SNJB's

Late Sau. Kantabai Bhavarlalji Jain

College of Engineering

(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)

Shri Neminath Jain Brahmacharyashram (SNJB) (Jain Gurukul)

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ESTD - 1928

Curriculum and Evaluation Scheme for First Year B. Tech. in Mechanical Engineering with Multidisciplinary Minor

To be implemented for 2026-30 Batch

(With Effect from Academic Year 2026-27)

CHAIRMAN
BOARD OF STUDIES MECHANICAL ENGINEERING
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Chandwad Dist.Nashik

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Chandwad
(Nashik)
Pin-423101

CHAIRMAN
ACADEMIC COUCIL
SNJB's
LSKBJ COLLEGE OF ENGINEERING
Chandwad Dist.Nashik

Vision of the Institute

Transform young aspirant learners towards creativity and professionalism for societal growth through quality technical education.

Mission of the Institute

- To transfer the suitable technology, particularly for rural development.
- To enhance diverse career opportunities among students for building a nation.
- To acquire the environment of learning to bridge the gap between industry and academics.
- To share values, ideas, and beliefs by encouraging faculty and students for the welfare of society.

Vision of the Mechanical Engineering Department

To impart quality technical education in the field of Mechanical Engineering for the benefits of society

Mission of the Mechanical Engineering Department

1.To provide quality education among the students through the curriculum and industrial exposure.
2.To develop a learning environment leading to innovations, skill development and professional ethics through curricular and extracurricular activities for societal growth.

Program Outcomes (POs) for an engineering graduate:

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop the solution of complex engineering problems.
PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes

PSO1

Graduates will have an ability to identify, analyze, and develop appropriate solution(s) to Mechanical Engineering Problems.

PSO2

Graduates will be able to use modern engineering tools for analyzing and solving practical problems of industry and society.

PSO3

Graduates will be able to learn and grow constantly, with good technical, spiritual, and ethical values with a zeal for life-long learning.

Table 1: Abbreviations

Abbreviation	Meaning
CIE	Continuous Internal Evaluation
MSE	Mid Semester Examination
SEE	Semester End Examination
BSC	Basic Science Courses
ESC	Engineering Science Courses
VSEC/VSC	Vocational and Skill Enhancement Courses
VEC	Value Education Courses
AEC	Ability Enhancement Courses
PCC	Program Core Courses
PEC	Program Elective Courses
MDM	Multidisciplinary Minor
OE/OEC	Open Elective - other than a particular program
EEM	Entrepreneurship/Economics/ Management Courses (HSSM)
ELC	Research Methodology
	Computer Engineering Project (CEP)/ Field Project (FP)
	Project
	Internship/ On Job Training (OJT)
IKS	Indian Knowledge System
CC/CCC	Co-Curricular Courses
HOC	Honor Courses
EXT	Exit Courses
DMC	Double Minor Courses
HRC	Honor with Research Courses
SIP	Student Induction Program
L	Lecture
T	Tutorial
P/PR	Practical
TH	Theory
Lab	Laboratory
TW	Term Work
OR	Oral
CE	Civil Engineering
CS	Computer Engineering
ME	Mechanical Engineering
AD	Artificial Intelligence and Data Science Engineering
ET	Electronics and Telecommunication Engineering

GENERAL COURSE STRUCTURE

- **Definition of Credit**:

Table 2: Credit Definition

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
2 Hours Practical (P) per week	1 Credit

- **Range of Credits: (B.Tech. or Equivalent) in Tech. with Multidisciplinary Minor:**

  In the light of the fact that a typical NEP Compliant Model Four-year Undergraduate degree program in Technology has about 176 credits, the total number of credits proposed for the four-year B.Tech. in **Mechanical Engineering** with Multidisciplinary minor degree is kept as **174.**

Table 3: Range of Credits

Course Category		Credits As PER NEP Guidelines	Proposed Credits
Basic Science Course	BSC/ESC	14-18	15
Engineering Science Course		12-16	15
Programme Core Course (PCC)	Program Courses	44-56	52
Programme Elective Course (PEC)		20	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses	14	14
Open Elective (OE) Other than a particular program		8	8
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	8	7
Ability Enhancement Course (AEC)	Humanities Social Science and Management (HSSM)	4	8
Entrepreneurship/Economics/ Management Courses		2	4
Indian Knowledge System (IKS)		2	4
Value Education Course (VEC)		4	2
Research Methodology(RM)	Experiential Learning Courses	4	2
Community Engagement Project (CEP)/ Field Project (FP)		2	4
Project		4	4
Internship/ OJT		12	12
Co-curricular Courses (CC)	Liberal Learning Courses	4	3
Total Credits		**160-176**	**174**

■ **Semester wise Credit Distribution Structure for Four Year B. Tech in Mechanical Engineering with Multidisciplinary Minor:**

Table 4: Semester-wise Credit Distribution Structure

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	8	7	-	-	-	-	-	-	15
Engineering Science Course		8	7	-	-	-	-	-	-	15
Programme Core Course (PCC)	Program Courses		4	14	9	9	7	6	3	52
Programme Elective Course (PEC)		-	-	-	-	6	5	6	3	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses	-	-	-	2	3	3	3	3	14
Open Elective (OE) Other than a particular program		-	-	-	3	2	3	-	-	8
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	-	-	3	2	2	-	-	-	7
Ability Enhancement Course (AEC)	Humanities Social Science and Management (HSSM)	2	2	-	2	-	2	-	-	8
Entrepreneurship/Economics/ Management Courses		-	-	2	2	-	-	-	-	4
Indian Knowledge System (IKS)		1	-	1	2	-	-	-	-	4
Value Education Course (VEC)		2	-	-	-	-	-	-	-	2
Research Methodology	Experiential Learning Courses	-	-	2	-	-	-	-	-	2
Community Engagement Project (CEP)/ Field Project (FP)		-	-	-	-	-	-	4	-	4
Project		-	-	-	-	-	2	2	-	4
Internship / OJT		-	-	-	-	-	-	-	12	12
Co-curricular Courses (CC)	Liberal Learning Courses	1	2	-	-	-	-	-	-	3
Total Credits (Major)		**22**	**22**	**22**	**22**	**22**	**22**	**21**	**21**	**174**

Students can opt for any of the following as per the rules and regulations given by the institute:

1. B. Tech with Multidisciplinary Minor = Total 174 Credits
2. B. Tech with Multidisciplinary Minor and Honor = Total 192 Credits
3. B. Tech with Multidisciplinary Minor and Honor with Research = Total 192 Credits
4. B. Tech with Multidisciplinary Minors (Double Minor) = Total 192 Credits

Students will have the flexibility to enter a program in odd semesters and exit a programme after the successful completion of even semesters as per their future career needs. **Students exiting will be awarded provided they secure additional EIGHT credits in skill-based vocational courses.**

The credit structure for different levels under the Four-year Bachelor's Multidisciplinary B. Tech Programme with multiple entries and multiple exit options are as given below**:**

Table 5: Credit Requirements

Level	Qualification Title	Credit Requirements	Semester	Year
4.5	One Year UG Certificate in Tech.	44	2	1
5.0	Two Years UG Diploma in Tech.	88	4	2
5.5	Three Years Bachelor's Degree in Vocation (B. Voc.) or B. Sc. (Tech.)	132	6	3
6.0	4-Years Bachelor's degree (B.Tech. or Equivalent) in Tech. with Multidisciplinary Minor	174	8	4

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TEACHING AND EVALUATION SCHEME FOR FIRST YEAR B-TECH

Semester – I

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	BSC	26-BSC-1-02	Engineering Chemistry	3	-	-	3	3	20	20	60	100	-	-	-	100
2	BSC	26-BSC-1-03	Linear Algebra And Differential Calculus	3	1	-	4	4	20	20	60	100	-	-	-	100
3	ESC	26-ESC-1-03	Engineering Graphics	3	-	-	3	3	20	20	60	100	-	-	-	100
4	ESC	26-ESC-1-11	Engineering Mechanics	2	-	-	2	2	20	20	60	100	-	-	-	100
5	BSC	26-BSC-1-06	Engineering Chemistry Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
6	ESC	26-ESC-1-08	Engineering Graphics Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	26-ESC-1-12	Engineering Mechanics Laboratory	-	-	4	4	2	-	-	-	-	25	-	-	25
8	VSEC	26-VSC-1-01	TechSkill	-	-	4	4	2	-	-	-	-	50	-	-	50
9	CCC		Co-curricular Course -I	-	-	2	2	1	-	-	-	-	50	-	-	50
10	IKS	26-IKS1-01	Indian Knowledge System	-	2	-	2	2	-	-	-	-	50	-	-	50
11	AEC	26-AEC-1-01	Professional Communication Skills	-	1	-	1	1	-	-	-	-	25	-	-	25
Total				**11**	**4**	**14**	**29**	**22**	**80**	**80**	**240**	**400**	**250**	**-**	**-**	**650**

Course Code	Basket of Co-curricular Course
26-CCC-1-01	Sports and Fitness
26-CCC-1-02	Study and Documentation of Local History
26-CCC-1-03	NSS
26-CCC-1-04	Cultural Enrichment
26-CCC-1-05	Performing Arts and Creative Expression
26-CCC-1-06	Magazine Designing and Creative Expression

Note: Students have to select any one course from the above basket.

Induction Program (Mandatory)	3 Weeks Duration
The induction program (as per AICTE guidelines) is to be completed at the start of the first year.	• SIP Module 1: UHV 1 • SIP Module 2: Physical Health and Related Activities • SIP Module 3: Familiarization of Department/ Branch and Innovation • SIP Module 4: Visit to a Local Area • SIP Module 5: Lectures by Eminent People • SIP Module 6: Proficiency Modules • SIP Module 7: Literature / Literary Activities • SIP Module 8: Creative Practices • SIP Module 9: Extra Curricular Activities

Semester – II

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	BSC	26-BSC-1-01	Engineering Physics	3	-	-	3	3	20	20	60	100	-	-	-	100
2	BSC	26-BSC-1-04	Statistics and Integral Calculus	3	-	-	3	3	20	20	60	100	-	-	-	100
3	ESC	26-ESC-1-01	Basic Electrical and Electronics Engineering	3	-	-	3	3	20	20	60	100	-	-	-	100
4	ESC	26-ESC-1-06	Programming and Problem Solving using Python	2	-	-	2	2	20	20	60	100	-	-	-	100
5	PCC	26-PCC-ME-1-01	Mechanical Engineering Systems	2	-	-	2	2	20		30	50	-	-	-	50
6	BSC	26-BSC-1-05	Engineering Physics Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	26-ESC-1-05	Basic Electrical and Electronics Engineering Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
8	ESC	26-ESC-1-10	Python Programming Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
9	PCC	26-PCC-ME-1-02	Mechanical Engineering Systems Lab	-	-	4	4	2	-	-	-	-	25	25	-	50
10	VSEC	26-VSC-1-02	TechShop	-	-	4	4	2	-	-	-	-	50	-	-	50
11	CCC	26-CCC-1-07	Co-curricular Course -II-Futurology Projects	-	-	4	4	2	-	-	-	-	25	-	-	25
Total				**13**	**0**	**18**	**31**	**22**	**100**	**80**	**270**	**450**	**175**	**25**	**0**	**650**

Level 4.5 Exit Criteria: Mandatory Courses to be completed after the first year to obtain One Year UG Certificate in Mechanical Engineering

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	EXT	26-EXT-1-01	Internship / Fieldwork/OJT	-	-	8	8	4	-	-	-	-	100	-	-	100
2	EXT	26-EXT-1-02	Minor Project	-	-	8	8	4	-	-	-	-	50	-	50	100
Total				**-**	**-**	**16**	**16**	**8**	**-**	**-**	**-**	**-**	**150**	**-**	**50**	**200**

SEM I

26-BSC-1-02 : Engineering Chemistry

Teaching Scheme:	**Credit:** 03	**Evaluation Scheme:**
Theory: 03 Hours/Week		**CIE:** 20 Marks **MSE**: 20 Marks **SEE** : 60 Marks

Prerequisites: Basic Knowledge of water and pollution, Environment, periodic table, Titrations- volumetric analysis, types of reaction, classification and properties of polymers, knowledge of fuels, Oxidation, reduction reactions, strong and weak electrolytes, electromagnetic radiations, electrochemical series and corrosion, Semiconductor

Companion Course: 26-BSC-1-06: Engineering Chemistry Lab

Course Objectives:

- **To understand** the fundamental principles of engineering chemistry and their relevance to engineering applications.
- **To acquire** knowledge of water treatment, electrochemistry, engineering materials, and corrosion.
- **To understand** the concepts of environmental chemistry and green chemistry for sustainable development.

Course Outcomes:

After completion of the course, learners should be able to

CONo	Course outcomes	BL
CO1	**Apply** appropriate technology for determining the purity and qualities of substances.	3
CO2	**Employ** diverse methods to analyze the molecular composition of liquids, fuels, and Polymers.	3
CO3	**Evaluate** the challenges posed by hard water and corrosion and explain strategies for mitigation.	3
CO4	**Compare** fuel composition, water quality, and corrosion prevention techniques.	3
CO5	**Analyze** fluids and fuels and find suitable purifying methods.	4
CO6	**Understand** the fundamental concepts of environmental chemistry, and it's real world applications.	3

Course Contents

Unit I	Water Technology	7 Hours

Water: Introduction, Hardness of water- Types, Analysis of water hardness (EDTA method) and Numericals, Alkalinity of Water and numericals. Ill effects of hard water-Scale, sludge, priming and foaming, External Treatment of water - Zeolite method, numericals, Purification of water: Reverse osmosis.

Exemplar/Case Studies-
1) Wastewater treatment
2) Different types of membranes used in water softening

Unit II	Battery Technology and Electroanalytical techniques	7 Hours

Batteries: Introduction, Ni-Cd battery, Construction, Uses, recent technologies in Lithium based batteries, Li-cells – $LiMnO_2$.
Electroanalytical techniques: pH metry: Introduction**,** standardization of pH meter, pH metric titration of strong acid versus strong base with titration curve,
UV-Visible Spectroscopy: Introduction, interaction of electromagnetic radiation with matter, statement of Beer's law and Lambert's law ,Instrumentation and basic principle of single beam spectrophotometer, Recent applications of UV-visible spectroscopy.
Conductometry.
Introduction to Conductometry ,Acid–Base Titration ,Determination of Strength of a Strong Acid Using a Conductometer ,Conductometric Titration Curve and Its Interpretation.

Exemplar/Case Studies-
1) Battery waste recycling
2) Current research and advances in fuel cells

Unit III	Chemistry of Engineering Materials	7 Hours

Polymers: Introduction, Glass transition temperature and Melting Temperature, Specialty Polymers: Structure, properties and applications of the following polymers-Conducting Polymer: Polyacetylene Doping of conducting polymer and its type, Biodegradable Polymers: PolyhydroxyButyrate Valerate- PHBV,
Nonmaterial's:
Introduction, definition, properties and general applications of Graphene,Carbon Nano tube And Quantum dots.

Exemplar/Case Studies-
1) Polymer composites: Fiber reinforced plastic (FRP) and Carbon reinforced polymer composite
2) Composition and Applications of woods metal, brass, Bronze, Ti-alloys

Unit IV	Environmental Chemistry	7 Hours

Green Chemistry: Definition, Goals of Green Chemistry, 12 principles of Green Chemistry, Industrial applications of Green Chemistry, Major Uses,Traditional and Green pathways of synthesis of Polycarbonate.
Chemicals in Agriculture: Pesticides, Insecticides, herbicides, fungicides Examples and uses. Bio Fertilizers Definition, examples and uses, E-Waste Management 6R's.

Exemplar/Case Studies-
1) Bhopal gas Tragedy
2) Hazardous Waste

Unit V	**Corrosion and its Protection**	**7 Hours**

Corrosion: Introduction, Types of corrosion – Dry and Wet corrosion, mechanism, nature of oxide films, Pilling-Bed worth's rule, hydrogen evolution and oxygen absorption corrosion, Factors influencing rate of corrosion related to nature of metal and nature of Environment(4 to 5) **Methods of corrosion control:** 1.cathodic protection: Sacrificial Anodic Protection Method 2.Metallic coatings: Types-Anodic Coating & Cathodic Coating 3.Methods to apply metallic coating Galvanizing and Tinning, Electroplating.

Exemplar/Case Studies:
1) Organic coatings: Paints applications in industry for corrosion protection (AI&DS,Computer,E&TC)
2) Lubricants: Properties- Viscosity index, Flash point, oiliness, cloud point, and applications of lubricants (Mechanical)
3) Cement: Definition, Classification and properties, Chemical constituent of Portland cement (Civil).

Unit VI	**Energy Science**	**7 Hours**

Fuel: Introduction, Conventional and Non-conventional Energy Resources, Calorific value (CV), Gross calorific value (GCV) and Net calorific value (NCV), Determination of Calorific value: Bomb calorimeter, Numericals.
Solid fuel: Coal its Types, Proximate analysis of Coal, Disadvantages of fossil fuels, Hydrogen gas as a future fuel, Alternative fuels: Power alcohol, biodiesel**.**
Solar Cell: Introduction, Importance, Construction & working of Solar PV cell.

Exemplar/Case Studies:
1) Applications of fuel cells in automobile industry (Mechanical)
2) The Role of Civil Engineering in Energy Infrastructure Development (Civil).
3) Different soldering techniques for Printed Circuit Boards (EnTC)
4) Electrostatic and Hybrid capacitors (AIDS, Computer)

Learning Resources

Text Books:

T1. O. G. Palanna"Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd,2014.
T2. S. S. Dara, Dr. S. S. Umare"Textbook of Engineering Chemistry" ,S. Chand & Company Ltd,2016

Reference Books :

R1. S.Ramesh et al"Engineering Chemistry", Wiley India Pvt. Ltd,2012
R2. Shriver and Atkins"Inorganic Chemistry", Oxford University Press, 5ed, 2010
R3. S. M. Khopkar,Basic"Concept of Analytical Chemistry", New Age-International Publisher, 2ed, 2008
R4. A. K. De"Environmental Chemistry", New Age International Publications, 8ed,2018

Additional Resources: (Book, e-Resources)

1. G.Vijaya Pratap, Dr. Manasi Ghamande, Dr Prashant Pangrikar, De. Balaji Rupnar "A Text Book of Environmental Pollution and Management" ,R .K Publication.

e-Resources-

1.https://discovery1.delnet.in/Search/Results?lookfor=Sunita+Rattan&type=AllFields&location_code=&limit=60
2.https://discovery1.delnet.in/Search/Results?lookfor=O.+G.+Palanna%E2%80%9C&type=AllFields&location_code=&limit=60
3.https://discovery1.delnet.in/Search/Results?lookfor=S.+S.+Dara%2C+Dr.+S.+S.+Umare&type=AllFields&location_code=&limit=60

MOOC Courses links :

1.https://archive.nptel.ac.in/courses/105/106/105106119/
2.https://onlinecourses.nptel.ac.in/noc22_ce55/preview
3.https://archive.nptel.ac.in/courses/113/105/113105102/

26-BSC-1-03: Linear Algebra And Differential Calculus

Teaching Scheme:	**Credit:**	**Evaluation Scheme:**
Theory: 03 Hours/Week. Tutorial: 01 Hours/ Week.	TH : 4	**CIE :** 20 Marks. **MSE :** 20 Marks. **SEE :** 60 Marks.

Prerequisites: Basics of Differentiation, Basics of Integration, Maxima and Minima, Determinants and Basics of Matrices.

Companion Course: -

Course Objectives:

- To make the students familiarize with concepts and techniques in differential Calculus, and linear Algebra.
- The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in the discipline

Course Outcomes:
After completion of the course, learners should be able to

CONo	CO	BL
CO1	**Understand the** fundamental concepts of calculus, matrices, and differential equations.	2
CO2	**Solve** the system of linear equation by using matrix method, ODE ,Partial Diff , find the Expansion of Function	3
CO3	**Find** the Eigenvalue and Eigenvector. N^{th} order derivatives, series by using Taylor's and McLaren's theorem.	3
CO4	**Apply theorems** in Expansion, Leibnitz, Euler's theorems of Homogeneous Function, Cayley -Hamilton theorem.	3
CO5	Analyze the Problems and **apply** the appropriate concept to obtaining solutions	3
CO6	**Apply** the concept of Linear algebra, and differential calculus for real life engineering Problems.	3

Course Contents

Unit I	**Linear Algebra- Matrices ,System of linear equations**	7 Hours

Rank of a Matrix, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations, Application to problem in Engineering.

Exemplar/Case study: Case study on matrices.

Assignment: Assignment on System of, Linear Equations, Linear and Orthogonal Transformations

***Mapping of Course Outcomes**	**CO1, CO2, CO6**	
Unit II	**Linear Algebra- Eigenvalue and Eigenvector**	**7 Hours**
Eigenvalues and EigenVectors, Cayley Hamilton theorem, Diagonalization of a matrix, Reduction of Quadratic forms to Canonical form by Linear and Orthogonal transformation		
Exemplar/Case Studies : Case study on matrices eigenvalues and eigenvector		
Assignment : Assignment on Eigenvalues and EigenVectors, Reduction of Quadratic forms to Canonical form by Linear and Orthogonal transformations		
***Mapping of Course Outcomes**	**CO3, CO4, CO6**	
Unit III	**Differential Calculus: Expansion And Indeterminate form**	**7 Hours**
Rolle's Theorem, Mean Value Theorems, Taylor's Series and Maclaurin's Series, Expansion of functions using standard expansions, Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits and Applications.		
Exemplar/ Assignment : Assignment on Mean Value Theorems, Taylor's Series ,Indeterminate Forms,		
***Mapping of Course Outcomes**	**CO1,CO3, CO4, CO5**	
Unit IV	**Ordinary Differential equations and its Application**	**7 Hours**
Exact differential equations, Equations reducible to exact form, Linear differential equations, Equations reducible to linear form, Applications of Differential Equations to Orthogonal Trajectories, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, One dimensional Conduction of Heat		
exemplar/Assignment : Assignment on Differential equation and its Application		
***Mapping of Course Outcomes**	**CO1,CO2, CO5, CO6**	
Unit V	**Successive Differentiation and Linear Differential Equation**	**7 Hours**
Successive Differentiation, Leibnitz Theorem, DE of nth order with constant coefficients, Complementary Function, Particular Integral, General method, Shot -cut methods, Method of variation of parameters.		
Example/Assignment: Assignment on Linear Differential Equation & Successive Differentiation.		
***Mapping of Course Outcomes**	**CO1,CO2, CO4, CO5**	
Unit VI	**Partial Differentiations and its Applications**	**7 Hours**
Introduction to Partial Derivatives, Euler's Theorem on Homogeneous functions, Partial derivative of Composite Function, Total Derivative, Its applications Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.		
exemplar/Assignment : Assignment on Partial Differential equation and its Application		

***Mapping of Course Outcomes**	**CO1,CO2, CO4, CO5, CO6**
Learning Resources	
Text Books	
T1. .B. V. Ramana **,"**Higher Engineering Mathematics", (Tata McGraw Hill) (2017, 29th edition) **T2.** B. S. Grewal, "Higher Engineering Mathematics ", (Khanna Publication, Delhi(2014. 2nd edition)	
Reference Books :	
R1. Erwin Kreyszig , " Advanced Engineering Mathematics" , (Wiley Eastern Ltd.), (2014, 9th edition) **R2**. M. D. Greenberg , "Advanced Engineering Mathematics" , (Pearson Education), (2014. 2nd edition) **R3**. Peter V. O'Neil, " Advanced Engineering Mathematics " , (Thomson Learning) , (2013,7th edition)	
Additional Resources: (Books, e-Resources) https://discovery1.delnet.in/Search/Results?lookfor=B.+V.+Ramana&type=Author&location_code=&l imit=60 2.https://discovery1.delnet.in/Search/Results?lookfor=+B.+S.+Grewal&type=Author&location_code=&l imit=60 **3.https://discovery1.delnet.in/Search/Results?lookfor=Erwin+Kreyszig&type=Author&location_code=&limit=60** **4.https://discovery1.delnet.in/Search/Results?lookfor=M.+D.+Greenberg+&type=Author&location_code=&limit=60** **5.https://discovery1.delnet.in/Search/Results?lookfor=Peter+V.+O&type=Author&location_code=&limit=60** **6.https://discovery1.delnet.in/Search/Results?lookfor=George+B.+Thomas&type=Author&location_code=&limit=60** **7.https://discovery1.delnet.in/Search/Results?lookfor=+P.N.Wartika&type=Author&location_code=&limit=60** **8.https://discovery1.delnet.in/Search/Results?lookfor=Ron+Larson%2C&type=Author&location_code=&limit=60**	

26-ESC-1-03: Engineering Graphics

Teaching Scheme: Theory: 03 Hours/Week	**Credit:** 03	**Examination Scheme:** **CIE :** 20 Marks **MSE** : 20 Marks **SEE** : 60 Marks

Prerequisites Courses: Basic Knowledge of geometrical shapes and its construction.

Companion Course: 26-ESC-1-08: Engineering Graphics Lab

Course Objectives:

- Introduce fundamental principles of Engineering Drawing.
- Teach different projection methods such as orthographic, isometric.
- Familiarize students with technical drawing techniques.
- Educate on dimensioning standards and specifications in engineering drawings.
- Enhance communication skills through graphical representation of design concepts.

Course Outcomes:

After completion of the course, learners should be able to

CO NO	CO	BL
CO1	**Visualize** and effectively communicate engineering ideas through graphical representation.	3
CO2	**Utilize** drawing instruments and effectively produce drawings with appropriate dimensioning styles.	3
CO3	**Understand** basic principles of engineering graphics to solve simple design and drafting of engineering application Problems.	3
CO4	**Apply** the theory of projection for line, curves, planes and solids.	3
CO5	**Draw** orthographic projections and isometric views using theory of projection.	3

Course Contents		
Unit I	**Projection of Point and line**	**6 Hours**
Fundamentals of Engineering Drawing: Need of Engineering Drawing and design, introduction of drawing instruments and their uses, Sheet layout, Line types and dimensioning and simple geometrical constructions **Projection of points and lines:** Theory of projection, Projection of a Point in first quadrant, Projection of line inclined to both Principle planes (First angle of method of projection only).		
#Exemplar/Case Studies: ● Redraw the given drawing and identify different types of lines, and dimension style used		
***Mapping of Course Outcomes**		CO1, CO2,CO3, CO4, CO5
Unit II	**Projection of planes**	**6 Hours**
Projection of regular planes on auxiliary and reference planes by first angle method only, projection of planes- Triangular plane, Quadrilateral Planes, Pentagonal plane, Hexagonal plane and Circular plane etc., Plane inclined to both principle planes.		
#Exemplar/Case Studies: ● Draw F.V, T.V. & S.V. of a given 2D planes like Triangle, Rectangle, Pentagon, Hexagon, Circle		
***Mapping of Course Outcomes**		CO1, CO2,CO3, CO4, CO5
Unit III	**Development of Lateral Surfaces**	**6 Hours**
Introduction to development of lateral surfaces and its industrial applications. Draw the development of lateral surfaces for cut sections of cone, pyramid, prism, Cylinder etc. resting on H.P.		
#Exemplar/Case Studies: ● Draw lateral development of any real life product and to make 3D models using card sheet or sheet metal.		
***Mapping of Course Outcomes**		CO1, CO2,CO3, CO4, CO5
Unit IV	**Engineering Curves**	**6 Hours**
Introduction to conic sections and its real world applications, various methods to construct the conic sections, Helix for Cone and Cylinder, Rolling Curves (Involutes, Cycloid) and Spiral		
#Exemplar/Case Studies: 5. Identify different conic sections used in a real life product or phenomena and to draw it using applicable method.		
***Mapping of Course Outcomes**		CO1, CO2,CO3, CO4, CO5

Unit V	**Orthographic Projection**	**6 Hours**
Introduction to First and Third angle Projection methods, Orthographic projection of machine elements/parts along with sectional view by first angle method.		
#Exemplar/Case Studies: ● Measure the dimension of any real life product and draw its orthographic views with dimensions using suitable scale.		
***Mapping of Course Outcomes**		CO1, CO2,CO3, CO4, CO5
Unit VI	**Isometric Projection**	**6 Hours**
Introduction to isometric projection, oblique projection and perspective projection. Draw the isometric projection from the given orthographic views.		
#Exemplar/Case Studies: ● Read and measure the dimension of any real life product and draw its Isometric views with dimensions using suitable scale.		
***Mapping of Course Outcomes**		CO1, CO2,CO3, CO4, CO5
Learning Resources		
Text Books		
T1: K. Venugopal, K, , "Engineering and Graphics", New Age International, New Delhi,2015 T2: Jolhe, D. A., (2015), "Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill, New Delhi,2015. T3:Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication, Anand, India,2016.		
Reference Books :		
R1**.** B. Bhattacharyya, S.C. Bera "Engineering graphics" I.K. International Publishing House Pvt.Ltd. New Delhi**..**		

26-ESC-1-11:Engineering Mechanics

Teaching Scheme: Theory: 02 Hours/Week	**Credit:** 02	**Examination Scheme:** **CIE**: 20 Marks **MSE:** 20 Marks **SEE**: 60 Marks

Prerequisites Courses: Trigonometry, Derivation and integration, Basic concepts of linear motion of particles.

Companion Course: Linear Algebra And Differential Calculus, Engineering Graphics

Course Objectives:

- To impart knowledge about force systems and methods to determine the resultant.
- To impart knowledge about the centroid and moment of inertia.
- To impart knowledge to determine the reaction of beams.
- To train students to solve problems related to particle mechanics using principles of kinematics, kinetics of rectilinear motion, and work-power-energy.

Course Outcomes: After completion of the course, learners should be able to

CO No	CO	BL
CO1	To impart knowledge about force systems and methods to determine the resultant.	3
CO2	To impart knowledge about the centroid and moment of inertia.	3
CO3	To impart knowledge to determine the reaction of beams.	3
CO4	To train students to solve problems related to particle mechanics using principles of kinematics, kinetics of rectilinear motion, and work-power-energy.	3

Course Contents

Unit I	**Force System**	**04 Hours**

Principles of statics, Types of forces, Resolution and composition of forces, Resultant of concurrent forces.

#Exemplar/Case Studies: Application of a concurrent force system – e.g., analyzing forces acting on a crane hook system.

***Mapping of Course Outcomes**	CO1

Unit II	**Moments & couple**	**04 Hours**

Moment of a force, Varignon's theorem, Resultant parallel force system, Couple, Equivalent force-couple system.		
#Exemplar/Case Studies: Evaluating a loaded seesaw system using Varignon's Theorem.		
***Mapping of Course Outcomes**	CO1	
Unit III	**Resultant forces in beams**	**04 Hours**
Free body diagrams of forces, Equilibrium of concurrent and parallel forces in a plane, Types of beams, Types of supports, and reaction calculation.		
#Exemplar/Case Studies: Identify and analyze support reactions in residential floor beams.		
***Mapping of Course Outcomes**	CO3	
Unit IV	**Centroid & Moment of Inertia**	**04 Hours**
Introduction to centroid and Centroid calculation of plane lamina, Introduction to moment of inertia, and calculation of moment of inertia.		
#Exemplar/Case Studies: A Case Study on Centroid and Moment of Inertia.		
***Mapping of Course Outcomes**	CO2	
Unit V	**Rectilinear Motions**	**04 Hours**
Introduction to Dynamics & Basic Concepts, types of motion, rectilinear motion, Equations of Motion (Uniform Acceleration) (Primary numerical treatment)		
#Exemplar/Case Studies: To reflect motion concepts (e.g., projectile motion in sports, vehicle acceleration).		
***Mapping of Course Outcomes**	CO4	
Unit VI	**Kinematics & Kinetics of Particles**	**04 Hours**
Kinematics of linear motion, Equations of motion, Newton's second law, Work, Power, Energy, Conservative and non-conservative forces.		
#Exemplar/Case Studies: Energy conservation in braking systems of vehicles.		
***Mapping of Course Outcomes**	CO4	
Learning Resources		
Text Books:		
T1. R.K. Bansal, "A Textbook of Engineering Mechanics", Laxmi Publications **T2.** S.S. Bhavikatti and K.G. Rajashekarappa, "Engineering Mechanics", New Age International		
Reference Books :		

R1. S. P. Timoshenko and D. H. Young, "Engineering Mechanics", McGraw-Hill
R2. J. L. Meriam and Craige, "Engineering Mechanics", John Wiley
R3. R. C. Hibbeler, "Engineering Mechanics", Pearson Education

Additional Resources: (Books, e-Resources)

R.S. Khurmi and N. Khurmi, "A Textbook of Engineering Mechanics", S. Chand

MOOC Courses links :

- https://nptel.ac.in/courses/112106180
- https://nptel.ac.in/courses/112103109.

26-BSC-1-06: Engineering Chemistry Lab

Teaching Scheme:	**Credit:** 01	**Evaluation Scheme:**
Practical: 02 Hours/Week		Termwork (TW) : 25 Marks

Prerequisites: 11 th and 12 th Science Chemistry Basic knowledge

Companion Course: 26-BSC-1-02 : Engineering Chemistry

Course Objectives:

- To familiarize students with titration, spectroscopic analysis, and other typical laboratory procedures utilized in engineering.
- Introducing students to standard laboratory tools and apparatus utilized in chemical analysis and experimentation.
- To enhance students' ability to communicate scientific results in writing and oral forms through laboratory reports.
- To promote professional and ethical behavior in laboratory work, including honesty, cooperation, and time management.

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
CO1	**Apply** analytical techniques to determine water hardness, alkalinity, demonstrating an understanding of water quality parameters.	4
CO2	**Utilize** a colorimeter to measure the maximum absorption wavelength and determine the unknown concentration of a sample, showcasing competence in spectrophotometric methods.	4
CO3	Synthesize polymers, biodiesel from oil, semiconductor quantum dots, **acquiring** practical expertise in material synthesis and renewable energy sources.	4
CO4	**Employ** Mohr's Method to estimate chloride content and determine the strength of a strong acid using a conductometer,pH meter expanding their analytical toolkit.	4
CO5	**Utilize** a Bomb calorimeter and Proximate Analysis to determine the calorific value and composition of a solid fuel,understanding the energy content of fuels.	4
CO6	**Apply** electroplating to coat copper on iron, demonstrating knowledge of electrodeposition techniques (ECE).	4

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a reference and hands-on resource. It should include prologue (about University/program/ institute/ department/foreword/ preface), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment Write-up should include Title, Date of Completion, Objectives, diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, Assessment grade/marks and assessor's sign, Theory- Concept in brief).For reference one or two journals may be maintained in the Laboratory.

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as timely completion, performance, understanding, and presentation/journal writing.

Guidelines for Laboratory Conduction

- The faculty will explain the aim, procedure, observations, calculations, and expected outcome of the experiment.
- Students shall perform the experiment in groups under the supervision of the faculty and laboratory staff.
- Handle all apparatus, chemicals, and instruments carefully and follow all laboratory safety rules.
- Maintain discipline, follow laboratory timings, and keep the work area clean.
- Report any accident or equipment damage immediately to the instructor.
- Get the observations, calculations, and laboratory record verified and submitted on time.

Virtual Laboratory: (If Any):-

1.https://vlab.amrita.edu/?sub=2
2.https://chemistryvl.pict.edu/#/
3.https://www.olabs.edu.in/?pg=topMenu&id=41

Suggested List of Laboratory Experiments/Assignments(Any Eight)

Sr No	Assignment Title	Mapping of Course Outcomes
1.	Water Analysis: Determination of total hardness of water by the EDTA method for its quality analysis	CO1
2.	Water Analysis: Determination of Alkalinity of water	CO1

3.	Acid-Base Titration: Determination of the strength of a strong acid using a pH meter	CO4
4.	Spectrophotometry: Measurement of the maximum absorption wavelength of a sample and determination of its unknown concentration using a colorimeter.	CO2
5.	Electrochemical Techniques (ECE): To coat copper on an iron plate using electroplating.	CO6
6.	Fuel Analysis: Proximate analysis of coal to understand its composition.	CO5
7.	Polymer Synthesis: Preparation of Phenol Formaldehyde / Urea Formaldehyde resin.	CO3
8.	Biodiesel Production: Preparation of biodiesel from oil.	CO3
9.	Nanomaterial Synthesis: Colloidal synthesis of 2-6 or 3-5 semiconductor quantum dots nanoparticles	CO3
10.	Acid -Base Titration: Determination of strength of strong acid using a Conductometer.	CO4

Learning Resources

Text Books :

T1. O.P. Varmani and A.K.Narula, "Applied Chemistry 'Theory and Practice", 2ed, New Age International Publishers,New Delhi 2012.
T2. S.K.Bhasin and Sudha Rani , "Laboratory manuals on Engg.Chemistry'',3 ed, Dhanpat Rai publishing company (Pvt) Ltd,New Delhi-2012.
T3. Archana Thakur, "Practical Engineering Chemistry" , Alpha Science International Limited, 2019

Reference Book :

R1.G. R. Chatwal & S. K. Anand,"Instrumental Methods of Chemical Analysis", Himalaya Publishing House.2019

Additional Resources: (Books, e-Resources)

G. H. Jeffery J. Bassett J. Mendham R C. Denney,"Textbook of Quantitative Chemical Analysis",5 th Edition

26-ESC-1-08: Engineering Graphics Lab

Teaching Scheme: Practical: 2 Hours/Week	**Credit:** 01	**Examination Scheme:** Term work (TW) : 25 Marks

Prerequisites Courses: Basic Knowledge of geometrical shapes, its construction and knowledge of computer handling.

Companion Course: 26-ESC-1-03: Engineering Graphics

Course Objectives:

- Introduce fundamental principles of Engineering Drawing.
- Educate on dimensioning standards and specifications in engineering drawings.
- Teach different projection methods such as orthographic, isometric.
- Provide hands-on training in CAD software for graphical communication.
- Enhance communication skills through graphical representation of design concepts.

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Apply** theory of projection accurately for point and line for graphical representation.	3
CO2	**Apply** theory of projection accurately for 2D planes for graphical representation.	3
CO3	**Draw** the development of lateral surfaces for cut sections of geometrical solids.	3
CO4	**Construct** the various engineering curves using the drawing instruments.	3
CO5	**Apply** the concept of orthographic projection to create sectional views from isometric views and to generate isometric views from given orthographic views.	3
CO6	**Apply** learnt skills effectively with practical competence to create detailed product/object drawings using CAD software.	3

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students in the form of a bunch of sheets. Bunch consists of Certificate, table of contents, and hand drawn sheets along with CAD Printout of each assignment (Title of assignment, Date of Completion, date of submission, Scale used, name of students, roll number, branch and division etc.) in a prescribed template provided on printed A2 size (594mm X 420mm) sheet.

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign marks based on the rubrics of evaluation prepared by course instructor, such as Proper Line Types, Graphically Accurate, Dimensions and Timely Submission for manual assessment and for CAD sheet assessment will be based on accuracy of dimension, level of detailing, use of CAD features and timely submission.

Guidelines for Laboratory Conduction

Group-A: Draw minimum one problem on each assignment on A2 size drawing sheet and same problem using CAD software. During the practical sessions the practice of drawing and familiarization with CAD software can be initially done for 2 to 3 practical sessions. After having hands-on experience with drawing instruments and CAD Software students have to draw the simple as well as some complex problems.

Group-B: Students have to solve a minimum of one assignment from group B by using CAD Software.

Suggested List of Laboratory Assignments

Group A: Assignments (Mandatory Assignment)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Draw projection of lines inclined to both principal planes.	CO1, CO6
2.	Draw Projection of different 2D planes inclined to both principal planes.	CO1, CO2, CO6
3.	Draw the development of the lateral surface of a solids/ truncated solids.	CO1, CO2, CO3, CO6
4.	Construct Engineering curves	CO1, CO2, CO3, CO4, CO6
5.	Draw orthographic of a given object.	CO1, CO2, CO3, CO4, CO5, CO6
6.	Draw Isometric projection of a given object.	CO1, CO2, CO3, CO4, CO5, CO6

Group B: Assignments (Out of List perform minimum 1)		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	Draw the Orthographic and isometric views of a Workshop Job prepared during the workshop practice using CAD software.	C01, C02, CO3, CO4, CO5, CO6
2.	Draw Orthographic and isometric projection of desktop monitor / CPU Box / Mouse using CAD software.	C01, C02, CO3, CO4, CO5, CO6
3.	Draw Simple elevation and plan of Floor of own house using CAD software.	C01, C02, CO3, CO4, CO5, CO6

Learning Resources

Text Books

T1: K. Venugopal, K, (2015), "Engineering and Graphics", New Age International, New Delhi. T2: Jolhe, D. A., (2015), "Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill,
New Delhi.
T3: Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication, Anand, India.

Reference Books :

R1. B. Bhattacharyya, S.C. Bera 'Engineering graphics' I.K. International Publishing House Pvt.Ltd. New Delhi.
R2.Sham Tickoo, Vivek Kumar Singh, Swapna D 'Auto CAD for Engineers and Designers (2023)' dreamTech Press.

26-ESC-1-12: Engineering Mechanics Laboratory

Teaching Scheme: Practical: 4 Hours/Week	**Credit:** 2	**Evaluation Scheme:** Termwork (TW) : 25 Marks

Prerequisites: Trigonometry, Derivation and integration, Basic concepts of linear motion of particles.

Companion Course: 26-ESC-1-04 : Engineering Mechanics

Course Objectives:

- To impart knowledge about force systems and find results by polygon law.
- To determine the support reactions of beams for parallel force systems.
- To study the belt friction method to calculate the coefficient of friction.
- Calculate position, velocity, and acceleration of particles using principles of kinematics.

Course Outcomes:

After completion of the course, learners should be able to:

CO No.	CO	BL
CO1	Determine the resultant of a concurrent force system by the polygon law.	3
CO2	Ascertain the support reactions of simply supported beams for parallel force systems.	3
CO3	Determine the coefficient of friction by the belt friction apparatus / inclined plane.	3
CO4	Apply conditions of equilibrium for non-concurrent non-parallel force systems.	3
CO5	Calculate the position, velocity, and acceleration of particles using principles of kinematics.	3

Guidelines for the Instructor's Manual

The instructor's manual is to be developed as a reference and hands-on resource. It should include a prologue (about University/program/ institute/ department/foreword/ preface), curriculum of the course, the conduct and Assessment guidelines, topics under consideration, concept, objectives, outcomes, a set of typical applications/assignments/ guidelines, and references.

Guidelines for Students' Laboratory Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of a Certificate, a table of contents, and a handwritten write-up of each assignment (Title, Date of Completion, Objectives, Theory- Concept in brief, Procedure, Instrument requirements, calculations, Assessment grade/marks and assessor's sign, conclusion/analysis).

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on the overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grades/marks based on parameters, such as teamwork, understanding, Regularity, Lab report, interpretation,n and quiz.

Guidelines for Laboratory Conduct

1. All the experiments mentioned in the syllabus are compulsory.
2. Divide the students of a batch into groups of not more than 5 students and ask each group to read separately, followed by calculations for each experiment. After every experiment faculty should sign the lab manual.
3. Use of open source software and recent versions is to be encouraged.

Suggested List of Laboratory Experiments/Assignments

Group A: Laboratory Experiments

Sr No	Assignment Title	Mapping of Course Outcomes
1.	Verification of the law of the parallelogram of forces/polygon of forces.	CO1
2.	To determine the support reaction of simple/compound beams.	CO2, CO4
3.	Determination of the coefficient of friction of belt/inclined plane.	CO3
4.	Determine the X and R ratio of the curvilinear motion.	CO5
5.	Determination of the coefficient of restitution.	CO5

Group B: Assignments (Out of List perform any 3)

Sr No	Assignment Title	Mapping of Course Outcomes
1.	To determine the resultant of the general force system (using any drafting software)	CO1
2.	To determine unknown forces of a concurrent force system (using any drafting software)	CO1
3.	To determine the support reaction of beams.	CO2

4.	Use the conditions of equilibrium for a non-concurrent non-parallel force system and draw the force polygon.	CO1, CO4
5.	To determine velocity, acceleration, displacement, and time of projectile motion.	CO5

Learning Resources

Text Books :

T1. F. P. Beer and E. R. Johnson, "Vector Mechanics for Engineers", McGraw-Hill Publication, Vol. 3
T2. R. C. Hibbeler, "Engineering Mechanics", Pearson Education, Vol. 1

Reference Books :

R1. S. P. Timoshenko and D. H. Young, "Engineering Mechanics", McGraw-Hill publication, Vol.-5
R2. J. L. Meriam and Craige, "Engineering Mechanics", John Wiley, Vol.-5
R3. A. P. Boresi and R. J. Schmidt, "Engineering Mechanics", Brooks/Cole Publication, Vol.-1

MOOC Courses links :

- https://nptel.ac.in/courses/112106180

26-VSC-1-01: TechSkill

Teaching Scheme: **Practical:** 4 Hours/Week	**Credit:** 2	**Examination Scheme:** **Termwork (TW)** : 50Marks

Prerequisites: Basic understanding of terms: computer, mobile device components and electrical devices.

Course Objectives:

Module I

- To understand the components, functions, and working principles of mobile devices and CCTV surveillance systems.
- To develop practical skills in mobile repairing, troubleshooting, and CCTV installation/configuration.

Module II

- To familiarize learners with computer hardware, software, operating systems, and networking fundamentals.
- To develop skills in installation, configuration, troubleshooting, and maintenance of computer systems and networks.

Module III

- To familiarize learners with electronic instruments, circuit components, and basic prototyping techniques.
- To develop practical skills in soldering, sensor interfacing, and Arduino/ESP32-based automation system development.

Course Outcomes:
After completion of the course, learners should be able to

CONo	CO	BL
	Module - I (AIDS)	
CO1	**Understand** and troubleshoot hardware and software issues in mobile devices	2
CO2	**Apply** fundamental concepts, components, and working principles of CCTV systems and evaluate their application in surveillance and security environments.	3
	Module - II (Computer)	
CO3	**Understand** the basic concept and structure of computer hardware and networking.	2
CO4	**Integrated** PC's into LAN & reinstall operating system and Study various application programs.	3

	Module - III (E&Tc)	
CO5	Understand and perform handling of electronic instruments, soldering/desoldering techniques, and basic electronic circuit prototyping.	**2**
CO6	Develop and implement basic Arduino/ESP32-based sensor interfacing and automation projects for real-world applications.	**3**

Guidelines for Instructor's Manual

The instructor‘s manual is to be developed as a reference and hands-on resource. It should include prologue (about institute/ department), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student's Laboratory Journal

Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as Write-up, Viva, Timely Completion.

Guidelines for Laboratory /Term Work Assessment

Problem statements must be decided jointly by the internal examiner and external examiner. During practical assessment, maximum weightage should be given to satisfactory implementation of the problem statement. Relevant questions may be asked at the time of evaluation to test the student’s understanding of the fundamentals, effective and efficient implementation. This will encourage, transparent evaluation and fair approach, and hence will not create any uncertainty or doubt in the minds of the students. So, adhering to these principles will consummate our team efforts to the promising start of student's academics.

Guidelines for Laboratory Conduction

A list of laboratory assignments is provided below. The instructor is expected to conduct the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. Use of open source software and recent versions are to be encouraged.

Suggested List of Laboratory Experiments/Assignments

Module I : MobiTech Assignments (Mandatory Assignment)

Sr	Assignment Title	*Mapping of Course

No		Outcomes
1.	Disassemble and reassemble the mobile device using mobile repairing tools.	CO1, CO2
2.	Disassemble a water-damaged phone, clean the components using appropriate methods, and replace any damaged parts.	CO1, CO2
3.	Troubleshooting of Mobile Display and Screen Issues	CO1, CO2
4.	Demonstrate procedures for backing up and restoring data on mobile devices.	CO2
5.	Study of different types of CCTV cameras, their functions, types of cables used in CCTV surveillance systems.	CO2
6.	Demonstrate CCTV Camera Installation and configuration.	CO2
Module II : Crafting Your Digital World Assignments (Mandatory Assignment)		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	Study of hardware peripherals of Desktop and Laptop Computer, Assembly of Computer system.	CO3
2.	Installation and configuration of internal or external peripherals, basic fault finding and troubleshooting of hardware peripherals.	CO3
3.	Study of operating systems. Types of operating system, Installation and configuration of Operating Systems like Windows and Linux.	CO3
4.	Installation and configuration of System Software and Application Software, basic fault finding and troubleshooting of software.	CO3
5.	Introduction to computer networks. Study of various topologies. Understanding the working of networking devices, Preparing the network cable using crimping tools and connectors.	CO4

6.	Study various internet-based services and understand basic networking commands. Case study: Installation and configuration of computer network in Lab using network switch.	CO4

Module III : Electronics Repair Hub (Mandatory Assignment)		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	Handling of Electronic Instruments: Multimeter, CRO, DC Power Supply, etc	CO5
2.	Soldering & Desoldering Practice of Electronic Components	CO5
3.	Breadboard-Based Circuit Prototyping using LEDs, Resistors and Switches	CO5
4.	Arduino/ESP32-Based Basic Interfacing Experiment (LED/Switch/Relay)	CO6
5.	Interfacing of Sensors such as LDR/IR/Temperature Sensor (Develop Home Automation system using Arduino)	CO6
6.	Mini Innovation/Automation-Based Prototype Development (Develop Smart City Solution using Arduino)	CO6

Learning Resources (If applicable)

Text Books

T1. Chukky Oparandu, "Mobile Phones and Tablets Repairs: A Complete Guide for Beginners and Professionals", ISBN 9789534116
T2. Scott Mueller, "Upgrading and Repairing PCs", 16th Edition, BPB Publication, ISBN 81-7635-737-5
T3. Manahar Lotia, Pradeep Nair, Payal Lotia, "Modern Computer Hardware Course" , BPB Publication, ISBN: 9788183331678
T4. J. A. Sam Wilson, "Electronic Troubleshooting & Servicing Techniques", Thomson Delmar Learning
T5. Simon Monk, Programming Arduino: Getting Started with Sketches, McGraw Hill.

Reference Books :

R1. Lotia M, "Modern Mobile Phone Service Diagram & Troubleshooting", Vol. I, BPB Publication, ISBN 8176563366
R2. Mark Edward Soper, "PC REPAIR AND TROUBLESHOOTING GUIDE", BPB Publication, ISBN: 9788183335096
R3. S. P. Bali, "Consumer Electronics", Pearson Education, 2nd Edition

Additional Resources: (Books, e-Resources)
Module I
LINK

Module II
LINK
Module III

- https://www.arduino.cc/en/Tutorial/HomePage
- https://randomnerdtutorials.com/projects-esp32/

MOOC Courses links :
Module II
LINK
LINK

26-CCC-1-01: Sports and Fitness

Teaching Scheme: Practical: 2 Hours / Week.	**Credit:** 01	**Evaluation Scheme:** Term work **(TW)** : 50 Marks

Prerequisite Courses: Warm up, stretches before asanas. Basic knowledge of sports

Companion Course: 26-CCC-1-03: Co-Curricular Course-I-NSS

Course Objectives:

- To motivate the students for higher education in Yogasana.
- To improve physical and mental fitness, remove stress and ethical knowledge about Yoga.
- To maintain their mental and physical wellness upright and develop ability in them to cope up with the stress arising in life.
- To create space in the curriculum to nurture the potential of the students in sports/games/ etc.
- To introduce a practice oriented introductory course on the subject. More involved / advanced course may come up in subsequent years of study.

Course Outcomes:
After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Explain** the Yoga ethics as an Indian culture	2
CO2	**Apply** basic Yoga and Pranayama in daily life to maintain physical and Mental fitness	3
CO3	**Design** basic training plans considering energy systems and physiological adaptations.	2
CO4	**Explain** wellness and its importance and define the components of wellness & Classify physical fitness and recognize its importance in life.	3

Course Contents

Unit I	Introduction of Yoga	6 Hours	CO1,CO2

Introduction: Presentations on Introduction to Yoga and its History, Meaning, History & Development of Yoga, General Guidelines for Yoga ethics & Practice. Perform warming up exercises to prepare the body from head to toe for Yoga.

Unit II	Surya Namaskar	6 Hours	CO1,CO2

Perform all the postures of Surya Namaskar one by one in a very slow pace, after warming up. Perform multiple Surya

Namaskar (Starting with three and gradually increasing it to twelve) . Shavasana is essential for self-relaxation.			
Unit III	**Introduction of Physical Education & Sports**	**6 Hours**	**CO1,CO2,CO3,CO4**
Concept of Physical Education, its Definition and Scope, Concept of Physical Fitness, Components of Health Related Physical Fitness (Cardio-vascular Endurance, Muscular Strength Endurance, Flexibility, and Body Composition) and Activities to improve these components, Physical Activity Guidelines (Physical activity for health benefits) .			
Unit IV	**Physical Fitness, Wellness, and Lifestyle**	**6 Hours**	**CO1,CO2,CO3,CO4**
Meaning & importance of Wellness, Health, and Physical Fitness, Traditional Sports & Regional Games for promoting wellness, Leadership through Physical Activity and Sports .			

Learning Resources

Text Books:

T1. Swami Vivekananda, "Patanjalis Yoga Sutras", Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: ? 978-9354407017
T2. Luisa Ray, Angus Sutherland, "Yoga for Every Body: A beginner's guide to the practice of yoga Postures, Breathing exercises and me", Vital Life Books (2022) ISBN-13?: ? 978- 1739737009**.**
T3. Foundation of Physical Education, Exercise Science and Sports,Bucher, C. A., & Wuest, D. A. (2010).. Tata McGraw Hill Education Private Limited. New Delhi.

Reference Books :

R1. Swami Saradananda, Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your, Watkins Publishing (2019) ISBN-13?: ? 978-1786782786
R2. Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSW, The Relaxation and Stress Reduction Workbook, A New Harbinger Self-Help Workbook (2019).

Additional Resources: (Books, e-Resources)

- https://onlinecourses.swayam2.ac.in/aic19_ed28/preview- introduction to Yoga and Applications of Yog
- https://onlinecourses.swayam2.ac.in/aic23_ge09/preview
- https://onlinecourses.swayam2.ac.in/aic23_ge05/preview
- https://onlinecourses.swayam2.ac.in/aic23_ge06/preview
- https://onlinecourses.nptel.ac.in/noc21_hs29/preview
- https://onlinecourses.swayam2.ac.in/nce19_sc04/preview
- https://www.classcentral.com/course/swayam-fitness-management-

26-CCC-1-02: Study and Documentation of Local History

Teaching Scheme: Practical: 2 Hours / Week.	**Credit:** 01	**Evaluation Scheme:** Term work **(TW)** : 50 Marks

Prerequisite Courses: History , English

Companion Course: 26-CCC-1-06: Magazine Designing and Creative Expression

Course Objectives:

- Understand the concept, scope, significance, and relevance of local history in the broader context of regional and national history.
- Identify and critically examine various primary and secondary sources used in the study of local history.
- Develop skills in historical research, including field surveys, oral history, interviews, and archival research.
- Acquire practical knowledge of documentation techniques such as photography, audio-video recording, mapping, cataloguing, and report writing.

Course Outcomes:
After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Explain** the meaning, scope, significance, and sources of local history and their role in historical	2
CO2	**Identify and evaluate** different sources of local history and apply appropriate research methods for collecting historical data.	3
CO3	**Conduct** field surveys, oral history interviews, and document historical evidence using suitable documentation techniques.	3
CO4	**Analyze** preservation and digital documentation methods and prepare a comprehensive local history project for academic presentation.	4

Course Contents

Unit I	Introduction to Local History	6 Hours	CO1,CO2,CO3,CO4

Meaning, nature, scope, and significance of local history ,Relationship between local, regional, national, and global history ,Objectives and importance of studying local history ,Sources of local history: Primary and Secondary Sources , Role of local

history in preserving cultural heritage and identity			
Unit II	**Sources and Methods of Local History**	**6 Hours**	**CO1,CO2,CO3,CO4**
Archaeological sources: monuments, inscriptions, coins, artifacts Archival sources: government records, land records,gazetteers, census reports ,Oral history: interviews, folklore, songs, legends, and traditions ,Literary sources: local literature, biographies, memoirs, newspapers ,Research methods in local history: field survey, observation, interviewing, and data collection			
Unit III	**Fieldwork and Documentation Techniques**	**6 Hours**	**CO1,CO2,CO3,CO4**
Planning and conducting field surveys , Preparation of questionnaires and interview schedules Documentation techniques: note-taking, photography, audio-video recording ,Collection, classification, and verification of historical data ,Report writing and referencing in local history research.			
Unit IV	**Preservation and Presentation of Local History**	**6 Hours**	**CO1,CO2,CO3,CO4**
Principles of preservation and conservation of historical records ,Digital documentation and archiving ,Heritage conservation: museums, archives, libraries, and community participation, Presentation of local history through exhibitions, heritage walks, documentaries, and digital media , Preparation of a local history project/report			
Learning Resources			
Text Books:			
T1. Local History: Theory and Practice. Carol Kammen. AltaMira Press. **T2.** The Encyclopedia of Local History. Edited by Carol Kammen and Amy H. Wilson. Rowman & Littlefield.			
Reference Books :			
R1. Local History in Theory and Practice – D. H. C. Stapleton **R2.** The Historian's Craft – Marc Bloch			
Additional Resources: (Books, e-Resources) • Digital Library of India (NDLI) – Free access to books, theses, and learning resources. • National Archives of India – Historical records, archival information, and research resources. • Archaeological Survey of India (ASI) – Information on monuments, excavations, and heritage sites. • Indian Culture Portal – Digital collections on India's cultural and historical heritage.			

26-CCC-1-03 :NSS

Teaching Scheme: Practical: 2 Hours / Week	**Credit:** 1	**Examination Scheme:** Termwork **(TW)** : 50 Marks

Prerequisites Courses: –

Companion Course: –--

Course Objectives:

- To understand the NSS Scheme in Nation Building
- To understand the importance of Shramdan to youth
- To understand the importance of Awareness Activities to youth
- To provide a technical solution to the different issues of society

Course Outcomes:
After completion of the course, learners should be able to

CO No	CO	BL
CO1	Describe the concept of Youth and compare the international definitions of the term Youth.	2
CO2	Students will be able to appreciate our demographic advantage and its role in nation-building.	3
CO3	Know the growth and evolution of NSS and its role in nation-building through community service.	2
CO4	Visualize the signs, symbols, and logo of NSS and understand their broader meaning.	4

Course Contents

Unit I	**Introduction to NSS**	**4 Hours**	**CO1**
Origin of NSS, Aims and Objectives of NSS, Motto of NSS, NSS Symbol, NSS Song, NSS Day, Basic Concepts and Components, NSS Program and Activities			
Unit II	**Shramdan**	**4 Hours**	**CO2**
Campus Cleaning, Tree Plantation, Weeding, Watering, any other activities, Registration of all students on MyBharat Portal			
Unit III	**Awareness Programs**	**4 Hours**	**CO3**
Awareness Programs: awareness rallies, blood donation, voter awareness, Fit India, Celebration of National and International			

Days, Personality Development Programs, Waste management awareness, Health awareness, Awareness for self-Employment in adapted villages, constructive activities, any other activities			
Unit IV	**Community Engagement and Problem Solving**	**4 Hours**	**CO4**
Visit to the adapted Village, identification of problems, propose a solution for the same, drafting and development of a procedure, model, or design			
Learning Resources			
Text Books			
T1. NATIONAL SERVICE SCHEME MANUAL (REVISED) 2006 Government of India, Ministry of Youth Affairs & Sports, New Delhi **T2.** Prof. B.K. Shivanna, "National Service Scheme" Printing Press, KSOU, Mysore, 2011 **T3.** Madhu Ahuja, Students Leaders in the National Service Scheme (NSSS) in Delhi: A case study 1986 (New Delhi: Dept. of Management and Extension, Lady Irwin College, University of Delhi, 1986) **T4.** Chattarjee, B., Social service opportunities for students in Slum Areas (reprint: Delhi: Delhi School of Social Work, University of Delhi, 1973)			
Reference Books :			
R1. Jones Gill, (2009), Youth, Polity Press, UK. i) Kehily Jane Mary (Etd.) (2007), Understanding Youth: Perspectives, Identities and Practices, Sage Publications, London**.** **R2.** Landis H. Paul, (2011), Adolescence and Youth: The Process of Maturing, Sarup Book Publishers Pvt. Ltd., New Delhi			
MOOC Courses links : ● Community Engagement and Social Responsibility - https://onlinecourses.swayam2.ac.in/ugc24_ge05			

26-CCC-1-04 : Cultural Enrichment

Teaching Scheme : Practical: 02 Hrs / Week	**Credit:** 01	**Evaluation Scheme:** Term work (TW) : 50 Marks .

Prerequisites Courses: - Basic knowledge about singing , Dancing , Drama etc

Companion Course: 26-CCC-1-05 : Co-Curricular Course-I : Performing Arts and Creative Expressions

Course Objectives:

- Students develop their ability to communicate ideas, emotions, and narratives effectively to an audience.
- Students learn to work together, cooperate, and compromise, establishing key collaboration skills, through group rehearsals and performances.
- Through painting, drawing, writing, and other artistic activities, students can explore their thoughts, emotions, and ideas in meaningful ways.

Course Outcomes:
After completion of the course, learners should be able to:

CO No	CO	BL
CO1	**Understand** the improvement of cultural perspective in daily life.	2
CO2	**Experience** physical benefits such as improved lung capacity, posture, relaxation, and stress relief through singing & to identify, evaluate, and enjoy many melodic aspects, including tone, pitch, rhythm, and intensity of sound	5
CO3	**Develop** proficiency in various artistic techniques and mediums, such as drawing, painting, sculpture, printmaking, or digital art.	3
CO4	**Develop** debating -Communal conversation.	3

Course Contents

Unit I	Performing Arts- Dance & Drama	6 Hours	CO1,CO2

Dance-Performance Practices :(conventions of performance etiquette, audience engagement, and stage presence in different cultural contexts.), Cultural Exchange: The interchange of cultural aspects between various communities and areas, including movements, rhythms, music, costumes, and themes, has an impact on dance practices.
Drama-Performance Skills: Developing performance skills, including acting, voice, movement, and improvisation, through practical exercises and rehearsals, Theatrical Production: Learning about the process of theatrical production, including stagecraft, set design, costume design, lighting, sound, and directing.

Unit II	**Music-Melody**	**6 Hours**	**CO1,CO2**
Song: Vocal Technique: Breathing exercises and techniques to develop proper breath support and control. Listening skills, enabling you to recognize, assess, and appreciate various elements of melody, such as tone, pitch, rhythm, and sound intensity. **Instrumental:** Fundamentals of music theory, including notation, scales, intervals, chords, and key signatures.			
Unit III	**Visual Arts & Literary Arts**	**6 Hours**	**CO1,CO3**
Visual Arts: painting, drawing, poster making sculpture(assembling materials such as clay, wood, metal, stone, or plaster), printmaking, photography. **Literary Arts**: Creative writing, Letters, Written arts, Verbal arts, Poetry Making			
Unit IV	**Debating-communal conversation**	**6 Hours**	**CO1,CO4**
Extempore, Forum debates, Express you! Panel discussions, JAM's (in the Just a Minute public speaking exercise, participants are asked to talk without hesitation for one minute on a particular topic.)			
Learning Resources			
Text Books:			
T1. Ganendra Dutt Bajpai, "Text Book of dance" , Publisher-Kanishka, ISBN-13 978-8184576177. **T2.** Dr.Shilpa Bahulekar,"KalaShasra Visharad", Publisher-Sanskar Prakashan,Third Edition.			
Reference Books :			
R1 ."Sangeet Ratnavali" by Ashok Kumar Yaman **R2**. "fundamentals of visual art by Dr. Anuj Choudhary"			
Additional Resources: (Books, e-Resources) https://smp.gymkhana.iitb.ac.in/extra_culture.php			

26-CCC-1-05: Performing Arts and Creative Expression

Teaching Scheme: Practical: 2 Hours / Week.	**Credit:** 01	**Evaluation Scheme:** Term work **(TW)** : 50 Marks

Prerequisite Courses: Basics of Drawing, Art &Craft

Companion Course: 26-CCC-1-04: Co-Curricular Course-I-Cultural

Course Objectives:

- Develop an appreciation for various forms of performing arts and creative expression.
- Enhance creativity, imagination, and artistic skills through practical participation.
- Build confidence, communication, and presentation skills through performance-based activities.
- Foster teamwork, collaboration, and leadership through group performances and creative projects.
- Understand the cultural, social, and historical significance of performing arts.

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Explain** the concepts, significance, and various forms of performing arts and creative expression, and appreciate their role in cultural preservation and personal development.	2
CO2	**Demonstrate** fundamental skills in rhythm, movement, voice, acting, storytelling, and creative expression through practical activities.	3
CO3	**Apply** creative thinking, communication, teamwork, and performance skills to design and present individual and group artistic performances.	3
CO4	**Plan,** organize, and present creative projects or cultural events, and evaluate their impact on personal growth and community engagement.	3

Course Contents

Unit I	**Introduction to Performing Arts and Creative Expression**	**6 Hours**	**CO1,CO2,CO3,CO4**
Meaning, scope, and importance of performing arts ,Types of performing arts: Music, Dance, Theatre, Folk Arts ,Creativity and self-expression: Concepts and significance Role of performing arts in personality development and cultural preservation			
Unit II	**Fundamentals of Performing Arts**	**6 Hours**	**CO1,CO2,CO3,CO4**

Basics of rhythm, movement, voice, and expression, Introduction to acting, storytelling, mime, and improvisation, Fundamentals of visual and creative expression, Appreciation of Indian and world performing arts traditions.			
Unit III	**Creative Skills and Performance Practice**	**6 Hours**	**CO1,CO2,CO3,CO4**
Individual and group performances ,Creative writing, script development, and stage presentation, Folk songs, dances, skits, and cultural performances , Teamwork, communication, leadership, and stage etiquette			
Unit IV	**Creative Projects and Community Engagement**	**6 Hours**	**CO1,CO2,CO3,CO4**
Planning and organizing cultural events , Performance for social awareness and community outreach Portfolio development and reflective journal , Final performance/project presentation and self-evaluation			
Learning Resources			
Text Books			
T1. The Performing Arts. Pearson Education. **T2.**An Introduction to Indian Art: Part II. National Council of Educational Research and Training, New Delhi.			
Reference Books :			
R1. The Empty Space. Penguin Books, 1995. **R2**.Natyashastra. Translated by Manomohan Ghosh. Asiatic Society, Kolkata.			
Additional Resources: (Books, e-Resources) ● Sangeet Natak Akademi (National Academy of Music, Dance and Drama) – Digital resources on Indian theatre, dance, music, and folk arts. Sangeet Natak Akademi ● National School of Drama (NSD) – Resources on theatre, acting, stagecraft, workshops, and productions. National School of Drama ● Indira Gandhi National Centre for the Arts (IGNCA) – Digital archives on Indian performing arts, manuscripts, and cultural heritage. IGNCA Digital Resources ● eGyanKosh (IGNOU) – Free study materials on performing arts, theatre, music, dance, and cultural studies. eGyanKosh ● SWAYAM – MOOCs on Indian culture, fine arts, communication, and creativity. SWAYAM			

26-CCC-1-06: Magazine Designing and Creative Expression

Teaching Scheme: Practical: 2 Hours / Week.	**Credit:** 01	**Evaluation Scheme:** Term work **(TW)** : 50 Marks

Prerequisite Courses: Basics knowledge of languages.

Companion Course: 26-CCC-1-05: Co-Curricular Course-I-Performing Arts and Creative Expression.

Course Objectives:

- Understand basics of magazine design and types of magazines.
- Learn principles of visual communication and layout design.
- Develop skills in typography, composition, and grid systems.
- Enhance creative thinking for editorial content and themes.

Course Outcomes:
After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Understand** fundamentals and evolution of magazine design and types of magazines	2
CO2	**Apply** principles of design, typography, and layout in magazine creation	3
CO3	**Develop** creative concepts, themes, and editorial content for magazines	3
CO4	**Design** effective magazine pages using grids, images, and visual hierarchy	3

Course Contents

Unit I	Introduction to Magazine Design	6 Hours	CO1,CO2,CO3,CO4

Meaning and evolution of magazines ,Types of magazines (news, fashion, lifestyle, academic, niche, digital) ,Role of magazines in media and communication ,Basics of visual communication ,Elements of design: line, shape, color, texture, space, typography ,Principles of design: balance, contrast, alignment, hierarchy, unity ,Introduction to editorial thinking and content planning

Unit II	Magazine Structure and Layout Design	6 Hours	CO1,CO2,CO3,CO4

Magazine anatomy: cover page, masthead, spine, table of contents, editorial page, feature pages ,Grid systems and layout planning ,Typography in magazine design (font pairing, readability, hierarchy) ,Use of images, illustrations, and white space ,Visual storytelling techniques ,Designing double-page spreads , Introduction to layout software (e.g., Adobe InDesign basics).

Unit III	**Creative Expression and Editorial Content Development**	**6 Hours**	**CO1,CO2,CO3,CO4**	
Concept development and theme creation ,Storyboarding and visual planning ,Writing and editing for magazines (headlines, captions, articles) ,Creative writing for features and interview, Photography and illustration in editorial design ,Infographics and data visualization ,Branding and identity in magazine design				
Unit IV	**Production, Digital Publishing and Project Work**	**6 Hours**	**CO1,CO2,CO3,CO4**	
Print production process (pre-press, printing, finishing) ,Paper types, formats, and printing techniques ,Magazine cover design and branding strategy ,Introduction to digital magazines and e-magazines ,Interactive and multimedia elements in digital publishing ,Ethics and copyright in publishing ,Final project: Designing a complete magazine issue (concept to production)				
Learning Resources				
Text Books				
T1. Ellen Lupton – Thinking with Type **T2**. Timothy Samara – Publication Design Workbook				
Reference Books :				
R1. John Z. Bratton – Magazine Design That Works **R2**. Andrew Haslam – Book Design				
Additional Resources: (Books, e-Resources) ● Adobe InDesign Tutorials (Official Adobe Learn) – https://www.adobe.com/learn/in-design ● Canva Design School – https://www.canva.com/learn/design-school/ ● Coursera – Graphic Design Courses – https://www.coursera.org ● Coursera – Visual Communication Courses – https://www.coursera.org ● Udemy – Magazine Design & Layout Courses – https://www.udemy.com				

26-IKS-1-01 : Indian Knowledge System

Teaching Scheme: TU: 2 Hours/Week	**Credit:** 2	**Evaluation Scheme:** Term work **(TW)** : **50 Marks**

Prerequisites Courses: – History

Companion Course: – Nil

Course Objectives:

- To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of Indian Knowledge System
- To make students acquainted with the facets of traditional knowledge & their relevance and help them be able to apply it to their day-to-day life.

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Explain** the foundation and significance of the Indian Knowledge System.	2
CO2	**Advocate** for the preservation of traditional knowledge.	3
CO3	**Apply** traditional knowledge principles to various fields.	3
CO4	**Analyze** the ongoing influence of Indian Knowledge Systems in the modern world.	4

Course Contents

Unit I	Introduction of Indian Education System	6 Hours	Book No.: T1, R1, R2.

Indian Education System Gurukul system, Ancient Universities (Nalanda, Takshashila,Vikramshila etc.)
Indian Ancient Scientists and Their Inventions Patanjali, Aryabhatta,Charaka,Varahmitra, VardhanmaanMahaveer,Bhaskaracharya, Brahmagupta,AadibramhaAdinath. Etc.
Indian Art and Architecture Tanjore Paintings, Madhubani Paintings, Warli Paintings, etc. ,Harappa and Mohenjo-Daro Civilization, Temples and other Religious Places, Forts and monuments.

Exemplar/Case Studies: A case study on integrating Ancient wisdom into modern Education.

Mapping of Course Outcomes		**CO1**	
Unit II	**Indian Mathematics & Astronomy**	**6 Hours**	**Book No.: T1, R2, R3.**
Introduction to Indian Mathematics : Introduction to Vedic Mathematics, Basic Arithmetic Techniques, Vedic Multiplication Techniques, Division Techniques , Algebra, Geometry, Trigonometry (Sine & Cosine), Magic squares in India. **Introduction to Indian Astronomy**: Indian contributions in astronomy, The celestial coordinate system ,Elements of the Indian calendar , Notion of years and months.			
Exemplar/Case Studies: Aryabhata's astronomical observations and calculations laid the foundation for modern trigonometry and spherical geometry.			
Mapping of Course Outcomes		**CO3**	
Unit III	**Indian Polity and Economy (I)**	**4 Hours**	**Book No.:T1, R1,R3.**
Indian Polity and Economy Indian conception of well-organized Polity and flourishing Economy of handcrafts, textile etc. as introduction, Foundational texts, and The notion of Bharartavarsha as a Chakravarti-Kshetra and important attributes of Chakravartin, King as the protector of Dharma. King as the strength and support of the weak, King as the protector of Varta, King as the protector of the times, Meaning of Varta: Krishi, Gopalana and Vanijya forming the basis of Varta and the core of economic activity in society. The importance of sharing, The Grams as the center of the polity.			
Exemplar/Case Studies: The **Mauryan and Gupta empires** exemplified administrative prowess and economic prosperity, with advancements in trade routes, currency systems, and taxation policies.			
Mapping of Course Outcomes		**CO2**	
Unit III	**Trade In Ancient India (II)**	**3 Hours**	**Book No.: T1, R1,R3.**
Trade In Ancient India (II): Types of Trade, Kautilya on Trade, Trade Routes, Port & Sailors, The Famous Silk Route, By product of Trade cultural Exchange.			
Exemplar/Case Studies: The case of the Silk Route and the maritime trade routes highlights India's pivotal role in facilitating exchanges of goods, ideas, and cultures.			
Mapping of Course Outcomes		**CO2**	
Unit IV	**Achievements of India in Engineering & Technology**	**6 Hours**	**Book No.: T1,R1,R2.**

Engineering and Technology in Ancient India, Engineering and Technology in Medieval India, Engineering and Technology in Modern India, Engineering and Technology: Metals and Metalworking, Water Management System.	
Exemplar/Case Studies: The Construction of Monumental Structure of Rangmahal , Renuka Devi Temple Chandwad	
Mapping of Course Outcomes	**CO4**
10 SIMPLE DAILY RULES **Foster Your Spiritual & Physical Well-Being (That Doesn't Take Time!)**	
1. Sunlight Spend some time sitting in the **sunlight** every day. It improves mood, boosts vitamin-D levels, and enhances overall health. **2. Grounding (Earthing)** Walk **barefoot on the ground** for a few minutes daily. This helps connect with nature and may reduce stress. **3. Breath work** Practice **deep breathing exercises** regularly. Deep breathing relaxes the mind, improves oxygen flow, and reduces anxiety. **4. Nature Connection** Spend time observing **the sky, trees, and natural surroundings**. Connecting with nature helps improve mental peace and emotional balance. **5. Growth** **Adopt or nurture a plant.** Taking care of plants builds responsibility and strengthens our connection with the environment. **6. Positivity** **Smile at yourself in the mirror.** Positive self-affirmation improves confidence and creates a positive mindset. **7. Sound Therapy** Listen to **natural sounds like birds chirping or soft music**. It helps calm the mind and promotes relaxation. **8. Gratitude** **Touch your feet or express gratitude once a day.** Practicing gratitude develops humility and appreciation for life. **9. Mindful Eating** Eat food **mindfully and with your hands** when possible. It increases awareness of taste, digestion, and food appreciation. **10. Reflection** Before going to sleep, **review your day's activities and learn from them.** Self-reflection helps personal growth and better decision-making.	
Learning Resources	
Text Books	

T1. B. Mahadevan, V. R. Bhat, NagendraPavana, "Introduction to Indian Knowledge Systems Concepts and Applications", PHI Learning Publications, Delhi, 2022.

Reference Books :

R1. SatishchandraChaterjee, DheerendramohanDatta, "An Introduction to Indian Philosophy",MotilalBanarsidass Publishing House, New Delhi, 2016
R2. V.Sivaramakrishnan (Ed.), "Cultural Heritage of India-course material", BharatiyaVidyaBhavan, Mumbai. 5th Edition,2014
R3., KapilKapoor, Avadesh Kumar Singh,"Knowledge Traditions and Practices of India", Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334

Additional Resources: (Books, e-Resources)

MOOC Courses links :
SWAYAM/NPTEL

- **Indian Knowledge System (IKS) : Concepts and Applications in Engineering**
  By Prof. B. Mahadevan, Dr. VinayakRajatBhat, Dr. R VenkataRaghavan | Indian Institute of Management Bangalore (IIMB), Chanakya University, Bangalore
  (https://onlinecourses.swayam2.ac.in/imb23_mg53/preview)
- **Indian Knowledge System (IKS) : Concepts and Applications in Science**
  By Prof. B. Mahadevan, Dr. VinayakRajatBhat, Dr. R VenkataRaghavan | Indian Institute of Management Bangalore (IIMB), Chanakya University, Bangalore
  (https://onlinecourses.swayam2.ac.in/imb23_mg53/preview)
  http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63
  (Centre of Excellence for Indian Knowledge System, IIT Kharagpur)

26-AEC-1-01: Professional Communication Skills

Teaching Scheme: Tutorial: 1Hours/Week.	**Credit:** 1	**Examination Scheme:** Termwork **(TW)** : 25 Marks

Prerequisites Courses: Basic Proficiency in English Language

Companion Course: NA

Course Objectives:

- To know the basic principles of communication skills
- To improve the verbal communication skills through participation
- To learn different visual tools of presentation
- To learn the importance of writing technical document

Course Outcomes:
After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Understand** the communication ethics and apply the principles and practices of Communication in daily life.	2
CO2	**Illustrate** the verbal communication skills by effectively participating in a group discussion.	3
CO3	**Use** various visual aids for enhancing the presentation skills.	4
CO4	**Write** a technical document with correctness of language, appropriate vocabulary and style.	5

Course Contents

Unit I	Introduction to Communication & Speaking Skills	4 Hours	CO1 , CO3

Introduction to Theory of Communication, Types of Communication, Barriers to Communication, Communication Ethics, Job Interviews

Exemplar/Case Studies: Write and narrate an article of your choice , Prepare your LinkedIn profile for digital communication

Unit II	Group Discussion	4 Hours	CO1 ,CO2,CO3

Basics of a Group Discussion, Understanding the different types of Group Discussions, Practical tips and suggestions for a GD.

Exemplar/Case Studies: Having Group Discussion of any given Topics.			
Unit III	**Presentation Skills & Public Speaking for Engineers**	**4 Hours**	**CO2 , CO3**
Structuring a compelling presentation, engaging an audience using visual aids effectively, techniques to manage and reduce public speaking anxiety, making a clear and concise speech outline.			
Exemplar/Case Studies: Having presentation of any given Topics.			
Unit IV	**Professional Writing**	**4 Hours**	**CO4**
Job Application with Resume, Office Drafting: Notice, Email, Technical Articles, Report Writing. Business Correspondence: Enquiry letter, Order letter, Complaint Letter and Adjustment letters			

Exemplar/Case Studies: Write down any one professional writing on following:

- Resume writing
- Leave Application to HOD/Principal
- Blog Writing/Content Writing
- Cover letter for internship application
- Request letter for a Bonafide Certificate/ Enquiry letter

Learning Resources

Text Books

T1. Meenakshi Raman, Sangeeta Sharma, "Technical Communication, Principles and Practice", Oxford University Press- ISBN 978-13-16640-08-1
T2. Rajendra Pal, J.S. Korlahalli, "Essential of Business Communication", Sultan Chand & Sons, New Delhi ISBN 9788180547294i

Reference Books :

R1. E. H. Mcgrath, "Basic Managerial Skills for All", Prentice Hall India Learning Private Limited; 9 edition (2011), ISBN: 9788120343146
R2. R. Subramanian, "Professional Ethics", Oxford University Press; Second edition 17 April 2017, ISBN: 019947

Additional Resources: (Books, e-Resources)

- https://www.britishcouncil.in
- https://www.chrmp.com/correct-english-usage-for-effective-technical-writing/#:~:text=Write%20in%20plain%20English.,voice%20instead%20of%20passive%20voice/
- Technical Writing Blogs - https://draft.dev/learn/the-best-technical-writing-blogs.

MOOC Courses links :

6. Technical Writing for Engineers [The Ultimate Guide & Course] -

https://www.instructionalsolutions.com/blog/technical-writing-engineers
7. SWAYAM NPTEL Course - Technical English for Engineers, By Prof. Aysha Iqbal- https://onlinecourses.nptel.ac.in/noc20_hs56/preview
8. SWAYAM NPTEL Course - English Language for Competitive Exams, By Prof. Aysha Iqbal
9. Google for Developers - Technical Writing Courses - https://developers.google.com/tech-writing

SEM II

26-BSC-1-01 : Engineering Physics

Teaching Scheme: Theory:3 Hours/Week	**Credit:**3	**Examination Scheme:** **CIE** : 20 Marks **MSE :** 20 Marks **SEE** : 60 Marks

Prerequisite Courses:
Useful Concepts: Band Theory of solids, Classification of solids, Study of atoms, Pransducer, Origin of Quantum Physics, and its comparison with classical mechanics, Dual nature of radiation, PiezoelectricEffect, Polarization, Properties of matter, Electric Field, Magnetic Field.

Companion Course: 26-BSC-1-05 Engineering Physics Lab.

Course Objectives:
- To provide inclusive knowledge of fundamental physics principles encouraging engineering students to venture in applications.
- To teach basic concepts and principles of physics, relate them to laboratory experiments.

Course Outcomes:
After completion of the course, learners should be able to

CONo	CO	BL
CO1	**Apply** the principles of Measurement and Dimensions for concepts of Engineering Physics.	3
CO2	**Discuss** the principles of physics to solve Engineering problems and applications of Engineering material.	2
CO3	**Describe** laser, Sensor & Fiber optics applications.	2
CO4	**Explore** to gain insights into the interdisciplinary nature of engineering, bridging physics with other fields.	3
CO5	**Understand** the core concepts of quantum mechanics & their uses.	2
CO6	**Identify** the impact of nanotechnology on various fields.	2

Power from heat- Transforming Thermal Energy into Electricity

Course Contents

Unit I	Dimensions and Semiconductor Physics	7 Hours

Measurements and Dimension, Need for Measurement: Units of Measurement, Systems of units; SI units, fundamental and derived units, Significant Figures, Dimensions of physical quantities, Band theory of solids, Classification of Conductor, Semiconductor & insulator on basis of band theory,Electrical Conductivity in Semiconductors, Fermi-Dirac Statistics, Hall effect,

Applications of Semiconductors, P-n Junction, (Zero, forward & reverse Biasing based on band theory) ,Solar cell.		
Exemplar/Case Studies: 1] To measure dimensions of different objects like wire ,metal bob, sheet etc through a suitable measuring instrument. 2] To study various computer components fabricated from semiconductor materials.		
***Mapping of Course Outcomes**	**CO1, CO2, CO4**	
Unit II	**Engineering Materials:- Magnetic and Dielectric properties**	**7 Hours**
Magnetic Materials:- Introduction, Magnetic Field, Magnetic Flux, Magnetic Permeability, Magnetic Susceptibility, Magnetization, Differentiate between Diamagnetic, Paramagnetic and Ferromagnetic Materials, Soft Magnetic Materials, Hard Magnetic Materials, Applications of Magnetic Materials- Electric Motors, Magnetic Storage Devices, Magnetic bearings. **Dielectric Materials:**-Capacitance, Permittivity & dielectric constant; Polarizability- Polar and non-polar, Dielectric susceptibility, Gauss law in dielectrics, Polarisation:- Electronics, ionic, Orientation Interface, internal field in solids, Dielectric in alternating fields, Ferroelectricity, Piezoelectricity.		
Exemplar/Case Studies: 1] Study how soft magnetic materials like silicon steel are used in EV motors to reduce energy losses and improved efficiency . 2] Study of Magnetic Domains Used for Data Storage in Hard Disk Drives (HDD)		
***Mapping of Course Outcomes**	**CO2, CO4**	
Unit III	**Photonics and LASER**	**7 Hours**
Introduction of LASER, Fundamentals of Laser: Absorption, Spontaneous emission and Stimulated emission, Metastable state, Resonant cavity, Population inversion, types of pumping, Diode Laser , Helium-Neon Gas Laser, Carbon Di-Oxide Gas Laser Applications(Engineering ,Medical, Communication)Parameters of optical fibers: Critical angle, total internal reflection, Numerical Aperture, Acceptance angle and acceptance cone, Numericals, Types of optical fibers: step index, graded index, Advantages of optical fiber communication.		
#Exemplar/Case Studies: 1] Study how diode lasers are used in supermarket barcode scanners to read product information quickly and accurately. .		
***Mapping of Course Outcomes**	**CO1, CO2, CO3, CO4**	
Unit IV	**Physics of Sensor and Characterization Techniques**	**7 Hours**
Principle and types of various Sensors,Ultrasonic sensors: Concept of inverse piezoelectricity, use of piezoelectric transducer as ultrasonic generator, Applications,Light sensors (LDR) and its applications, Fiber Optic Sensors and applications ,Infrared Sensors and Applications ,Concept of Polarisation- Double Refraction (Half Shade Polarimeter-Principle & Applications, Importance of Material Characterization Techniques, X- ray Spectroscopy (XRD), Ulra-Violet Spectroscopy (UV).		
#Exemplar/Case Studies: 1] To study different sensors like pressure, temperature, displacement etc for finding different Domestic & Societal Applications.		

***Mapping of Course Outcomes**	**CO1, CO2, CO3, CO4**	
Unit V	**Quantum Physics**	**7 Hours**
Introduction (Interaction of matter with radiation, Matter waves,) De Broglie hypothesis, Wave Packet), De Broglie hypothesis, Wave Packet, Concept of Phase velocity and group velocity and relation with particle velocity (Introductory), Heisenberg Uncertainty Principle, Concept Of Wave function and Probability Density; Physical interpretation of wave function, Schrodinger's time independent wave equation Applications: Particles trapped in one dimensional infinite potential well, Tunneling effect and STM, Fundamentals of Quantum Computing ,Difference between classical computing & quantum computing, Quantum , Qubit notation, Superposition theorem, Quantum Entanglement theorem (Qualitative Discussion),		
#Exemplar/Case Studies: Applications of Quantum Computing .		
***Mapping of Course Outcomes**	**CO2, CO4, CO5**	
Unit VI	**NDT and Nanotechnology**	**7 Hours**
Non Destructive Testing - Classification of Non-destructive testing methods, Principles of physics in Non-destructive Testing, Advantages of Non-destructive testing methods, Acoustic Emission Testing - Ultrasonic (thickness measurement, flaw detection), Radiography testing **Nanotechnology** - Introduction to nanotechnology, Quantum confinement and surface to volume ratio, Properties of nanoparticles: optical, electrical, mechanical.Applications of nanoparticles: Medical (targeted drug delivery), electronics, Space and Defence, automobile, environment and energy.		
#Exemplar/Case Studies: 1] Study the use of quantum dots in QLED televisions and smartphone displays.		
***Mapping of Course Outcomes**	**CO2, CO4, CO6**	
Learning Resources		
Text Books		
T1. Avadhanulu & Kshirsagar "A textbook of Engineering Physics"-S. Chand Publication 2023. **T2.** S. O. Pillai "A textbook of Engineering Physics", New Age International Publishers 2023.		
Reference Books :		
R1: David. J. Griffiths- Introduction to Quantum Mechanics- Cambridge university . **R2:** Arthur Beiser-Concepts of Modern Physics-Tata McGraw Hill **R3:**S. O. Pillai-Solid State Physics- New Age International Publishers 2023.		
Additional Resources: (Books, e-Resources) **1.E-Book of "Engineering Physics" for FE students.** Click Here 2.https://discovery1.delnet.in/Search/Results?lookfor=s+o+pillai&type=Author&location_code= 3.https://discovery1.delnet.in/Search/Results?lookfor=Avadhanulu+%26+Kshirsagar&type=Author&location_code=&limit=60		

4.https://discovery1.delnet.in/Search/Results?lookfor=A.S.+Vasudeva&type=Author&location_code=&limit=60
5.https://discovery1.delnet.in/Search/Results?lookfor=David.+J.+Griffiths&type=Author&location_code=&limit=60
6.https://discovery1.delnet.in/Search/Results?look for=Arther+Beiser+&type=Author&location_code=&limit=60

MOOC Courses links :

- https://onlinecourses.nptel.ac.in/noc25_ph07/preview
- https://onlinecourses.nptel.ac.in/noc20_bt16/preview

26-BSC-1-04: Statistics and Integral Calculus

Teaching Scheme: Theory: 03 Hours/Week.	**Credit :** 03	**Evaluation Scheme:** **CIE :** 20 Marks. **MSE :**20 Marks. **SEE :** 60 Marks.

Prerequisites Courses: Basics of Integration, Basics of Statistics , General probability

Companion Course: ----------

Course Objectives:

- To make the students familiarize with Mathematical Modeling of advanced techniques of Fourier series integration, tracing of curve, multiple integrals and their applications.
- The aim is to equip them with the basic concepts of statistics, probability functions & hypothesis tests.

Course Outcomes:
After completion of the course, learners should be able to

CONo	CO	BL
CO1	**Understand** the basic concepts of correlation, regression, probability distributions, Fourier series, integral calculus, curve tracing, and multiple integrals	2
CO2	**Find** the Mean, Median, Mode, Standard deviation, Correlation, regression, probability of given data , area of double integration and rectification of curve.	3
CO3	**Apply** the Proper and improper integrals by some special functions.	3
CO4	**Apply** advanced integration techniques such as Reduction formulae, Beta functions, and Gamma functions needed in evaluating multiple integrals and their applications	3
CO5	Analyse the Problems and **apply** the appropriate concept	3
CO6	**Apply** the concept of Statistics, Probability and Integral Calculus for real life Engineering Problems.	3

Course Contents

Unit I	**Statistics- Correlation and Regression line**	7 Hours

Measures of central tendency, Standard deviation, coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates, Curve fitting: fitting of straight line, parabola and related curves

Exemplar/Case Studies: Case study on Correlation.		
***Mapping of Course Outcomes**	**CO1,CO2, CO5, CO6**	
Unit II	**Basic Probability & Probability Distribution.**	**7 Hours**
Theorems on Probability, Bayes Theorem, Random variables, Mathematical Expectation, Probability density function, Probability distributions: Binomial, Poisson, Normal and Hypergeometric,Test of Hypothesis: Chi-Square test, t-distribution		
Exemplar/Case Studies: Case study on Probability Distribution		
***Mapping of Course Outcomes**	**CO1,CO2, CO5, CO6**	
Unit III	**Fourier series**	**7 Hours**
Definition ,Dirichlet's Condition, Full Range Fourier Series, Half Range Fourier Series, Harmonic Analysis Parseval's Identity And Application to Engineering problem.		
***Mapping of Course Outcomes**	**CO1,CO5, CO6**	
Unit IV	**Integral Calculus**	**7 Hours**
Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign, Error Function.		
***Mapping of Course Outcomes**	**CO1,CO3, CO4, CO5**	
Unit V	**Curve Tracing**	**7 Hours**
Tracing of Curves – Cartesian, Polar curves, Parametric curves, Rectification of curves.		
***Mapping of Course Outcomes**	**CO1,CO2, CO5, CO6**	
Unit VI	**Multiple Integrals and Its Applications**	**7 Hours**
Double and Triple integral, Change of order of integral Applications to find Area, Volume, Mass, Centre of Gravity and Moment of Inertia.		
***Mapping of Course Outcomes**	**CO1,CO2, CO4, CO5, CO6**	
Learning Resources		
Text Books		
T1. .B. V. Ramana **,"**Higher Engineering Mathematics", (Tata McGraw Hill) (2017, 29th edition) **T2.** B. S. Grewal, "Higher Engineering Mathematics ", (Khanna Publication, Delhi(2014. 2nd edition)		
Reference Books :		

R1. Erwin Kreyszig , " Advanced Engineering Mathematics" , (Wiley Eastern Ltd.), (2014, 9th edition)
R2. M. D. Greenberg , "Advanced Engineering Mathematics" , (Pearson Education), (2014. 2nd edition)
R3. Peter V. O'Neil, " Advanced Engineering Mathematics " , (Thomson Learning) , (2013,7th edition)

Additional Resources: (Books, e-Resources)

1. https://discovery1.delnet.in/Search/Results?lookfor=B.+V.+Ramana&type=Author&location_code=&limit=60
2. https://discovery1.delnet.in/Search/Results?lookfor=+B.+S.+Grewal&type=Author&location_code=&limit=60
3. https://discovery1.delnet.in/Search/Results?lookfor=Erwin+Kreyszig&type=Author&location_code=&limit=60
4. https://discovery1.delnet.in/Search/Results?lookfor=M.+D.+Greenberg+&type=Author&location_code=&limit=60
5. https://discovery1.delnet.in/Search/Results?lookfor=Peter+V.+O&type=Author&location_code=&limit=60
6. https://discovery1.delnet.in/Search/Results?lookfor=George+B.+Thomas&type=Author&location_code=&limit=60
7. https://discovery1.delnet.in/Search/Results?lookfor=+P.N.Wartika&type=Author&location_code=&limit=60
8. https://discovery1.delnet.in/Search/Results?lookfor=Ron+Larson%2C&type=Author&location_code=&limit=60

26-ESC-1-01 : Basic Electrical & Electronics Engineering

Teaching Scheme:	**Credit:** 03	**Evaluation Scheme:**
Theory: 03 Hours/Week		**CIE** : 20 Marks **MSE** : 20 Marks **SEE** : 60 Marks

Prerequisites: Basic knowledge of Physics

Companion Course: 26-ESC-1-05 : Basic Electrical & Electronics Engineering Lab

Course Objectives:

- To provide knowledge about electrical and electronic components and circuits.
- To provide knowledge about sensors, batteries.
- To provide knowledge of safety protocols, grounding techniques, and protective devices
- To be aware of the electrical systems & electrical machines.

Course Outcomes: After completion of the course, learners should be able to

CO No.	CO	BL
CO1	Understand basic circuit elements and analyze the resistive circuits.	2
CO2	Describe diodes and transistors and use them in simple electronic circuits.	3
CO3	Select appropriate sensors for given applications and explain their basic working.	3
CO4	Understand electrical safety protocols, grounding techniques, and protective devices	2
CO5	Explain electrical distribution, analyze basic energy usage, and understand solar and battery systems.	2
CO6	Explain working of DC motors, transformers, and special motors with their applications..	2

Course Contents

Unit I	Basic Circuits elements	6 Hours

Basic Circuit Elements: Passive (R, l, C, T, Relay etc.) & Active (D, Q, IC etc.) electronics components and their uses in the circuits. Resistor & capacitor - Series and parallel connection, Voltage and current divider theorem. Ohm's law, Kirchoff's laws: Basic

concepts of KVL & KCL.		
Exemplar/Case Studies: Applications of Active & passive electronics components.		
***Mapping of Course Outcomes :**	**CO1**	
Unit II	**Semiconductor Devices & Circuits**	**6 Hours**
Diodes: PN junction diode, Biasing, V-I characteristics. Special diodes: LED, Photodiode. Rectifier Circuits: HWR, FWR (Bridge). Introduction to regulated DC power supply. Transistors: BJT - Introduction, Region of operation, Configuration, BJT as a Switch & amplifier (CE)**.**		
Exemplar/Case Studies: Applications of diodes.		
***Mapping of Course Outcomes :**	**CO2**	
Unit III	**Sensors**	**6 Hours**
Sensors: Selection criterion, Active and Passive sensors. Block diagram of instrumentation system. Working Principles and applications of sensors : Temperature, Moisture, GAS, Ultrasonic, PIR. Application - Sensors for Kitchen safety System.		
Exemplar/Case Studies: Applications of Sensors required for home safety..		
***Mapping of Course Outcomes :**	**CO3**	
Unit IV	**Electrical Safety and Wiring Fundamentals**	**6 Hours**
Safety Practices & Human Protection - Electric Shock:, Personal Protective Equipment (PPE), Safety Protocols & standards. Neutral, Earthing & Grounding - Purpose, Neutral vs. Earth. Safety & Protection Devices - Over-current & Short-circuit Protection (Fuse, MCB, MCCB), Leakage & Shock Protection (ELCB, RCCB). Electrical Wiring & Cables - Conductors & Insulation, Standards.		
Exemplar/Case Studies: Types of standards to follow during wiring of hotel, commercial buildings etc.		
***Mapping of Course Outcomes :**	**CO4**	
Unit V	**Fundamentals of Electrical Systems**	**6 Hours**
Electrical distribution system, Single phase and three phase supply, Alternating voltage & current, Calculation & billing of energy consumption, How to reduce the power consumption. Non Conventional Energy Source: Rooftop Solar Plant. Battery: Introduction to Lithium Ion Battery.		
Exemplar/Case Studies: Calculate the electric consumption of your home and suggest the ways to reduce it.		

***Mapping of Course Outcomes :**	**CO5**	
Unit VI	**Electrical Machines**	**6 Hours**
DC Machines (Shunt and series motor) : Introduction, Working principle & Application. Special Motors : Introduction and application of Stepper motor, Servo motor. Transformer : Working principles, types, losses, EMF equation of transformer, Application.		
Exemplar/Case Studies: Applications of Motor and transformer.		
***Mapping of Course Outcomes :**	**CO6**	
Learning Resources		
Text Books		
T1. B.L. Theraja, "A Textbook of Electrical Technology", S. Chand Publication T2. S.K. Hajra, "A Textbook of Electrical Workshop Practice", S.K. Katariya & Sons T3. R.S. Sedha, "Applied Electronics", S. Chand T4. D.P. Kothari, I. J. Nagrath, "Electric Machines", McGraw Hill		
Reference Books		
R1. V. K. Mehta, Rohit Mehta, "Basic Electrical Engineering", S Chand Publications R2. Van Valkenburgh,"Solid State Electronics", Cengage Learning R3. Srinivas, "Basic Electrical Engineering", I. K. International R4. John Cadick, "Electrical Safety Engineering", Elsevier R5. Abhijit Chakrabarti, "Electrical Machines", McGraw Hill R6. D.V.S. Murty, "Transducers and Instrumentation", PHI, 2nd Edition		
Additional Resources: (Books, e-Resources) https://en.wikipedia.org/wiki/Lithium-ion_battery		
MOOC Courses links : https://onlinecourses.nptel.ac.in/noc24_ee53/preview https://onlinecourses.nptel.ac.in/noc24_mm10/preview		

26-ESC-1-06: Programming and Problem Solving using Python

Teaching Scheme: Theory: 02 Hours/Week	**Credit:** 02	**Evaluation Scheme:** **CIE** : 20 Marks **MSE:** 20 Marks **SEE** : 60 Marks

Prerequisites Knowledge: Basic Computer Skills, Logical Thinking and Problem-Solving Skills.

Companion Course: 26-ESC-1-10: Programming and Problem Solving using Python Lab

Course Objectives:

- To develop proficiency in algorithmic thinking and problem-solving using computers.
- To gain a knowledge of fundamental programming paradigms.
- To cultivate logical thinking skills to analyze code, identify logical errors.
- To introduce Object-Oriented principles and concepts to design effective solutions.
- To elaborate principles of code reusability, flexibility, extensibility, and scalability.
- To comprehend the concept of file handling within programming environments.

Course Outcomes:

After completion of the course, learners should be able to

CO NO	CO	BL
CO1	**Develop** algorithmic solutions to simple computational problems.	3
CO2	**Develop** simple Python programs for solving problems.	3
CO3	**Understand** the significance of conditional branching and iteration.	2
CO4	**Understand** the object-oriented principles and concepts and **utilize** it to design solutions using Python.	2
CO5	**Apply** code reusability, flexibility, extensibility, and scalability using object-oriented principles.	3
CO6	**Understand** the concept of file handling and **demonstrate** its significance in programming environments.	3

Course Contents

Unit I	**Introduction of programming design tools and Basics of Python programming**	**5 Hours**
Program Design Tools : Algorithms, Flowchart and Pseudo code , Programming Language Introduction and Paradigms. **Introduction to Python Programming:** Features , History , Application, Python Program Structure, Identifiers, Data Types,Constants, Variables,Reserved words, Type casting operator, Input and output functions, Indentations and comments**,**Operators and Expressions.		
#Exemplar/Case Studies Cooking Adventures: A Delicious Journey into Python Programming. ● **Ingredients (Data Types):** Introduction to essential ingredients such as integers, floats, strings, and lists. Understanding the flavor and characteristics of each data type through culinary analogies. ● **Recipes (Variables and Operations):** Learning how to create variables to store ingredients and manipulate them using basic operations. Crafting recipes (code snippets) to combine ingredients and perform calculations, akin to cooking up a delicious dish.		
***Mapping of Course Outcomes**		**CO1,CO2**
Unit II	**Control Statements in Python Programming**	**5 Hours**
Decision Control Statements : if, if-else , nested if, if-elif-else statements . **Basic Loop Structure / Iterative Statements** : while loop , for loop , nested loops, break, continue, pass statement, else statements using loop. **Decision Controls with Other Data Types:** List, Tuple Dictionary.		
#Exemplar/Case Studies "Vending Machine Simulator" is an innovative Python program designed to replicate the functionalities of a real vending machine in a virtual environment. ● **Menu Display and item selection (Using if-elif-else).** ● **Payment Calculation.** ● **Store data in sequential data type.**		
***Mapping of Course Outcomes**		**CO2,CO3**
Unit III	**Modular Programming**	**5 Hours**
Function: Need of Function , Function definition, Function call, Function arguments, Passing arguments to functions, Variable scope and lifetime, Local and Global variable, return statement, Lambda Function. **Modules:** Introduction of modules, Making own module, import and from...import statement, Introduction of standard library module , Introduction of Packages in Python.		
#Exemplar/Case Studies The "Smart Home Automation System" project exemplifies the principles of functions and modular programming in Python,		

<table>
<tr><td colspan="3">demonstrating how breaking down complex tasks into smaller, manageable modules enhances code readability, maintainability, and reusability.
● Modular Design: The Smart Home Automation System separate modules for controlling lights, adjusting thermostats, and activating security alarms.
● Function Parameters: Modules accept parameters to the light control module may accept parameters such as brightness level, color, and duration.
● Function Return Values: Modules return status codes or error messages to indicate the success or failure of operations.</td></tr>
<tr><td colspan="2">*Mapping of Course Outcomes</td><td>CO5</td></tr>
<tr><td>Unit IV</td><td>Introduction of Object oriented programming</td><td>5 Hours</td></tr>
<tr><td colspan="3">Introduction of Object oriented programming: Features of object oriented programming.
Classes and Objects: Defining classes , creating objects, Class method and self argument, __init__() method, __del__() method, Class variable and Object variable, Public and Private data members, Private method, Class method.</td></tr>
<tr><td colspan="3">#Exemplar/Case Studies
Develop a digital Car Management System for ABC Car Rentals to streamline their operations.
● Create Car Class: With attributes (properties) like make, model, year, and mileage, and methods (functions) that represent car functionalities like accelerate, brake, and display_info.
● Creating Car Objects: create instances (objects) that represent specific cars.
● Display the Car information : create class method to display car information.</td></tr>
<tr><td colspan="2">*Mapping of Course Outcomes</td><td>CO4,CO5</td></tr>
<tr><td>Unit V</td><td>Abstraction, Inheritance and Polymorphism</td><td>5 Hours</td></tr>
<tr><td colspan="3">Concept of Inheritance: Parent class, derived class. Types of inheritance: Single, Multiple, Multilevel, Multipath Inheritance.
Dynamic Polymorphism: Method overloading, Runtime Polymorphism: Method overriding.
Introduction of other features: Data abstraction and Hiding through classes.</td></tr>
<tr><td colspan="3">#Exemplar/Case Studies
Our computer store needs a robust management system to keep track of its inventory of peripherals.
● Design a Python program that uses the concept of inheritance to represent different types of peripherals. Each peripheral type will be a subclass of a base class, allowing us to organize and manage them uniformly.</td></tr>
<tr><td colspan="2">*Mapping of Course Outcomes</td><td>CO4,CO5</td></tr>
<tr><td>Unit VI</td><td>File Handling</td><td>5 Hours</td></tr>
<tr><td colspan="3">Files: Introduction of files, File path, Types of files, Opening and Closing files.
File Operations: write() and writelines() method, read() and readline() method, append() method, Opening file using with keyword, rename and deleting the files.</td></tr>
</table>

Dictionary method: mkdir(), getcwd(), chdir(), rmdir(), listdir(), Methods from the OS module.

#Exemplar/Case Studies

The "Word Search Engine" project showcases the practical application of file handling in Python programming by creating a tool to search for specific words within text files.

- **File Opening:** The program allows users to specify the file they want to search by providing the file path as input.
- **Word Search:** Learners implement algorithms to search for a target word within the text file.
- **Search Results:** Upon finding occurrences of the target word, the program displays the line numbers or positions where the word is found within the file.

***Mapping of Course Outcomes**	**CO6**

Learning Resources

Text Books

T1. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, ISBN 13: 978-0-19-948017-6
T2. R. Nageswara Rao, "Core Python Programming", Dreamtech Press; Second edition ISBN-13: 978-9386052308

Reference Books :

R1: Romano Fabrizio, "Learning Python", Packt Publishing Limited, ISBN: 9781783551712, 1783551712
R2: Paul Barry, "Head First Python- A Brain Friendly Guide", SPD O'Reilly, 2nd Edition, ISBN:978-93-5213-482-3
R3: Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education, ISBN-10: 9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943
R4: Jeeva Jose, P. Sojan Lal, "Introduction to Computing & Problem Solving with Python", Khanna Computer Book Store; First edition, ISBN-10: 9789382609810, ISBN-13: 978-9382609810

Additional Resources: (Books, e-Resources)

- https://wiki.python.org/moin/PythonBooks
- https://docs.python.org/3/

MOOC Courses links :

1. **Python for Data Science**
   https://onlinecourses.nptel.ac.in/noc22_cs32/preview
2. **The Joy of Computing using Python**
   https://onlinecourses.nptel.ac.in/noc21_cs32/preview

26-PCC-ME-1-01: Mechanical Engineering Systems

Teaching Scheme:	**Credit:** 02	**Evaluation Scheme: CIE :**
Theory: 2 Hours/Week		20 Marks **SEE** : 30 Marks

Prerequisites: Basic knowledge of physics, different types of energy sources, vehicle components.

Companion Course: 26-PCC-ME-1-02 : Mechanical Engineering Systems Lab

Course Objectives:

- To provide a knowledge of power transmitting, supporting, and holding elements used in both industrial machinery and domestic appliances.
- To provide an understanding of energy conversion devices and power plants.
- To introduce manufacturing processes applying proper method to produce components
- To get acquainted with vehicle systems.

Course Outcomes:

After completion of the course, learners should be able to

CO NO	CO	BL
CO1	**Identify** various machine elements and explain their function and applications	2
CO2	**Identify and describe** various energy sources and conversion devices	2
CO3	**Understand** various manufacturing process and recognize the suitable machining operations	2
CO4	**Explain** various vehicle systems and their specifications	2

Course Contents

Unit I	Introduction to Machine Element	6 Hours

Machine, Structure. Power transmitting element- Shaft, Coupling, Clutch, Belt drive, Chain drive, Gear drive. Supporting Element- Axle, Bearing, Chassis, structure, machine frame, machine bed. Holding element- mechanical keys, Mechanical Fasteners in industry and domestic appliances.

Case Studies (Any One)

List and write the function of different machine elements used in:

- Automobile Vehicle Systems
- Sewing Machine
- Any Agricultural Machine

Unit II	Energy sources and conversion devices	6 Hours

Energy sources: Thermal energy, Hydro energy, Nuclear energy, Solar energy. Energy conversion devices: Introduction of water pump, reciprocating air compressor, steam & water turbine, Two stroke and Four stroke engines (Petrol, Diesel and CNG engines).Layout and working of thermal, nuclear, hydroelectric and wind power plant

Case Studies (Any One)

1. List down the use of Solar Energy by Rural Community in different applications.
2. List down the use of compressed air in different utilities.
3. List down the names of thermal/nuclear/hydroelectric/wind power plants in Maharashtra with installed capacity.

Unit III	Introduction to Manufacturing Process	6 Hours

Casting, Forging, Metal forming (Drawing, Extrusion), Sheet metal working, Metal joining, Metal cutting processes and machining operations-Turning, Milling and Drilling. Introduction to CNC and VMC. Micromachining, Additive manufacturing and 3D Printing. Reconfigureable manufacturing system, IOT, IIOT.

Case Studies (Any One)

Discuss the manufacturing process and recognize machining operations used in following:

- Simple Metal Keychain
- Hand tools like spanner, screw driver, plier etc.
- Machine bed/Electric motor body/Engine body
- Metal window

Unit IV	Vehicle Systems and Specifications	6 Hours

Classification of automobiles. Vehicle specifications of two/three wheeler, light motor vehicles, trucks, buses and multi-axle vehicles.
Introduction of chassis layouts, steering system, suspension system, braking system, cooling system and fuel injection system and fuel supply system. Vehicle active and passive safety arrangements: seat, seat belts, airbags and antilock brake system. Introduction of Electric and Hybrid Vehicles.

Case Studies (Any One)

List down the following:

- Electric and Hybrid Vehicles available in the market with their specifications.
- Advanced safety features in passenger cars.

Learning Resources

Text Books:

T1: Nag, P. K., "Engineering Thermodynamics'' Tata McGraw-Hill Publisher Co. Ltd

T2: Stephanie Torta, Jonathan Torta, "3D Printing: An Introduction", Mercury Learning and Information, 2019.

Reference Books :

R1. Groover, and Mikell P., "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", Prentice Hall, USA.

R2. Khan, B. H., "Non-Conventional Energy Sources", Tata McGraw-Hill Publisher Co Ltd.

26-BSC-1-05 : Engineering Physics Laboratory

Teaching Scheme:	**Credit:** 01	**EvaluationScheme:**
PR: 02 Hours/week.		**Termwork(TW):** 25Marks

Prerequisites :

Useful Concepts: Band theory of solids, Classification of solids, Study of Atoms, Molecules and atomic theory and Rutherford Expt, Photoelectric effect, Transducer, Meaning of calibration, Piezoelectric effect, Polarisation, Properties of Matter, Electric field, Magnetic Field.

Companion Course: 26-BSC-1-01 Engineering Physics

Course Objectives:

- To gain practical knowledge by applying experimental methods to correlate with the theory.
- To develop intellectual communication skills and discuss the basic understanding of various experimental principles involved.

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Demonstrate** understanding of optoelectronic devices and their characteristics.	2
CO2	**Apply** scientific principles to analyze and measure physical properties.	3
CO3	**Utilize** experimental techniques for characterization and analysis.	3
CO4	**Evaluate** and interpret data to determine material properties and functionalities.	4
CO5	**Demonstrate** familiarity with basic electronic components and use them to design simple electronic circuits.	3
CO6	**Proficiently** perform various NDT techniques including but not limited to Visual Inspection,Ultrasonic Testing and Radiography Testing.	3

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a reference and hands-on resource. It should include prologue (about University/program/ institute/ department/foreword/ preface), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student's Laboratory Journal/Manual

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, , Assessment grade/marks and assessor's sign, Theory- Concept in brief, (if applicable), conclusion/analysis.

Guidelines for Laboratory /Term Work Assessment Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as Team work, Understanding,Lab report and interpretation of result and conclusion.

Guidelines for Laboratory Conduction & Safety

- Do not come into the lab early unless the instructor is present.
- Do not set equipment too close to the edge of the table.
- Do not activate any circuit or apparatus until the instructor inspects it.
- Never touch a possibly live circuit and do not touch electrical equipment with wet hands.
- No food or drink is to be consumed in the laboratory.
- Any food or drink brought to the lab must remain in the students carrying bag until they leave.

Virtual Laboratory: (If Any):

- Evaluate Non-Destructive Testing (NDT) methods: Study various NDT techniques for material characterization without damaging the sample.(Ultrasonic Testing)-https://cs-iitd.vlabs.ac.in/exp/pulse-velocity-test/simulation.html
- Simulation Experiments on Sensors (LDR)-https://classadapt.com/simulation-of-ldr-variable-resistor-in-a-circuit/

Suggested List of Laboratory Experiments/Assignments(Any 8)

Sr .No	Assignment Title	*Mapping of Course Outcomes
1	Analyze the light sensitivity of solar cells: Measure the current-voltage (I-V) characteristics of a solar cell to understand its efficiency in converting light energy into electricity.	CO1,CO2
2	Calculate the energy gap in a semiconductor: Determine the forbidden energy gap of a semiconductor material, a crucial parameter for its applications in electronics and optoelectronics.	CO1,CO2

3	Measure the angle of polarization with a half-shade polarimeter: Utilize a half-shade polarimeter to analyze the polarization of light, a technique used in various applications like 3D glasses and glare reduction.	CO2,CO3
4	Characterize a diffraction grating using a laser: Employ a laser and a diffraction grating to determine the number of lines per unit length on the grating. This knowledge is essential for designing optical instruments like spectrometers	CO1,CO4
5	Simulate sensor behavior: Through simulations, investigate the response of various sensors to different stimuli, allowing for the optimization of sensor design for specific applications.	CO1,CO5
6	Determine the velocity of a liquid using an ultrasonic interferometer: Measure the velocity of a liquid with an ultrasonic interferometer, a non-invasive technique used in industrial processes and medical diagnostics	CO5,CO6
7	Measure the numerical aperture of an optical fiber: Determine the numerical aperture of an optical fiber, a parameter defining its light-gathering ability, which is critical for communication and sensing applications.	CO1,CO2
8	Determine the dielectric constant of solid material.	CO2,CO4
9	Analyze the impact of light on sensor response: Study the dependence of a sensor's output on the intensity or wavelength of light. This understanding is crucial for designing light-based sensors for various applications.	CO1,CO5,CO6
10	Explore the switching behavior of transistors: Analyze the operation of a transistor as a switch, a fundamental building block in digital circuits.	CO5,CO2

Learning Resources

Text Books

T1. Avadhanulu & Kshirsagar "A textbook of Engineering Physics"-S. Chand Publication 2023.
T2. S. O. Pillai "A textbook of Engineering Physics", New Age International Publishers 2023

26-ESC-1-05: Basic Electrical and Electronics Engineering Lab

Teaching Scheme:	**Credit:** 1	**Evaluation Scheme:**
Practical: 02 hrs/Week		Termwork (TW) : 25 Marks

Prerequisite Courses: Basic knowledge of Physics

Companion Course: 26-ESC-1-01: Basic Electrical and Electronics Engineering

Course Objectives:

- To provide practical demonstration of electrical components and basic laws.
- To provide practical demonstration of semiconductor devices and their applications.
- To provide practical demonstration of electrical safety devices & electrical machines.
- To provide knowledge of batteries, cables, sensors & transformers.

Course Outcomes: After completion of the course, learner should be able to

CO No.	CO	BL
CO1	Identify electronic components and verify basic electrical laws under DC supply.	2
CO2	Build and test regulated power supply, LED biasing circuits and transistor circuits.	3
CO3	Demonstrate electrical safety and protection devices .	3
CO4	Explain applications of sensors, batteries, cables, transformers and renewable electrical systems.	2

Guidelines for Instructor's Manual

The Instructor's Manual should be developed as a reference and hands-on resource for effective conduct of laboratory sessions. It should include the assessment rubric and practical conduction plan. The manual should contain, for every experiment, the aim, objectives, brief theory related to the experiment, apparatus with detailed specifications, connection/circuit diagram, observation table or simulation waveforms, sample calculations for one or two readings, result table, graphs wherever applicable, and conclusion. It should also include a few viva questions related to the experiment and explain the relevance of the practical in real-life applications and industry to strengthen the students' conceptual understanding.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students in the form of a laboratory journal. The journal should consist of a

certificate, table of contents, and a printed write-up of each experiment containing the title, date of completion, objectives, problem statement, hardware requirements, assessment grade/marks with the assessor's signature, and brief theory. It should also include the circuit
diagram, observation table, test cases or test data set (wherever applicable), mathematical model or calculations (wherever applicable), result, and conclusion/analysis. One or two reference journals may be maintained in the laboratory for students' guidance.

Guidelines for Laboratory /Term Work Assessment

There should be continuous assessment for the Term Work throughout the semester. The assessment of laboratory work should be based on the overall performance of the student in each laboratory assignment. Evaluation should consider parameters such as timely completion of experiments, practical performance, conceptual understanding, accuracy of observations and results, punctuality, laboratory discipline, and neatness of the journal. Viva-voce may also be conducted to assess the understanding of fundamental concepts. The assessment shall be carried out using predefined rubrics as approved by the department.

Guidelines for Laboratory Conduction

All the experiments mentioned in the syllabus are compulsory and should be performed by every student. Before conducting each experiment, the instructor should explain the aim, objectives, theory, procedure, and expected outcome. Students should strictly follow laboratory safety rules and use electrical and electronic instruments carefully. The observations and results should be recorded during the practical session and verified by the instructor. Students are expected to maintain discipline, regular attendance, and proper maintenance of the laboratory journal. Wherever applicable, demonstrations, industrial relevance, and real-life applications of the experiment should also be discussed to enhance practical understanding and skill development.

Virtual Laboratory: (If Any):

10. https://be-iitkgp.vlabs.ac.in/List%20of%20experiments.html
11. https://sl-coep.vlabs.ac.in/List%20of%20experiments.html

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Compulsory Assignment)

Sr No	Assignment Title	Mapping of Course Outcomes
1.	Identify different types of active and passive electronic components.	CO1
2.	Demonstration of basic electrical laws - Ohm's law, KVL, KCL.	CO1
3.	Build and test regulated DC power supply.	CO2
4.	Build and test LED biasing circuit.	CO2
5.	Build and test transistor as an amplifier.	CO3

6.	Demonstration of electrical safety and protection devices.	CO3
Group B: Assignments (Any 2)		
Sr No	**Assignment Title**	**Mapping of Course Outcomes**
1.	Demonstration of home safety systems using gas, flame, ultrasonic and PIR sensors.	CO4
2.	Study of different types of Cables & their applications.	CO4
3.	Study of battery construction and specifications.	CO4
4	Determine efficiency and regulation of single phase transformers.	CO4
Group C: Assignments (optional)		
Sr No	**Assignment Title**	**Mapping of Course Outcomes**
1.	Visit to rooftop solar power plant.	CO4
Learning Resources		
Text Books		
T1. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill		
Reference Books :		
R1. S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson		
Additional Resources: (Books, e-Resources): • https://www.tinkercad.com		
MOOC Courses links : • https://onlinecourses.swayam2.ac.in/nou24_ec02/preview • https://onlinecourses.nptel.ac.in/noc24_ee12/preview		

26-ESC-1-10: Python Programming Lab

Teaching Scheme:	**Credit:** 01	**Evaluation Scheme:**
Practical: 02 Hours/Week		Termwork (TW) : 25 Marks

Prerequisite Courses: Basic Computer Skills, Logical Thinking and Problem-Solving Skills.

Companion Course: 26-ESC-1-10 : Programming and Problem Solving Using Python.

Course Objectives:

- Enhance proficiency in algorithmic thinking and efficient problem-solving.
- Acquire a thorough understanding of fundamental programming concepts through effective study.
- Elaborate principles of code reusability, flexibility, extensibility, and scalability, data abstraction to develop solutions that are efficient and adaptable to varying requirements.

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Apply** fundamental programming principles of Python to solve given problems.	3
CO2	**Demonstrate** control and iterative statements in python.	2
CO3	**Develop** the skills to **utilize** python data structures like Lists, Tuples, Sets and dictionaries.	3
CO4	**Design** user defined functions, modules.	3
CO5	**Apply** object -oriented programming principles in python.	3
CO6	**Develop** Python applications for manipulating files.	3

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a reference and hands-on resource. It should include prologue (about institute/ department), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software and Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart), conclusion/analysis. Program codes with sample output of all performed assignments are to be submitted as softcopy. As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journals must be avoided. Use of CD containing student programs maintained by Laboratory In-charge is highly encouraged. For reference one or two journals may be maintained with program prints in the Laboratory.

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as Write-up, Correctness and Documentation of Program, Viva, Timely Completion.

Guidelines for Laboratory Conduction

List of laboratory assignments is provided below . The instructor is expected to conduct the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. Encourage students for appropriate use of coding style, proper indentation and comments. Use of open source software and recent versions is to be encouraged.

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Any 8 Assignment)

Sr No	Assignment Title	Mapping of Course Outcomes
1.	Write a Python program to calculate the bill amount for an item given its quantity, sold , value , 10% discount and 5% tax.	CO1
2.	Write a Python program to calculate the electricity bill based on following information . Consumption Unit — Rate of charge 0-150 — Rs. 3 per Unit 151-350 — Rs. 100 plus Rs. 3.75 per unit exceeding 150 units 301-450 — Rs. 200 plus Rs. 4 per unit exceeding 350 units 451-600 — Rs. 300 plus Rs. 4.25 per unit exceeding 450 units Above 600 — Rs. 400 plus Rs. 5 per Unit exceeding 600	CO2
3.	Write a Python program to perform various tasks such as adding books, displaying	CO2

	available books, searching for books by title, borrowing books, and returning books. To achieve this, you need to implement several functions: ● Add a book ● Display available books ● Search for a book ● Borrow a book ● Return a book ● Exit the program	
4	Write a Python program to accept N numbers from users and store it in a sequential data type variable. Compute and display maximum, minimum, sum and average of numbers.	CO3
5.	Write a Python program to check whether a given integer is an Armstrong number or not. An Armstrong number is an integer with three digits such that the sum of the cubes of its digits is equal to the number itself. For example, 371 is an Armstrong number because $3^3+7^3+1^3=371$	CO2 CO3
6.	Write a Python program that accepts a number from the user and prints the digits of the number in reverse order.	CO3
7.	Write a Python program to accept a number from the user and generate the Fibonacci series up to that number. The Fibonacci series is a sequence of numbers where each number is the sum of the two preceding ones, usually starting with 0 and 1.	CO3, CO4
8.	Write a Python Program to Declare the class of employee to display Names, employee_id, salary of employees. **Employee Class Declaration:** Declares a class named "Employee". The class includes private member variables for employee names, IDs, and salaries, as well as public member functions for accessing and displaying this information. **Display Functionality:** The Employee class provides member functions to display employee names, IDs, and salaries.	CO5
9.	Implement a Python program for ATM money withdrawal functionality with private data members 'AccountNo' and 'balance'. include a withdrawal function that deducts the withdrawal amount from the balance and returns the remaining balance. If the withdrawal amount exceeds the balance, it should display a 'Not enough balance' message ● **Class Definition:** The system defines a class named 'ATM' to represent	CO5

	the ATM money withdrawal functionality. ● **Withdrawal Function:** The 'ATM' class provides a withdrawal function that accepts the withdrawal amount as a parameter. ● **Encapsulation:** The 'AccountNo' and 'balance' data members are declared as private to encapsulate them within the class. ● **Error Handling:** The withdrawal function includes error handling to detect cases where the withdrawal amount exceeds the available balance.	
10.	Develop a Python program that demonstrates these fundamental concepts by modeling various geometric shapes and their interactions. ● **Class Declaration:** define class Shape and class methods to calculate area and perimeter of shape. ● **Constructor and Destructor:** initial the value for class. ● I**nheritance:** inherit class Shape in child class Rectangle,Circle	CO5
11.	Write a Python program to copy the contents of one file into another file. **File Input and Output:** The system prompts users to specify the source and destination files for content replication.	CO6
12.	Write Python programming by to search for specific words within text files **File Opening:** The program allows users to specify the file they want to search by providing the file path as input. **Word Search:** implement the logic to search for a target word within the text file. **Search Results:** Upon finding occurrences of the target word, the program displays the line numbers or positions where the word is found within the file.	CO6

Learning Resources

Text Books

T1. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, ISBN 13: 978-0-19-948017-6
T2. R. Nageswara Rao, "Core Python Programming", Dreamtech Press; Second edition ISBN-13: 978-9386052308

Reference Books :

R1: Romano Fabrizio, "Learning Python", Packt Publishing Limited, ISBN: 9781783551712, 1783551712
R2: Paul Barry, "Head First Python- A Brain Friendly Guide", SPD O'Reilly, 2nd Edition, ISBN:978-93-5213-482-3
R3: Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education, ISBN-10: 9789387572942, ISBN-13:

978-9387572942, ASIN: 9387572943
R4: Jeeva Jose, P. Sojan Lal, "Introduction to Computing & Problem Solving with Python", Khanna Computer Book Store; First edition, ISBN-10: 9789382609810, ISBN-13: 978-9382609810

Virtual Lab:
https://python-iitk.vlabs.ac.in/

MOOC Courses links :

1. **Python for Data Science**
   https://onlinecourses.nptel.ac.in/noc22_cs32/preview
2. **The Joy of Computing using Python**
   https://onlinecourses.nptel.ac.in/noc21_cs32/preview

26-PCC-ME-1-02 : Mechanical Engineering Systems Lab

Teaching Scheme:	**Credit:** 1	**Evaluation Scheme:**
Practical: 2 Hours/Week		Term work (TW) : 25 Marks Practical (PR): 25 Marks

Prerequisites: Basic knowledge of physics, different types of energy sources, vehicle components.

Companion Course: 26-PCC-ME-1-01: Mechanical Engineering Systems

Course Objectives:

- Introducing students to the vehicle specification and basics of vehicle systems through hands-on demonstrations and practical learning experiences.
- To get acquainted with various energy conversion devices
- To introduce machining and manufacturing processes applying proper method to produce components
- Describe various sand and permanent mold casting methods.
- To get acquainted with vehicle systems and specifications of vehicles
- Arrange visits for visualize what students learned in classroom to the real industrial situation

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
CO1	**Explain** the fundamentals of power producing and power absorbing devices.	2
CO2	**Select** the appropriate molding and pattern making for the sand casting process.	3
CO3	**Develop** a simple object using additive manufacturing process (3D printing) and Illustrate the machining operations like turning, drilling and milling on various machine tools.	3
CO4	**Compare** various vehicle systems and specifications.	3
CO5	**Understand** the practical knowledge about how different devices/machines and processes work together in order to produce a product or service and write the technical report.	2

Guidelines for Student's Laboratory Journal

After conduction of practical students have to write Handwritten assignments of 4-6 pages with diagrams as per content given by the course instructor. The laboratory assignments are to be submitted by students in the form of hand written assignments. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Brief theory related to the assignment, Schematic Layout/ Diagram, Few short questions related to the practical, Assessment marks and assessor's sign,).

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign marks based on the rubrics of evaluation prepared by the course instructor, such as understanding of theory, Diagram /Presentation, Question and answering and Timely submission.
Assessment of practical's will be based on MCQ test / case study mentioned in syllabus.

Suggested List of Laboratory Assignments

Group A: Assignments (Mandatory)

Sr. No	Experiment Title
1.	Demonstration of I.C. Engine
2.	Demonstration of Domestic appliances viz. refrigerator and air-conditioner
3.	Demonstration of various machining operations like turning, drilling and milling
4.	Demonstration of vehicle systems (automobile chassis, steering system, suspension system, braking system)
5.	Demonstration of Sand Casting Process
6.	Introduction to additive manufacturing technique and development of any simple object using 3D printer
7.	Demonstration of CNC Machine

Group B: Assignments (Any 1)

Sr. No.	Experiment Title
1.	Industry / Workshop / Showroom Visit
2.	Visit to solar power plant

Learning Resources

Text Books:

T1: Nag, P. K., "Engineering Thermodynamics'' Tata McGraw-Hill Publisher Co. Ltd
T2: Basant and Agrawal, "Basics of Mechanical Engineering", John Wiley and Sons, USA

Reference Books :

R1. Groover, and Mikell P., "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", Prentice Hall, USA.
R2. Curtis D Anderson and Judy Anderson, "Electric and Hybrid Cars: A History", 2nd Ed., McFarland and Company.
R3. Khan, B. H., "Non-Conventional Energy Sources", Tata McGraw-Hill Publisher Co Ltd.

26-VSC-1-02: TechShop

Teaching Scheme: Practical: 4 Hours/Week	**Credit:** 2	**Examination Scheme:** Termwork **(TW)** : 50Marks

Prerequisites: Basic safety rules, basic knowledge of geometrical drawing.

Course Objectives:

- To develop practical skills related to construction activities, workshop practices, and modern manufacturing techniques used in engineering applications.
- To familiarize students with tools, equipment, materials, safety practices, and standard procedures followed in civil, mechanical, and workshop environments.
- To provide hands-on exposure to digital fabrication technologies such as 3D printing, laser cutting, CNC machining, and reverse engineering.
- To develop the ability to perform basic manufacturing, fabrication, fitting, joining, and assembly operations using appropriate tools and techniques.
- To cultivate problem-solving skills, teamwork, and safe working habits through practical engineering assignments and prototype development activities.

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
CO1	Explain the importance of construction materials and basic construction activities used in civil engineering practices.	3
CO2	Perform on-site construction activities (Lineout, Masonry, Casting etc.)	3
CO3	Understand the principles and workflow of digital manufacturing processes, including 3D modelling, slicing, laser cutting and CNC machining	2
CO4	Develop and fabricate engineering components using 3D printing, laser cutting, CNC machining and reverse engineering techniques.	3
CO5	Apply workshop safety practices and identify the functions and operations of conventional machine tools, fitting tools and fabrication equipment.	3
CO6	Perform basic workshop operations such as carpentry, fitting, joining, welding, and sheet metal fabrication using appropriate tools and techniques.	3

Guidelines for the Instructor's Manual

The instructor's manual shall contain:

- The production drawing of a job with all linear and geometric dimensions.
- Raw material, size and shape, and allowances provided.
- List of drawings and tools required.
- Process plan to complete the job.
- General safety instructions.

Guidelines for Students' Laboratory Journal

- The student has to maintain a file consisting of drawings/sketches of the jobs and a brief description of tools, equipment and procedures used for doing the job and a schedule.
- The student has to maintain one file for write-ups based on the demonstration of Techshop.

Guidelines for Laboratory /Term Work Assessment

Term work assessment shall be based on the timely completion of the job, quality of the job, skills acquired, and maintaining the journal, as well as brief write-ups on illustrations/sketches of demonstrated parts/mechanisms/machine tools, etc.

Guidelines for Laboratory Conduction

All assignment of each module are compulsory

Suggested List of Laboratory Experiments/Assignments

Module I : Civil Engineering Workshop Assignments (Mandatory Assignments)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	**Civil Engineering Activities at the Construction Site:** Perform lineout of a building using Nylon Twine, Measuring Tape, Marking Pegs, Lime Powder.	CO1, CO2
2.	**Masonry:** Practical Study of Common Brick Bonds in Masonry.	CO1, CO2
3.	**Precast Element Casting :** Paver Block Making Using Mould and Concrete.	CO1, CO2
4.	**Finishing Works:** Prepare the surface for whitewashing and painting using a brush, roller, or spray, then apply it to the walls.	CO2

5.	**Visit to the construction site:** Visit to the construction site to study the construction materials and construction activities.	CO2
Module II: Digital Manufacturing and Rapid Prototyping Assignments (Mandatory Assignments)		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	Design a Basic 3D Model for Additive Manufacturing using CAD Software	CO3
2.	Perform 3D Slicing and Fabricate the Component using FDM 3D Printer	CO3, CO4
3.	Create 2D Vector Graphics for Laser Cutting Applications	CO3
4.	Perform Laser Cutting and Engraving Operations on Suitable Material	CO4
5.	Demonstrate CNC Wood Router Machining Operations for Simple Components	CO3, CO4
6.	Perform 3D Scanning and Reverse Engineering of Mechanical Components	CO4
Module III : Workshop Assignments (Mandatory Assignment)		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	**Workshop Safety and Safe Working Practices :** Demonstrate safe working practices by understanding fire hazards, electrical safety, machine guarding, use of personal protective equipment (PPE), and accident prevention methods in workshop environments.	CO5
2.	S**tudy and Demonstration of Conventional Machine Tools :** Identify the parts, functions, and working principles of machine tools such as lathes and drilling machines through practical demonstration and observation of machining operations.	CO5
3.	**Carpentry and Woodworking Practices:** Perform basic woodworking operations, including measuring, marking, cutting, joint preparation, and finishing using hand tools and carpentry machines.	CO6

4.	**Joining and Fabrication Processes :** Demonstrate temporary and permanent joining methods using mechanical fasteners, adhesives, soldering, brazing, and welding techniques for engineering applications.	CO6
5.	**Fitting and Assembly Operations:** Perform fitting operations such as marking, cutting, and filing, drilling, and tapping while maintaining dimensional accuracy, interchangeability, and safety practices.	CO5,CO6
6.	**Sheet Metal and Fabrication Practices:** Demonstrate sheet metal operations such as cutting, bending, punching, riveting, and fabrication of simple utility components using appropriate tools and equipment.	CO6

Learning Resources (If applicable)

Text Books

T1. Hajra Choudhury S.K., Hajra Choudhury A.K., and Roy Nirjhar, *Elements of Workshop Technology – Vol. I (Manufacturing Processes)*, Media Promoters & Publishers.
T2. Hajra Choudhury S.K., *Workshop Technology – Vol. II*, Media Promoters & Publishers.
T3. Ibrahim Zeid, *CAD/CAM Theory and Practice*, Tata McGraw-Hill Publication.
T4. Sham Tickoo, *CAD, CAM and CAE for Engineers and Designers*, Dreamtech Press.
T5. Andreas Gebhardt, *Understanding Additive Manufacturing and 3D Printing*, Hanser Publications.
T6. B.S. Raghuwanshi, *Workshop Technology*, Dhanpat Rai Publications.

Reference Books :

R1. Massey Howard C, Basic Plumbing With Illustrations, Craftsman Book Co: California, ISBN 9780934041997
R2. PWD- Standard Data Book for Building Work, PWD Government of Maharashtra, Mumbai
R3. CPWD work manual, CPWD Government of India, New Delhi.

26-CCC-1-07: Co-curricular Course –II- Futurology Projects

Teaching Scheme: Practical: 04 Hours/Week.	**Credit: 02**	**Evaluation Scheme:** Term work (TW) : 25 Marks

Prerequisites Courses: 26-BSC-1-01: Engineering Physics, 26-BSC-1-03: Linear Algebra And Differential Calculus, 26-ESC-1-01: Basic Electrical and Electronics Engineering, 26-ESC-1-02: Programming and Problem Solving, 26-VSC-1-01: TechSkill.

Companion Course: 26-BSC-1-02: Engineering Chemistry, 26-BSC-1-04: Statistics Probability and Integral Calculus, 26-ESC-1-03: Engineering Graphics , 26-ESC-1-04: Smart Building and Materials, 26-PCC-CS-1-01: Object Oriented Programming using Java, 26-VSC-1-02: TechShop

Course Objectives:

- To emphasize learning activities that are long-term, interdisciplinary and student-centric.
- To inculcate independent learning by problem solving with social context.
- To provide the new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products which are useful for a student in preparing for an engineering career.
- To provide every student the opportunity to get involved either individually or as a group to develop team skills and learn professionalism.

Course Outcomes:

After completion of the course, learners should be able to

CO NO	CO	BL
CO1	Develop creative thinking and learn the innovation cycle of design thinking process for Developing innovative products/models.	6
CO2	Work effectively in teams, communicate well with others, and collaborate on group projects.	3
CO3	Apply theoretical knowledge to practical settings and develop proficient technical skills Relevant to their chosen hobby or interest.	3

Guidelines for Mentor:

1. Initiate Design Thinking Mindset

- Encourage creative problem-solving with a strong emphasis on societal needs.
- Help students understand that innovation starts with empathy and real-world relevance.

2. Defining Objectives – Innovation for Social Impact

- Guide students to frame clear, focused problem statements.
- Ensure the projects are oriented toward solving relevant social issues or local community problems.

3. Brainstorming and Idea Generation

- Let students share ideas freely in groups.
- Encourage creative thinking and respect all ideas — big or small.
- Help them select the best and most useful ideas.

4. Think Creatively to Solve the Problem

- Teach students to think in new and different ways.
- Help them explore multiple solutions, not just one.

5. Build Prototypes and Test Ideas

- Guide students to make simple models or prototypes.
- Let them test the ideas, get feedback, and improve their work.
- Teach them that failure is part of learning.

Selection of Project/Problem/Theme :

- Begin by selecting a problem or topic based on interest or curiosity.
- The problem may relate to daily life, science, society, or technology.
- It should align with a subject area and support learning or knowledge application.
- Problems that connect two or more subjects (multidisciplinary) are encouraged.
- The problem should be examined from different perspectives.
- Projects may range from simple to complex but must support specific learning goals.
- Hands-on activities such as building models, creating designs, or conducting experiments are recommended.
- Ideas and skills from various subjects should be integrated wherever possible.
- Technology, such as internet resources, software, and digital tools, should be used for research, collaboration, and presentations.
- Real-life problems may be addressed, or real situations explored through fieldwork or surveys.
- Reports or summaries should be prepared based on the work completed and the knowledge gained.
- Participation in hobby club contests provides an opportunity to showcase work and gain insights from peers
- Competitions help foster innovation, teamwork, and confidence.

Assessment:

- The college, department, and mentors regularly check student progress and how well the program is working.
- The Co-curricular Course-II is reviewed from time to time to ensure quality work.
- Both individual and group performance are observed during the course.
- Mentors and college authorities keep an eye on all activities and do regular assessments.
- Students should show teamwork, self-motivation, and take responsibility for their learning.
- The department supports students by giving proper guidance, orientation, and required resources.
- Mentors and students both take part in the assessment process.

- Students can show their learning through presentations, reports, or models.
- Assessment looks at each student's role, involvement, and performance in the group.
- Group work is also assessed based on teamwork, communication, task sharing, and cooperation.
- Proper documentation and clear presentations are an important part of the evaluation.

Evaluation and Continuous Assessment:

It's suggested that all activities are recorded, and regular assessments are conducted, with proper documentation maintained by both students and mentors in a "Co-curricular Course -II Work Book." Each mentor should maintain a Continuous Assessment Sheet. The recommended assessment parameters and weightage are as follows:

- Idea Inception (10%)
- Awareness / Consideration of Environment / Social / Ethical / Safety Measures / Legal l Aspects (10%)
- Provided Solutions / Final Product Outcomes (20%) - assessed individually and as a team.
- Documentation (20%) - Project report and Co-curricular Course -II workbook.
- Demonstration (40%) - assessed based on presentation, user interface, usability etc.
- The Co-curricular Course -II workbook will serve to facilitate students, mentors, and project coordinators, reflecting accountability, punctuality, technical writing ability, and the workflow of undertaken tasks

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad

(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)

Curriculum and Evaluation Scheme for First Year B. Tech. in Mechanical Engineering with Multidisciplinary Minor

To be implemented for 2026-30 Batch

(With Effect from Academic Year 2026-27)

	SNJB's Late Sau KBJ College of Engineering, Chandwad (An Autonomous Institute affiliated to Savitribai Phule Pune University, Pune)		
	Examination: Mid Semester Examination **(MSE)**		**Programme:** UG
	Class:	**Branch:**	
	Academic Year:	**Semester:**	**Pattern:**
Course Name:		**Course Code:**	
Time: 1Hour		**Maximum Marks:** 20	

Instructions to the candidates:

- *Solve Q.1 OR Q.2; Q.3 OR Q.4; Q.5 OR Q.6*
- *Bold-faced figures to the right indicate full marks.*
- *Assume the suitable data if necessary*
- *Any other instruction required for particular course may be added by subject/course chairman*

QN	Question	Mark
1a)	Q 1 can be bifurcated to maximum two sub questions (Unit I)	7
1b)		
	OR	
2	Q 2 can be bifurcated to maximum two sub questions (Unit I)	7
3	Q 3 can be bifurcated to maximum two sub questions (Unit II)	7
	OR	
4	Q 4 can be bifurcated to maximum two sub questions (Unit II)	7
5	Q 5 can be bifurcated to maximum two sub questions (Unit III)	6
	OR	
6	Q 6 can be bifurcated to maximum two sub questions (Unit III)	6

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(With Effect from Academic Year 2026-27)

Semester End Examination (Regular) : Month Year

Programme: UG (Program Name) **Class:**

Course and Code: **Semester: (Odd/Even)**

Academic Year: **Pattern:**

Time: 2Hr 30 Min **Examination: SEE (Month Year)** **Max. Marks: 60**

Instructions to the candidates:

- *Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8*
- *Bold-faced figures to the right indicate full marks.*
- *Assume the suitable data if necessary, but Justify it.*
- *Draw the neat labelled diagrams, wherever necessary.*

QN	Question	Marks
1 a)	Unit I	6
1 b)	Unit II	7
1 c)	Unit III	7
	OR	
2 a)	Unit I	6
2 b)	Unit II	7
2 c)	Unit III	7
3 a)	Unit IV	7
3 b)	Unit IV	7
	OR	
4 a)	Unit IV	7
4 b)	Unit IV	7
5 a)	Unit V	7
5 b)	Unit V	6
	OR	
6 a)	Unit V	7
6 b)	Unit V	6
7 a)	Unit VI	7
7 b)	Unit VI	6
	OR	
8 a)	Unit VI	7
8 b)	Unit VI	6

Supporting Document

Sr.No.	Syllabus Contains	Short Answer	Yes / No	Page No. (In Syllabus)
1	अभ्यासक्रम	Enclosed in Syllabus	Yes	1
2	पात्रता	(As per the Rules and Regulations mentioned in MoM)	Yes	100
3	अभ्यासक्रमाची उद्दिष्टे	Enclosed in Syllabus	Yes	13
4	विषयाचे नाव	Enclosed in Syllabus	Yes	08
5	घटकांचा तपशील	Enclosed in Syllabus	Yes	08
6	तासिका	Enclosed in Syllabus	Yes	08
7	श्रेयांक पद्धत	Enclosed in Syllabus	Yes	08
8	संदर्भ साहित्य	Enclosed in Syllabus	Yes	15
9	संदर्भ ग्रंथ	Enclosed in Syllabus	Yes	15
10	प्रश्नपत्रिकेचे स्वरूप	Enclosed in Syllabus	Yes	98
11	अंतर्गत मूल्यमापनाचे स्वरूप	Enclosed in Syllabus	Yes	08
12	सत्र परीक्षेचे स्वरूप	Enclosed in Syllabus	Yes	99
13	गुणांकन	Enclosed in Syllabus	Yes	08