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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Curriculum Structure and Evaluation Scheme for F.Y. B. Tech. in Mechanical Engineering with Multidisciplinary Minor

To be implemented for 2025-29 Batch
(With Effect from Academic Year 2025-26)

CHAIRMAN
BOARD OF STUDIES MECHANICAL ENGINEERING
SNJB's
LSKBJ COLLEGE OF ENGINEERING
Chandwad Dist.Nashik

CHAIRMAN
BOARD OF STUDIES APPLIED SCIENCE
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LSKBJ COLLEGE OF ENGINEERING
Chandwad Dist.Nashik

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Chandwad (Nashik) Pin-423101

CHAIRMAN
ACADEMIC COUCIL
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Chandwad Dist.Nashik

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Curriculum Structure and Evaluation Scheme
To be implemented for 2025-29 Batch

Vision of the Institute

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

Mission of the Institute

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

Vision of the Mechanical Department

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

Mission of the Mechanical 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 to 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).

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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
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
AC	Audit 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

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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	25-BSC-1-02	Engineering Chemistry	3	-	-	3	3	20	20	60	100	-	-	-	100
2	BSC	25-BSC-1-03	Linear Algebra And Differential Calculus	3	1	-	4	4	20	20	60	100	-	-	-	100
3	ESC	25-ESC-1-03	Engineering Graphics	3	-	-	3	3	20	20	60	100	-	-	-	100
4	ESC	25-ESC-1-11	Engineering Mechanics	2	-	-	2	2	20	20	60	100	-	-	-	100
5	BSC	25-BSC-1-06	Engineering Chemistry Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
6	ESC	25-ESC-1-08	Engineering Graphics Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	25-ESC-1-12	Engineering Mechanics Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
8	VSEC	25-VSC-1-02	TechShop	-	-	4	4	2	-	-	-	-	50	-	-	50
9	CCC		Co-curricular Course -I	-	-	2	2	1	-	-	-	-	50	-	-	50
10	IKS	25-IKS-1-01	Indian Knowledge System	-	2	-	2	2	-	-	-	-	50	-	-	50
11	AEC	25-AEC-1-01	Professional Communication Skills	-	1	-	1	1	-	-	-	-	25	-	-	25
Total				**11**	**4**	**12**	**27**	**21**	**80**	**80**	**240**	**400**	**250**	**-**	**-**	**650**

Course Code	Bucket of Co-curricular Course
25-CCC-1-A	Yoga
25-CCC-1-B	Sports
25-CCC-1-C	NSS (National Service Scheme)
25-CCC-1-D	Cultural

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

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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	25-BSC-1-01	Engineering Physics	3	-	-	3	3	20	20	60	100	-	-	-	100
2	BSC	25-BSC-1-04	Statistics and Integral Calculus	3	-	-	3	3	20	20	60	100	-	-	-	100
3	ESC	25-ESC-1-01	Basic Electrical and Electronics Engineering	3	-	-	3	3	20	20	60	100	-	-	-	100
4	ESC	25-ESC-1-06	Programming and Problem Solving using Python	2	-	-	2	2	20	20	60	100	-	-	-	100
5	PCC	25-PCC-ME-1-01	Mechanical Engineering Systems	2	-	-	2	2	20		30	50	-	-	-	50
6	BSC	25-BSC-1-05	Engineering Physics Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	25-ESC-1-05	Basic Electrical and Electronics Engineering Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
8	ESC	25-ESC-1-10	Python Programming Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
9	PCC	25-PCC-ME-1-02	Mechanical Engineering Systems Lab	-	-	2	2	1	-	-	-	-	25	25	-	50
10	VSEC	25-VSC-1-01	TechSkill	-	-	4	4	2	-	-	-	-	50	-	-	50
11	CCC	25-CCC-1-05	Co-curricular Course -II	-	-	4	4	2	-	-	-	-	25	-	-	25
Total				**13**	**-**	**16**	**29**	**21**	**100**	**80**	**270**	**450**	**175**	**25**	**-**	**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	25-EXT-1-01	Internship / Fieldwork/ OJT	-	-	-	-	4	-	-	-	-		-	100	100
2	EXT	25-EXT-1-02	Mini Project	-	-	-	-	4	-	-	-	-		-	100	100
Total				**-**	**-**	**-**		**8**	**-**	**-**	**-**	**-**		**-**	**200**	**200**

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Semester-I

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25-BSC-1-02 : Engineering Chemistry		
Teaching Scheme: Theory: 03 Hours/Week	**Credit:** 03	**Evaluation Scheme:** **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: 25-BSC-1-06: Engineering Chemistry Lab		

Course Objectives:

- To understand technology involved in the analysis of water for improving its quality as a commodity by purification.
- To build consciousness about the advancement in batteries and acquire the knowledge and importance of electro-analytical techniques for qualitative and quantitative analysis of materials.
- To understand chemistry of various engineering materials with composition-structure, properties and applications of speciality polymers, nanomaterial, Solders.
- To enlighten the students with the basic concepts of Environmental Chemistry and the use of Green chemistry for pollution control .
- To Illustrate the corrosion of metals and its control by using different methods.
- To study conventional and green fuels with respect to their composition, properties and applications.

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.	4
CO4	**Compare** fuel composition, water quality, and corrosion prevention techniques.	4
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

Mapping of Course Outcomes	CO1,CO2,CO3,CO4,CO5,CO6

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.

Exemplar/Case Studies-

1) Battery waste recycling
2) Current research and advances in fuel cells

Mapping of Course Outcomes	**CO2,CO5**

Unit III	**Chemistry of Engineering Materials**	**7 Hours**

Polymers: Introduction, Glass transition temperature and Melting Temperature, Speciality Polymers: Structure, properties and applications of the following polymers-Conducting Polymer: Polyacetylene Doping of conducting polymer and its type, Biodegradable Polymers: PolyhydroxyButyrate Valerate-PHBV, Electroluminescent polymer

Nanomaterials: Introduction, definition, properties and general applications of Graphene

Solders : Eutectic mixtures and soft solders, Advanced Ceramic materials and cermets, applications

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

Mapping of Course Outcomes	**CO1,CO2**

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		
Mapping of Course Outcomes		**CO3,CO6**
Unit V	**Corrosion and its Protection**	**7 Hours**
Corrosion: Introduction, Types of corrosion – Dry and Wet corrosion, mechanism, nature of oxide films, Pilling-Bedworth's rule, hydrogen evolution and oxygen absorption corrosion, Factors influencing rate of corrosion related to nature of metaland 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).		
Mapping of Course Outcomes		**CO2,CO4,CO5**
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)		
Mapping of Course Outcomes		**CO1,CO2,C04,CO5**
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/

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25-BSC-1-03: Linear Algebra And Differential Calculus		
Teaching Scheme: Theory: 03 Hours/Week. Tutorial: 01 Hours/ Week.	**Credit:** TH : 4	**Evaluation Scheme:** **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

CO No	CO	BL
CO1	**Understand** the basic Concept.	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** theorem in Expansion, Leibnitz, Euler's theorems of Homogeneous Function,Cayley -Hamilton theorem.	3
CO5	Analyze the Problems and **apply** the appropriate concept	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/Case Studies :--		
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/Case Studies: –		
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/Case Studies: –		
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/Case Studies: –		
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		

25-ESC-1-03: Engineering Graphics

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

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

Companion Course: 25-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

<table>
<tr><td colspan="3">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).</td></tr>
<tr><td colspan="3">#Exemplar/Case Studies:
● Redraw the given drawing and identify different types of lines, and dimension style used</td></tr>
<tr><td colspan="2">*Mapping of Course Outcomes</td><td>CO1, CO2,CO3, CO4, CO5</td></tr>
<tr><td>Unit II</td><td>Projection of planes</td><td>6 Hours</td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td colspan="3">#Exemplar/Case Studies:
● Draw F.V, T.V. & S.V. of a given 2D planes like Triangle, Rectangle, Pentagon, Hexagon, Circle</td></tr>
<tr><td colspan="2">*Mapping of Course Outcomes</td><td>CO1, CO2,CO3, CO4, CO5</td></tr>
<tr><td>Unit III</td><td>Development of Lateral Surfaces</td><td>6 Hours</td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td colspan="3">#Exemplar/Case Studies:
● Draw lateral development of any real life product and to make 3D models using card sheet or sheet metal.</td></tr>
<tr><td colspan="2">*Mapping of Course Outcomes</td><td>CO1, CO2,CO3, CO4, CO5</td></tr>
<tr><td>Unit IV</td><td>Engineering Curves</td><td>6 Hours</td></tr>
<tr><td colspan="3">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</td></tr>
<tr><td colspan="3">#Exemplar/Case Studies:
● Identify different conic sections used in a real life product or phenomena and to draw it using applicable method.</td></tr>
<tr><td colspan="2">*Mapping of Course Outcomes</td><td>CO1, CO2,CO3, CO4, CO5</td></tr>
<tr><td>Unit V</td><td>Orthographic Projection</td><td>6 Hours</td></tr>
<tr><td colspan="3">Introduction to First and Third angle Projection methods, Orthographic projection of machine elements/parts along with</td></tr>
</table>

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**..**		

25-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:

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/11210310		

25-BSC-1-06: Engineering Chemistry Lab

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

Prerequisites: 11 th and 12 th Science Chemistry Basic knowledge

Companion Course: 25-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	Course outcomes	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.	**3**

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.	**3**
CO6	**Apply** electroplating to coat copper on iron, demonstrating knowledge of electrodeposition techniques (ECE).	**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

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

1. The teacher will brief the given experiment to students, its procedure, observations calculation, and outcome of this experiment.
2. Apparatus, chemicals, solutions and equipment required for given experiment will be provided by the lab assistants
3. Students will perform the same experiment in a group under the supervision of faculty and lab assistants. After performing the experiment students will check their readings, and calculations from their respective teacher.

4. Students follow lab guideline as given below

- Follow lab timings strictly.
- Keep your belongings and bags in the rack.
- Use instruments of the lab properly.
- Use fans and tubes of the lab only if required.
- Do not disturb an arranged set of practicals.
- Never work alone in the laboratory.
- Never begin working, until your instructor arrives.
- Never bring smoking materials, food or drink into the chemistry lab.
- Many laboratory chemicals are poisonous. Never taste a chemical or a solution.
- Do not use broken or cracked glass equipment.
- Read the label carefully before removing a chemical from a container.
- Do not pipette out any concentrated acids, alkalis and buffer solutions.
- While diluting H2SO4, pour the acid very slowly into water with constant stirring. Do not add water to the acid.
- Use tongs wherever necessary especially when you have to pick up hot objects.
- Arrange the stools properly after use.
- Handle apparatus with care and wash them thoroughly before and after use.
- At once report all accidents to your teacher.
- Get your write up checked regularly and in 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.	Fuel Analysis: Determine the calorific value of given solid fuel by using Bomb calorimeter.	CO5
10.	Nanomaterial Synthesis: Colloidal synthesis of 2-6 or 3-5 semiconductor quantum dots nanoparticles	CO3
11.	Quantitative Analysis: Estimation of Chloride content by Mohr's Method	CO4
12.	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

25-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: 25-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 and Isometric views of a given object.	CO1, CO2, CO3, CO4, CO5, CO6
6.	Draw projection of lines inclined to both principal planes.	CO1, 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.

25-ESC-1-12: Engineering Mechanics Lab

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

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

Companion Course: 25-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

25-VSC-1-02: TechShop

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

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

Course Objectives:

- To develop students' skill sets in various construction activities in Civil Engineering.
- To impart the basic knowledge and understanding related to building construction.
- To provide exposure to the students with hands-on experience in various basic engineering practices in automobiles.
- To know the function of engine and gear oil used in vehicles.
- To understand workshop practices and safety Norms.
- To know the various manufacturing shops in the workshop.

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

CO No	CO	BL
CO1	**Illustrate** the importance of various construction materials and activities.	3
CO2	**Perform** on site construction activities (Lineout, masonry, Casting etc.)	3
CO3	**Use** different tools and equipment for removal of wheel, puncture of tyre cleaning of spark Plug and battery terminals of vehicles	3
CO4	**Select** appropriate engine and gear oil for a particular vehicle	3
CO5	**Apply** the safety precautions/practices in the workshop	3
CO6	**Illustrate** the various manufacturing processes used in the workshop.	3

Guidelines for 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 Student's 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 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 jobs, quality of job, skill 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**	
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	**Civil Engineering Activities At 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 :** Flower Pot Making Using Concrete and Mould.	CO1, CO2
4.	**Finishing Works:** Prepare the surface for whitewashing and painting using brush, roller, spray then apply it to the walls.	CO2

5.	**Visit to construction site:** Visit to the construction site to study the construction material and construction activities.	CO2
Module II	**Mechanical**	
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	Demonstration of Hand tools and Cleaning tools and applications in the Automobile and Mechanical feld.	CO3
2.	Use of various tools and equipment like screw jack, spanners for removal of wheels and puncture of tyres of vehicle.	CO3
3.	Inspect and clean the Spark plug of the motorcycle/scooter.	CO3
4.	Assignment on importance of engine oils and understanding of various engine oil grading system in two/four wheeler vehicles	CO4
5.	Assignment on importance of gear oils and understanding of gear oil grading system in two/four wheeler vehicles.	CO4
6.	Study of maintenance of batteries used in two/four wheeler vehicles.	CO3
Module III	**Workshop**	
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	**Safety in Workshop:** Fire hazards, electric short circuit–causes and remedies, machine protection, human protection, accident prevention methods, and the ability to observe safe working habits	CO5
2.	**Demonstration of lathe Machine:** Demonstration on various functions of lathe parts: Headstock, Tailstock, Carriage, Lead screw, All geared Mechanism, Apron mechanism etc.	CO5, CO6
3.	**Demonstration of Carpentry Processes:** Introduction to woodworking, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft and machining allowances	CO5, CO6

4.	**Demonstration of Joining Processes:** Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies	CO5, CO6
5.	**Demonstration of Fitting Processes:** Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping	CO5, CO6
6.	**Demonstration of Sheet metal work:** Introduction to sheet metal operations: punching, blanking, bending, drawing, with riveting/brazing/soldering (at least one temporary and one Permanent joint either using resistance welding/Arc welding)	CO5, CO6

Learning Resources

Text Books

T1. A Text Book of Automobile Engineering - R. K. Rajput
T2. A Textbook of Internal Combustion Engines : R.K. Rajput
T3. Elements of workshop technology/vol 1 manufacturing processes S. K. Hajra Choudhury, A. K. Hajra Choudhury and Nirjhar Roy
T4. Workshop Technology II, S. K. Hajra Choudhury

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.

25-CCC-1-A: Yoga

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

Prerequisite Courses: Warm up, stretches before asanas.

Companion Course: 25-CCC-1-02: Sports

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 get acquainted with Warm up, Surya Namaskar, Yogasana, Pranayama, meditation practices
- To understand the importance of healthy diet and hygienic practices for maintaining good health

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	**Explain and Practice** of meditation for improving concentration and better handling of stress	3
CO4	**Explain and adopt** healthy diet and hygienic practices for maintaining good health	3

Course Contents

Unit I	Introduction of Yoga	4 Hours	CO1,CO4

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**	**4 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	**Basic Asanas**	**8 Hours**	**CO1,CO2,CO3**
Perform Yogasana to develop body strength and flexibility, Supine Posture - Sarvangasna, Halasana, Setubandhasana Prone Posture - Bhujangasana, Shalabhasana, Makarasana Sitting Posture Paschimottanasan. Bhadrasana, Vakrasana Standing Posture - Veer BhadrasanaVrikshasana, Trikonasana Shavasana is essential for self-relaxation.			
UnitIV	**Basic Pranayama, Kapalbhati & Meditation**	**8 Hours**	**CO1,CO2,CO3**
Perform Pranayama, Meditation in daily life to maintain physical and Mental fitness,Pranayama:- Perform BhastrikaPranayam, Anulom-VilomPranayamKriya,Practice Kapalbhati PranayamKriya Practice BhramariPranayam,Meditation:- Perform sitting in Dhyan Mudra and Meditating. Start with five minutes and slowly increase to higher durations,Guideline for diet and hygienic Practices.			
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**.**			
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) **R3.** Ann Swanson, Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice,			

ISBN-13?: ? 978-1465479358.

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-

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25-CCC-1-B : Sports

Teaching Scheme: Practical: 2 Hours/Week	**Credit:** 01	**Examination Scheme:** Termwork **(TW)** : 50 Marks

Prerequisites Courses: Basic knowledge of sports

Companion Course: 25-CCC-1-01 Yoga

Course Objectives:

- 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
- Develop techniques and tactics involved in organized physical activities, games and sports
- Develop positive health related fitness habits which can be practiced lifelong so as to prevent degenerative diseases.

Course Outcomes:

After completion of the course, learners should be able to

CO No	CO	BL
CO1	Design basic training plans considering energy systems and physiological adaptations.	2
CO2	Explain wellness and its importance and define the components of wellness & Classify physical fitness and recognize its importance in life.	3
CO3	Apply psychological strategies to improve athletes & motivation, goal- setting, and mental resilience	3
CO4	Enhanced physical fitness leads to improved athletic performance and overall well-being	3

Course Contents

Unit I	Introduction of Physical Education & Sports	4 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 II	**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			
Unit III	**Practice of different sport Activity**	**10 Hours**	**CO1,CO2,CO3,CO4**
Every student should participate in game/sports selected by him/her			
Unit IV	**Fitness Assessment**	**4 Hours**	**CO1,CO2,CO3,CO4**
Cardiovascular Endurance, Flexibility, Muscular Strength Endurance and,Body Composition			
Learning Resources			
Text Books			
T1.Foundation of Physical Education, Exercise Science and Sports,Bucher, C. A., & Wuest, D. A. (2010).. Tata McGraw Hill Education Private Limited. New Delhi. **T2.** First Aid Handbook.keech, P. (2010), Hermes House. London. **T3**.Physical Activity and Health Guidelines,Rahl, R. V. (2010). Human Kinetics. USA **T4**.Principle and History of Physical Education and Sports,Singh, D. K. (2010),Friends Publication. New Delhi. **T5**.Textbook of Applied Measurement Evaluation & Sports Selection,Kansal, D. K. (2008). Sports and Spiritual Science			
Reference Books :			
R1. NSCA's Guide to Test and Assessment,Miller, T. (2012), Human Kinetics, USA. **R2**. Test Measurement and Evaluation in Physical Education and Sports,Yobu, A. (2010). Friends Publication. New Delhi. **R3**.Measurement and Evaluation in Physical Education, Lipman, H. A. (2009). Friends Publication, New Delhi. **R4**. Measurement and Evaluation in Human Performance,Morrow, J. Jackson, A., Disch, J., & Mood, D. (2005). Human Kinetics, USA.			
• **Additional Resources:-**			
• **MOOC Courses links :-**			

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25-CCC-1-C : 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
1	Describe the concept of Youth and compare the international definitions of the term Youth.	2
2	Students will be able to appreciate our demographic advantage and its role in nation-building.	3
3	Know the growth and evolution of NSS and its role in nation-building through community service.	2
4	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. MadhuAhuja, 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			

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24-CCC-1-D: Cultural		
Teaching Scheme : Practical: 02 Hrs / Week	**Credit:** 01	**Evaluation Scheme:** Term work (TW) : 50 Marks
Prerequisites Courses: - —------		
Companion Course: .. —--------		

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**	**4 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

- **MOOC Courses links :------**

25-IKS-1-01 : Indian Knowledge System

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

Prerequisites Courses: – Nil

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

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**
Introduction to Indian Mathematics, Binary mathematics and combinatorial problems in Chandaḥ Śāstra . 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**
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**
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**
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**
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)

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25-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

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 :

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

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Semester-II

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25-BSC-1-01 : Engineering Physics

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

Prerequisite Courses: Useful Concepts: Band theory of solids, Classification of solids, Study of Atoms, Molecules and atomic theory and Rutherford Expt, Photoelectric effect, Transducer, Origin of Quantum mechanics and its comparison with classical mechanics, Dual nature of radiation, Meaning of calibration, Piezoelectric effect, Polarisation, Properties of Matter, Electric field, Magnetic Field.

Companion Course: 25-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.	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

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 equipments like wire ,metal bob, sheet etc 2] To study different equipment of computers made up of semiconductor material.		
***Mapping of Course Outcomes**	**CO1, CO2, CO4**	
Unit II	**Crystallography**	**7 Hours**
Introduction, Lattice direction, Miller indices, Lattice planes, Lattice point and space lattice, The basis and crystal structure , Unit cell and lattice parameter , Primitive cell , The seven crystal systems and Bravais space lattice.The unit cell characteristics Number of atoms per unit cell, Atomic radius, Coordination number, Packing density. Separations between lattice planes in a cubic crystal, X-ray diffraction, Bragg's law.		
Exemplar/Case Studies: 1] To study different parameters of silicon such as structure, defects etc (Solar Cell) 2] To analyze different crystals in nature like chalk, alum, Nacl, Sugar etc.		
***Mapping of Course Outcomes**	**CO1, 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, three & four level lasers. types of pumping, Ruby Laser, Semiconductor Laser (heterojunction laser diode) ,He-Ne 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] To verify and study light through different technology like fiber optics, sensors,solar cells etc.		
***Mapping of Course Outcomes**	**CO1, CO2, CO3, CO4**	
Unit IV	**Physics of Sensor and Characterization Techniques**	**7 Hours**
Ultrasonic sensors: Concept of inverse piezoelectricity, use of piezoelectric transducer as ultrasonic generator, Applications,Light sensors (LDR) : Concept of Polarisation- Double Refraction (Half Shade Polarimeter-Principle & Applications, Material Characterization Techniques and Instrumentation (e.g. XRD)		
#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 Superposition theorem, Quantum Entanglement theorem, Quantum cryptography)- Computer and AIDS Engineering		
#Exemplar/Case Studies: Applications of STM.(Medical)		
***Mapping of Course Outcomes**	**CO1, 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] To analyze the different properties of material components. (View Nanomaterial)		
***Mapping of Course Outcomes**	**CO1, 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 : 1. https://onlinecourses.nptel.ac.in/noc25_ph07/preview 2. https://onlinecourses.nptel.ac.in/noc20_bt16/preview

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

Teaching Scheme:	**Credit :** 03	**Evaluation Scheme:**
Theory: 03 Hours/Week.		**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

CO No	CO	BL
CO1	**Understand** the basic Concept.	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.		
Exemplar/Case Studies: –		
***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.		
Exemplar/Case Studies: –		
***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.		
Exemplar/Case Studies: –		
***Mapping of Course Outcomes**	**CO1,CO2, CO5, CO6**	
Unit VI	**Multiple Integral and Its Applications**	**7 Hours**
Double and Triple integrations, Change of order of integration, Applications to find Area, Volume, Mass, Centre of Gravity and		

Moment of Inertia.	
Exemplar/Case Studies: –	
***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**	

25-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: 25-ESC-1-05 : Basic Electrical & Electronics Engineering Lab

Course Objectives:

- To provide knowledge about electrical and electronic components and circuits.
- To be aware of the electrical safety devices, electrical systems & electrical machines.
- To provide knowledge about sensors.
- To impart knowledge of the basic principles of communication systems.

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

CO No.	CO	BL
CO1	Analyze the resistive circuits.	**4**
CO2	Use Semiconductor devices in the rectifier, switch and amplifier applications**.**	**3**
CO3	Explain the electrical systems and safety devices.	**2**
CO4	Explain the construction, working principle of electrical machines.	**2**
CO5	Select the sensors for given applications.	**3**
CO6	Describe the basic principles of communication systems.	**2**

Course Contents

Unit I	**Basic Circuits elements**	**6 Hours**

Basic Circuit Elements: Active & passive electronics components and their uses in the circuits**.** Sources: Ideal & Practical Voltage & Current sources. 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 - Region of operation, CE configuration, BJT as a Switch & amplifier, E-MOSFET- Switch & amplifier.		
Exemplar/Case Studies: Applications of diodes.		
***Mapping of Course Outcomes :**	**CO2**	
Unit III	**Fundamentals of Electrical Systems and safety devices**	**6 Hours**
Electrical system: Single phase and three phase supply, Alternating voltage & current. Calculation & billing of energy consumption, How to reduce the power consumption. Safety devices: Fuse, MCB, MCCB, ELCB. Battery: Introduction, Lithium Ion Battery. Non Conventional Energy Source: Rooftop Solar Plant.		
Exemplar/Case Studies: Calculate the electric consumption of your home and suggest the ways to reduce it.		
***Mapping of Course Outcomes :**	**CO3**	
Unit IV	**Electrical Machines**	**6 Hours**
DC Machines (Shunt and series motor) : Construction, Working principle & Application. Transformer : Working principles, types, losses, emf equation of transformer, Application. Special Machines : Introduction to Stepper motor, Servo motor.		
Exemplar/Case Studies: Applications of Motors.		
***Mapping of Course Outcomes :**	**CO4**	
Unit V	**Sensors**	**6 Hours**

Sensors: Selection criterion, Active and Passive sensors. Block diagram of instrumentation system. Working Principles and applications of sensors : Temperature (RTD, Thermocouple), Force / Weight (Strain Gauge, load Cell), Motion (LVDT), Obstacle (ultrasonic)		
Exemplar/Case Studies: Applications of Sensors.		
***Mapping of Course Outcomes :**	**CO5**	
Unit VI	**Basic Communication System**	**6 Hours**
Communication System : Block Diagram of Communication System. Communication Media: Wired and Wireless. Electromagnetic spectrum (IEEE spectrum). Modulation- Need, Amplitude & Frequency Modulation. Mobile Communication System : Cellular Network, GSM, Introduction to 5G.		
Exemplar/Case Studies: Applications of different media (wired, wireless) used for communication.		
***Mapping of Course Outcomes :**	**CO6**	
Learning Resources		
Text Books		
T1. B.L. Theraja, "A Textbook of Electrical Technology", S. Chand Publication T2. R.S. Sedha, "Applied Electronics", S. Chand T3. 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. Abhijit Chakrabarti, "Electrical Machines", McGraw Hill R5. D.V.S. Murty, "Transducers and Instrumentation", PHI, 2nd Edition R6. J. Schiller, "Mobile Communication", Pearson, 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

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-29 Batch

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

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

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

Companion Course: 25-ESC-1-10: Python Programming 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

CONo	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, 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.		
***Mapping of Course Outcomes**		**CO5**
Unit IV	**Introduction of Object oriented programming**	**5 Hours**
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.		
#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 informatio**n : create class method to display car information.		
***Mapping of Course Outcomes**		**CO4,CO5**
Unit V	**Abstraction, Inheritance and Polymorphism**	**5 Hours**
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.

#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.

***Mapping of Course Outcomes**	**CO4,CO5**

Unit VI	**File Handling**	**5 Hours**

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.
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

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

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

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

Companion Course: 24-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
CO.1	**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 processes and recognize the suitable machining operations.	3
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		
***Mapping of Course Outcomes**	**CO 1**	
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) ● List down the use of Solar Energy by Rural Community in different applications. ● List down the use of compressed air in different utilities. ● List down the names of thermal/nuclear/hydroelectric/wind power plants in Maharashtra with installed capacity.		
***Mapping of Course Outcomes**	**CO2**	
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. Reconfigurable 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		
***Mapping of Course Outcomes**	**CO3**	
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.		
***Mapping of Course Outcomes**	**CO4**	

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.

25-BSC-1-05 : Engineering Physics Lab

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

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: 25-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

CONo	CO	BL
CO1	**Demonstrate** understanding of optoelectronic devices and their characteristics.	3
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.	3
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):

- Study of Bragg's law.
- Simulation Experiments on Sensors.

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, CO4

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.	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.	CO1, 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.	CO2
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.	CO3
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.	CO2
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.	CO2
8	Investigate a phenomenon related to double refraction: Conduct an experiment based on double refraction to determine the refractive indices of a material or identify the type of crystal. Double refraction has applications in optical components like waveplates and polarization filters.	CO2, CO3, 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
10	Explore the switching behavior of transistors: Analyze the operation of a transistor as a switch, a fundamental building block in digital circuits.	CO5
11	Evaluate Non-Destructive Testing (NDT) methods: Study various NDT techniques for material characterization without damaging the sample.	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. A.K. Katiyar, C.K. Pandey. Katiyar, C.K. Pandey "Engineering Physics: Theory and Practical, 2ed-Wiley Book Series.
Additional Resources: (Books, e-Resources) **1.**https://www.arvindguptatoys.com/toys.html

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

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

Prerequisite Courses: Basic knowledge of Physics

Companion Course: 25-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.

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

CO No.	CO	BL
CO1	Analyze resistive circuits using KVL, KCL under DC supply	**4**
CO2	Build and test power supply, LED biasing, transistor application as a switch and amplifier	**3**
CO3	Demonstrate the electrical safety devices & electrical machines	**3**
CO4	Explain applications of batteries, cables & sensors	**2**

Guidelines for Instructor's Manual

The instructor‘s manual is to be developed as a reference and hands-on resource. It should include rubric for the assessment and practical conduction plan. The Instructor’s Manual should contain the following related to every experiment – Aim , objectives, Brief theory related to the experiment, Apparatus with their detailed specifications, Connection diagram /circuit diagram, Observation table/ simulation waveforms, Sample calculations for one/two readings, Result table, Graph and Conclusions, Few

questions related to the experiment, Relevance of practical in real life /industry.

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 printed write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, test cases, Test Data Set (if applicable), mathematical model (if applicable), conclusion/analysis. For reference one or two journals may be maintained in the Laboratory.

Guidelines for Laboratory /Term Work Assessment

There should be continuous assessment for the TW. 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, punctuality and neatness etc. or as per the defined rubrics.

Guidelines for Laboratory Conduction

All the experiments mentioned in the syllabus are compulsory. Use of open source software and recent versions are to be encouraged.

Virtual Laboratory: (If Any):

1. https://be-iitkgp.vlabs.ac.in/List%20of%20experiments.html
2. 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.	Demonstration of electrical safety devices.	CO3
2.	Identify & test different types of active & passive electronic components.	CO1
3.	Demonstration of Ohm's, KVL, KCL.	CO1
4.	Design & build LED biasing circuit.	CO2

5.	Design & build transistor as a switch/amplifier.	CO2
6.	Build & test regulated DC power supply.	CO2
Group B: Assignments (Any 2)		
Sr No	**Assignment Title**	**Mapping of Course Outcomes**
1.	Understanding the battery parts & its specification.	CO3
2.	Determine efficiency and regulation of single phase transformer.	CO4
3.	Study of different types of sensors & their applications.	CO5
4	Study of different types of Cables & their applications.	CO6
Group C: Assignments (optional)		
Sr No	**Assignment Title**	**Mapping of Course Outcomes**
1.	Visit to rooftop solar power plant.	CO3
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): **1.** https://www.tinkercad.com		
MOOC Courses links : 1. https://onlinecourses.swayam2.ac.in/nou24_ec02/preview 2. https://onlinecourses.nptel.ac.in/noc24_ee12/preview		

25-ESC-1-10: Python Programming Lab

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

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

Companion Course: 25-ESC-1-06 : 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 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	CO2
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.	CO3 , CO4

	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.	
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 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.	CO5
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

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-29 Batch

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

Teaching Scheme:	**Credit:** 1	**Examination Scheme:**
Practical: 2 Hours/Week		Term work **(TW)**: 25 Marks **Oral/Practical (OR)**: 25 Marks

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

Companion Course: 25-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
CO.1	**Explain** the fundamentals of power producing and power absorbing devices.	2
CO.2	**Select** the appropriate moulding 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.	2
CO4	**Compare** various vehicle systems and specifications.	2
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.

Guidelines for Laboratory Conduction

- Clearly understand the topic or concept that will be demonstrated.
- Wear safety goggles, lab coats, gloves, and closed-toe shoes as per the requirements of the demonstration instructed by the instructor or lab supervisor.
- Handle equipment, tools, and materials with care to avoid accidents or damage.
- If the demonstration involves electrical equipment or circuits, ensure that all connections are secure and power sources are switched off when not in use.
- Report any accidents, injuries, equipment malfunctions, or safety violations promptly to the instructor for appropriate action and assistance.

Virtual Laboratory: (If Any):

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Mandatory Assignment)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Demonstration of I.C. Engine.	CO1
2.	Demonstration of Domestic appliances viz. refrigerator and air-conditioner.	CO1, CO5
3.	Demonstration of various machining operations like turning, drilling and milling.	CO3
4.	Demonstration of vehicle systems. (automobile chassis, steering system, suspension system, braking system)	CO4
5.	Demonstration of Sand-Casting Process.	CO2
6.	Introduction to additive manufacturing technique and development of any simple object using 3D printer.	CO3

7.	Demonstration of CNC Machine.	CO3
Group B: Assignments (Out of List perform any 2) (Optional)		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	Industry / Workshop / Showroom Visit	CO5
2.	Visit to solar power plant	CO1, CO5
Learning Resources (If applicable)		
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.		

25-VSC-1-01 : Techskill

Teaching Scheme: Practical: 04 Hours/Week	**Credit:** 2	**Evaluation Scheme:** Termwork (TW) : 50 Marks

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

Course Objectives:

Module I

- To understand mobile phone and surveillance system components, their functions, and how they work together.
- To Develop skills to repair Mobile and troubleshoot CCTV System

Module II

- To familiarize learners with the computer hardware and software components, their functionality.
- To introduce the computer network, internet and its configuration.

Module III

- To enable students to operate basic electronic instruments and perform accurate soldering on PCBs.
- To develop skills for analyzing wiring and troubleshooting household electrical appliances safely.

Course Outcomes:

After completion of the course, learners should be able to

CO No.	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	**Demonstrate** the use of basic electronic instruments and perform precise soldering of electronic components on a PCB.	3
CO6	**Analyze** wiring connections and troubleshoot basic faults in electrical home appliances by following standard safety practices.	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 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 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, Viva, Timely Completion.

Guidelines for Practical Examination

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

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**	**12 Hours**
Sr No	**Assignment Title**	**Mapping of COs**
1.	**Disassemble and reassemble** the mobile device using mobile repairing tools.	CO1
2.	**Disassemble a water-damaged phone**, clean the components using appropriate methods, and replace any damaged parts.	CO1
3.	Troubleshooting of **mobile screen display.**	CO1
4.	Demonstrate procedures for **backing up** and **restoring** data on mobile devices.	CO1
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**	**12 Hours**
Sr No	**Assignment Title**	**Mapping of COs**
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**	**12 Hours**
Sr No	**Assignment Title**	**Mapping of COs**
1.	Handling of electronic instruments: Voltmeter, Ammeter, Multimeter, CRO etc.	CO5
2.	Soldering & desoldering practice of electronic components.	CO5
3.	Study of different types of electrical wires, their applications & wiring standards like fire safety etc.	CO6
4.	Hands on practice of residential wiring & wiring board.	CO6
5.	Troubleshooting of clothes Iron.	CO6
6.	Troubleshooting of mixer grinder.	CO6
Learning Resources		
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

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

- https://www.nsdcindia.org/scmp/assets/image/1179656187-CCTV_Installation_Technician__English.pdf

Module II

- https://github.com/com-puter-tips/Technical-eBooks/blob/master/The%20Ultimate%20Computer%20Repair%20Guide-slicer.pdf

Module III

- https://www.electrorecycle.ca/blog/repair-resources-for-small-appliances/
- https://home.howstuffworks.com/how-to-repair-small-appliances.htm

MOOC Courses links :

Module II

- https://cursa.app/free-courses-maintenance-of-computers-and-notebooks-online
- https://nptel.ac.in/courses/106105084

25-CCC-1-05: Co-curricular Course -II

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

Prerequisites Courses: 25-BSC-1-01: Engineering Physics, 25-BSC-1-03: Linear Algebra And Differential Calculus, 25-ESC-1-01: Basic Electrical and Electronics Engineering, 25-ESC-1-02: Programming and Problem Solving, 25-VSC-1-01: TechSkill.

Companion Course: 25-BSC-1-02: Engineering Chemistry, 25-BSC-1-04: Statistics Probability and Integral Calculus, 25-ESC-1-03: Engineering Graphics , 25-ESC-1-04: Smart Building and Materials, 25-PCC-CS-1-01: Object Oriented Programming using Java, 25-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
1	Develop creative thinking and learn the innovation cycle of design thinking process for Developing innovative products/models.	6
2	Work effectively in teams, communicate well with others, and collaborate on group projects.	3
3	Apply theoretical knowledge to practical settings and develop proficient technical skills Relevant to their chosen hobby or interest.	3

Group Structure:

- Students will work in monitored groups under the guidance of assigned mentors to plan, manage, and complete a task, project, or activity based on a specific problem.
- Each group will consist of 5 to 6 students.
- A mentor is assigned to oversee each individual group.

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 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