiti Lonavla.
2	Hathayoga Pradipika Swatmarama	3rd	Swami Digambaraji	Kaivalyadhama, Lonavala
3	The Science of Yoga	2nd	Taimini	Theosophical Publishing House, Adyar, Madras

Reference Books				
Sr. No.	Title	Edition	Author/s	Publisher
1	Light on yoga	2nd	B.K.S Iyengar	Schocken Books
2	Yoga Darshan	2nd	Swami Niranjanananda	Swami Niranjanananda
3	Modern Trends and Physical Education	4th	A. Singh	Kalyani Publishers

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.
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	Apply partial differentiation to solve composite and implicit function problems and use Euler's theorem on homogeneous 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	PO11
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 (statement only), Line and surface integrals, Green's theorem	08

	(in the plane), Gauss divergence theorem, and Stokes theorem (without proofs).	
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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	PO11
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.

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, H ₂ -O ₂ 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	PO11
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 Streamlit. 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	PO11
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): <code>_init_</code> , 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	3 rd 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	PO11
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	<p>Introduction to Engineering Drawing and Computer Aided Sketching</p> <p>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.</p> <p>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.</p>	06
2	<p>Projection of Lines and Planes</p> <p>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.</p> <p>B) Projection of planes (Regular polygons like Triangular, Square, Pentagon, Hexagon, and circle) inclined to one plane & perpendicular to other plane (3 Stages problem).</p>	08
3	<p>Projection of Solids and Development of Surface</p> <p>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).</p> <p>B) Development of lateral surface of regular solids: Prism, Cone, Cylinder.</p>	07
4	<p>Orthographic & Isometric Projection</p> <p>A) Orthographic projection, selection and spacing of views, Orthographic views, required views from Pictorial view (Conversion of 3D view into orthographic view)</p> <p>B) Isometric axes, lines & planes, Isometric Scale, Isometric drawing, and isometric view. Conversion of orthographic view into</p>	07

	Isometric view.	
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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. Natarajan	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	PO11
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 Shankwar	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

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 (Fe ₃ O ₄).	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
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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	L	T	P	Credit
Course Code: 25BSC1203L	--	--	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 Oral Examination (OE), 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.

OE is based on 100% Experiments.

Course Contents

Practical No.	List of Experiments	Hours
1	Introduction to Python <ol style="list-style-type: none"> Demonstration of installation and configuration of Anaconda and Spyder Write a Python program to take user input and print it. Write a Python program to swap two numbers. 	02
2	Control Structures <ol style="list-style-type: none"> Write a Python program to check if a year is a leap year. Write a Python program to find the factorial of a number using loops. 	02
3	Nested Loops, Function, Recursion <ol style="list-style-type: none"> 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 Write a Python program to compute simple interest using a function with parameters for principal, rate, and time. Write a Python program to calculate the factorial of a number using recursion. 	02
4	Lists <ol style="list-style-type: none"> Write a Python program to find the sum and average of elements in a list. Write a Python program to reverse a given string using 	02

	<p>slicing.</p> <p>c. Write a Python program to check if a given string is a palindrome.</p>	
5	<p>Dictionaries and Sets</p> <p>a. Write a Python program to demonstrate basic dictionary operations: add, delete, and update key-value pairs.</p> <p>b. Write a Python program to find the intersection and union of two sets.</p> <p>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.</p>	02
6	<p>File Handling</p> <p>a. Create a text file and add course outcomes of this course. Implement file operations on it.</p> <p>b. Write a Python program to count the number of words in a file.</p>	02
7	<p>Object-Oriented Programming (OOP)</p> <p>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</p> <p>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</p> <p>c. Create a Calculator class with methods for addition, subtraction, multiplication, and division.</p>	02
8	<p>Exception Handling</p> <p>a. Write a Python program to handle Zero Division Error and Index Error exceptions.</p> <p>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.</p> <p>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.</p>	02
9	<p>Modules, Libraries Strings</p> <p>a. Write a Python program using the math module to calculate square root, power, and trigonometric functions.</p> <p>b. Write a Python program using the date time module to print the current date, time, and weekday.</p> <p>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.</p>	02

10	Using Streamlit <ol style="list-style-type: none"> Use virtual environments and launch Streamlit applications. Accept user input via Streamlit widgets. 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	PO11
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
	--	--	2	1

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 and 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	Teach CPR in a class	02
7	Arrangement of free medical checkup camp in villages	02
8	Teach basics about First Aid	02
9	Resume Career Workshop	02
10	Public Service Announcement	02
11	Water Filter Design	02
12	Town History Project	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.