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)

Neminagar, Chandwad - 423101, Dist. Nashik (MS, India).

Tele: (02556) 253750, Web: www.snjb.org, Email: principalcoe@snjb.org

ESTD - 1928

SNJB

Curriculum and Evaluation Scheme for First Year B. Tech. in Artificial Intelligence & Data Science Engineering with Multidisciplinary Minor

To be implemented for 2026-30 Batch

CHAIRMAN
BOARD OF STUDIES AI&DS ENGINEERING
SNJB's
LSKBJ COLLEGE OF ENGINEERING
Chandwad Dist.Nashik

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

SNJB's COLLEGE OF ENGINEERING
Chandwad
(Nashik)
Pin-423101

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

Vision of the Institute

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

Mission of the Institute

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, and beliefs by encouraging faculty and students for the welfare of society.

Vision of the Artificial Intelligence & Data Science Department

To nurture and excel in the domain of Artificial Intelligence and Data Science by providing exposure to develop intellectual professionals and ethical values to serve the greater cause of society.

Mission of the Artificial Intelligence & Data Science Engineering Department

1. To foster students with the latest technologies and thrust areas in the field of AI & DS.
2. To inculcate values that will assist in developing professionals with social and ethical responsibilities.
3. To collaborate with industry, academic, and research organizations to create competent IT professionals.

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)

Program Specific Outcomes

- **PSO1**

  Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying.

- **PSO2**

  Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

- **PSO3**

  Successful Career and Entrepreneurship - The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

Table 1: Abbreviations

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

GENERAL COURSE STRUCTURE

- **Definition of Credit**:

Table 2: Credit Definition

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

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

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

Table 3: Range of Credits

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

■ **Semester wise Credit Distribution Structure for Four Year B. Tech in Artificial Intelligence & Data Science Engineering with Multidisciplinary Minor:**

Table 4: Semester-wise Credit Distribution Structure

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

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

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

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

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

Table 5: Credit Requirements

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

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

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

Curriculum and Evaluation Scheme for First Year B. Tech. in Artificial Intelligence & Data Science Engineering with Multidisciplinary Minor

To be implemented for 2026-30 Batch

(With Effect from Academic Year 2026-27)

TEACHING AND EVALUATION SCHEME FOR FIRST YEAR B-TECH

Semester – I

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	BSC	26-BSC-1-01	Engineering Physics	3	-	-	3	3	20	20	60	100	-	-	-	100
2	BSC	26-BSC-1-03	Linear Algebra And Differential Calculus	3	1	-	4	4	20	20	60	100	-	-	-	100
3	ESC	26-ESC-1-01	Basic Electrical and Electronics Engineering	3	-	-	3	3	20	20	60	100	-	-	-	100
4	ESC	26-ESC-1-13	Problem Solving and Programming	2	-	-	2	2	20	20	60	100	-	-	-	100
5	BSC	26-BSC-1-05	Engineering Physics Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
6	ESC	26-ESC-1-05	Basic Electrical and Electronics Engineering Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	26-ESC-1-14	Problem Solving and Programming Lab	-	-	4	4	2	-	-	-	-	25	-	-	25
8	VSEC	26-VSC-1-02	TechShop	-	-	4	4	2	-	-	-	-	50	-	-	50
9	CCC		Co-curricular Course -I	-	-	2	2	1	-	-	-	-	50	-	-	50
10	IKS	26-IKS1-01	Indian Knowledge System	-	2	-	2	2	-	-	-	-	50	-	-	50
11	AEC	26-AEC-1-01	Professional Communication Skills	-	1	-	1	1	-	-	-	-	25	-	-	25
Total				**11**	**4**	**14**	**29**	**22**	**80**	**80**	**240**	**400**	**250**	**-**	**-**	**650**

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

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

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

Semester – II

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	BSC	26-BSC-1-07	Quantum Physics	3	-	-	3	3	20	20	60	100	-	-	-	100
S2	BSC	26-BSC-1-04	Statistics and Integral Calculus	3	-	-	3	3	20	20	60	100	-	-	-	100
3	ESC	26-ESC-1-03	Engineering Graphics	3	-	-	3	3	20	20	60	100	-	-	-	100
4	ESC	26-ESC-1-15	Digital Electronics and Logic Design	2	-	-	2	2	20	20	60	100	-	-	-	100
5	PCC	26-PCC-CS-1-01	Object Oriented Programming	2	-	-	2	2	20	-	30	50	-	-	-	50
6	BSC	26-BSC-1-08	Quantum Physics Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	26-ESC-1-08	Engineering Graphics Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
8	ESC	26-ESC-1-16	Digital Electronics and Logic Design Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
9	PCC	26-PCC-CS-1-02	Object Oriented Programming Lab	-		4	4	2	-	-	-	-	25	25	-	50
10	VSEC	26-VSC-1-01	TechSkill	-	-	4	4	2	-	-	-	-	50	-	-	50
11	CCC	26-CCC-1-07	Co-curricular Course -II-Futurology Projects	-	-	4	4	2	-	-	-	-	25	-	-	25
Total				**13**	**0**	**18**	**31**	**22**	**100**	**80**	**270**	**450**	**175**	**25**	**0**	**650**

Level 4.5 Exit Criteria: Mandatory Courses to be completed after the first year to obtain One Year UG Certificate in Artificial Intelligence & Data Science Engineering

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

SEM I

26-BSC-1-01 : Engineering Physics

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

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

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

Course Objectives:

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

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

CO No.	CO	BL
CO1	**Apply** the principles of Measurement and Dimensions for concepts of Engineering Physics.	3
CO2	**Discuss** the principles of physics to solve Engineering problems and applications of Engineering material	2
CO3	**Describe** laser, Sensor & Fiber optics applications.	2
CO4	**Explore** to gain insights into the interdisciplinary nature of engineering, bridging physics with other fields.	3
CO5	**Understand** the core concepts of quantum mechanics & their uses.	2
CO6	**Identify** the impact of nanotechnology on various fields	2

Course Contents

Unit I	Dimensions and Semiconductor Physics	7 Hours

Measurements and Dimension, Need for Measurement: Units of Measurement, Systems of units; SI units, fundamental and

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

Unit V	**Quantum Physics**	**7 Hours**
Introduction (Interaction of matter with radiation, Matter waves,) De Broglie hypothesis, Wave Packet), De Broglie hypothesis,Wave Packet, Concept of Phase velocity and group velocity and relation with particle velocity (Introductory), Heisenberg Uncertainty Principle, Concept Of Wave function and Probability Density; Physical interpretation of wave function, Schrodinger's time independent wave equation Applications: Particles trapped in one dimensional infinite potential well, Tunneling effect and STM, Fundamentals of Quantum Computing ,Difference between classical computing & quantum computing, Quantum , Qubit notation, Superposition theorem, Quantum Entanglement theorem (Qualitative Discussion),		
#Exemplar/Case Studies: Applications of Quantum Computing .		
***Mapping of Course Outcomes**	**CO2, CO4, CO5**	
Unit VI	**NDT and Nanotechnology**	**7 Hours**
Non Destructive Testing - Classification of Non-destructive testing methods, Principles of physics in Non-destructive Testing, Advantages of Non-destructive testing methods, Acoustic Emission Testing - Ultrasonic (thickness measurement, flaw detection), Radiography testing **Nanotechnology** - Introduction to nanotechnology, Quantum confinement and surface to volume ratio, Properties of nanoparticles: optical, electrical, mechanical.Applications of nanoparticles: Medical (targeted drug delivery), electronics, Space and Defence, automobile, environment and energy.		
#Exemplar/Case Studies: 1] Study the use of quantum dots in QLED televisions and smartphone displays.		
***Mapping of Course Outcomes**	**CO2, CO4, CO6**	
Learning Resources		
Text Books		
T1. Avadhanulu & Kshirsagar "A textbook of Engineering Physics"-S. Chand Publication 2023. **T2.** S. O. Pillai "A textbook of Engineering Physics", New Age International Publishers 2023.		
Reference Books :		
R1: David. J. Griffiths- Introduction to Quantum Mechanics- Cambridge university . **R2:** Arthur Beiser-Concepts of Modern Physics-Tata McGraw Hill **R3:**S. O. Pillai-Solid State Physics- New Age International Publishers 2023.		
Additional Resources: (Books, e-Resources) **1.E-Book of "Engineering Physics" for FE students.** Click Here **2.**https://discovery1.delnet.in/Search/Results?lookfor=s+o+pillai&type=Author&location_code= **3.**https://discovery1.delnet.in/Search/Results?lookfor=Avadhanulu+%26+Kshirsagar&type=Author&location_code=&limit=60 **4.**https://discovery1.delnet.in/Search/Results?lookfor=A.S.+Vasudeva&type=Author&location_code=&limit=60 **5.**https://discovery1.delnet.in/Search/Results?lookfor=David.+J.+Griffiths&type=Author&location_code=&limit=60		

MOOC Courses links :

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

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

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

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

Companion Course: -

Course Objectives:

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

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

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

Course Contents

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

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

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

Introduction to Partial Derivatives, Euler's Theorem on Homogeneous functions, Partial derivative of Composite Function, Total Derivative, Its applications Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.	
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=602.https://discovery1.delnet.in/Search/Results?lookfor=+B.+S.+Grewal&type=Author&location_code=&l imit=60 3.https://discovery1.delnet.in/Search/Results?lookfor=Erwin+Kreyszig&type=Author&location_code=&limit=60 4.https://discovery1.delnet.in/Search/Results?lookfor=M.+D.+Greenberg+&type=Author&location_code=&limit=60 5.https://discovery1.delnet.in/Search/Results?lookfor=Peter+V.+O&type=Author&location_code=&limit=60 6.https://discovery1.delnet.in/Search/Results?lookfor=George+B.+Thomas&type=Author&location_code=&limit=60 7.https://discovery1.delnet.in/Search/Results?lookfor=+P.N.Wartika&type=Author&location_code=&limit=60 8.https://discovery1.delnet.in/Search/Results?lookfor=Ron+Larson%2C&type=Author&location_code=&limit=60	

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

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

Prerequisites: Basic knowledge of Physics

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

Course Objectives:

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

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

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

Course Contents

Unit I	**Basic Circuits Elements**	**6 Hours**

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

Exemplar/Case Studies: Applications of Active & passive electronics components.		
***Mapping of Course Outcomes :**	**CO1**	
Unit II	**Semiconductor Devices & Circuits**	**6 Hours**
Diodes: PN junction diode, Biasing, V-I characteristics. Special diodes: LED, Photodiode. Rectifier Circuits: HWR, FWR (Bridge). Introduction to regulated DC power supply. Transistors: BJT - Introduction, Region of operation, Configuration, BJT as a Switch & amplifier (CE)**.**		
Exemplar/Case Studies: Applications of diodes.		
***Mapping of Course Outcomes :**	**CO2**	
Unit III	**Sensors**	**6 Hours**
Sensors: Selection criterion, Active and Passive sensors. Block diagram of instrumentation system. Working Principles and applications of sensors : Temperature, Moisture, GAS, Ultrasonic, PIR. Application - Sensors for Kitchen safety System.		
Exemplar/Case Studies: Applications of Sensors required for home safety..		
***Mapping of Course Outcomes :**	**CO3**	
Unit IV	**Electrical Safety and Wiring Fundamentals**	**6 Hours**
Safety Practices & Human Protection - Electric Shock:, Personal Protective Equipment (PPE), Safety Protocols & standards. Neutral, Earthing & Grounding - Purpose, Neutral vs. Earth. Safety & Protection Devices - Over-current & Short-circuit Protection (Fuse, MCB, MCCB), Leakage & Shock Protection (ELCB, RCCB). Electrical Wiring & Cables - Conductors & Insulation, Standards.		
Exemplar/Case Studies: Types of standards to follow during wiring of hotel, commercial buildings etc.		
***Mapping of Course Outcomes :**	**CO4**	
Unit V	**Fundamentals of Electrical Systems**	**6 Hours**
Electrical distribution system, Single phase and three phase supply, Alternating voltage & current, Calculation & billing of energy consumption, How to reduce the power consumption. Non Conventional Energy Source: Rooftop Solar Plant. Battery: Introduction to Lithium Ion Battery.		
Exemplar/Case Studies: Calculate the electric consumption of your home and suggest the ways to reduce it.		
***Mapping of Course Outcomes :**	**CO5**	

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

26-ESC-1-13: Problem Solving and Programming

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

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

Companion Course: 26-ESC-1-14: Problem Solving and Programming Lab

Course Objectives:

- To develop problem-solving and algorithm design skills.
- To gain an understanding of programming language syntax and operations.
- To learn fundamental control flow mechanisms used in programming.
- To understand and apply data structures for handling collections of data.
- To develop skills in modular programming and code organization.
- To understand and implement file input/output operations.

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

CONo	CO	BL
CO1	**Understand** the basic concepts of C language programming	2
CO2	**Apply** C programming constructs to solve simple problems	3
CO3	**Design** structured logic using appropriate control flow	3
CO4	**Implement** modular programs using functions, pointer, arrays, and strings	3
CO5	**Perform** file input/output operations and manage data using file handling in C.	3

Course Contents

Unit I	Introduction to Programming and C Language Basics	5 Hours

Programming Language Introduction and Paradigms. **Program Design Tools :** Algorithms, Flowchart and Pseudo code; **Introduction to C Programming:** C Program Structure, Identifiers, Data Types, Constants, Variable, Reserved words, Type

conversions, Input and output functions (scanf and printf), Operators and Expressions**,** Notion of Assembler, Interpreter and Compiler.		
#Exemplar/Case Studies: Designing and Implementing a Simple Calculator using Algorithm, Flowchart, Pseudocode, and C Programming		
***Mapping of Course Outcomes**	**CO1, CO2**	
Unit II	**Control Structures in C Programming**	**5 Hours**
Selection Control Statements : if, if-else, nested if-else, switch case statement. **Iterative Control Statements:** while, do while and for loops ,nested loops **Jump Statements**: break, continue and goto statement		
#Exemplar/Case Studies: Build a program to simulate a basic ATM system with PIN verification, balance checking, and withdrawal using loops and conditions.		
***Mapping of Course Outcomes**	**CO2 , CO3**	
Unit III	**Arrays and Strings**	**5 Hours**
Arrays: One Dimensional Arrays, Declaration of One-dimensional Arrays, Initialization of One Dimensional Arrays, Two –dimensional Arrays, Initialization of Two- dimensional Arrays. **Character Arrays and Strings**: Declaration and Initialization String Variables, Introduction to String handling Functions		
#Exemplar/Case Studies: Create a student mark-sheet system storing marks of multiple subjects using arrays and display total, average, and grade		
***Mapping of Course Outcomes**	**CO4**	
Unit IV	**Functions and Recursion**	**5 Hours**
Need for functions, declaring and defining functions , Function calling, Function parameter and return types, Call by value, Recursion, Recursion vs iteration,Introduction to call by reference		
#Exemplar/Case Studies: Develop a program to compute factorial using both iterative and recursive approaches and compare execution flow		
***Mapping of Course Outcomes**	**CO4**	
Unit V	**Pointers in C**	**5 Hours**
Introduction to pointers, Pointer declaration and initialization, Address(&) and Dereference(*) operators, Pointerarithmatics, Call by reference using pointer, Pointers and arrays, Dynamic memory allocation: malloc, calloc, free		
#Exemplar/Case Studies: Design a program to manage a list of students using dynamic memory, where user can add or remove		

entries at runtime.		
***Mapping of Course Outcomes**	**CO4**	
Unit VI	**File Handling and Structure**	**5 Hours**
File Management in C: Introduction, Defining and opening a file, closing a file, Input/output and Error Handling on Files **Introduction of structure and Union**		
#Exemplar/Case Studies: Student Records Management System using Files and Structures in C		
***Mapping of Course Outcomes**	**CO5**	
Learning Resources		
Text Books		
T1. Yashwant Kanetkar, "Let Us C", BPB Publication, BPB Publications, 15th edition ISBN 13 978-8183331630 **T1.** E. Balagurusamy , " Programming in ANSI C" , 8e , McGraw Hill Education , 8th edition , 13: 9789353165130		
Reference Books :		
R1. Harbison and Steele, "C: A Reference Manual", Atlantic Publishers, 5th Edition, ISBN-13: 978-0130895929 **R2.** Harry. H. Chaudhary, "C Programming :The Definitive Beginner Reference" , Createspace Independent Pub, ISBN-13 : 978-1500481001		
Additional Resources: (Books, e-Resources) • https://ia801404.us.archive.org/2/items/cprogbooks/k%26r.pdf • https://www.javatpoint.com/c-programming-language-tutorial		
MOOC Courses links : **1. Introduction To Programming In C** • https://onlinecourses.nptel.ac.in/noc22_cs40/preview		

26-BSC-1-05 : Engineering Physics Laboratory

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

Prerequisites :

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

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

Course Objectives:

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

Course Outcomes:

After completion of the course, learners should be able to

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

Guidelines for Instructor's Manual

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

Guidelines for Student's Laboratory Journal/Manual

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of

contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, , Assessment grade/marks and assessor's sign, Theory- Concept in brief, (if applicable), conclusion/analysis.

Guidelines for Laboratory /Term Work Assessment

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

Guidelines for Laboratory Conduction & Safety

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

Virtual Laboratory: (If Any):

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

Suggested List of Laboratory Experiments/Assignments(Any 8)

Sr .No	Assignment Title	*Mapping of Course Outcomes
1	Analyze the light sensitivity of solar cells: Measure the current-voltage (I-V) characteristics of a solar cell to understand its efficiency in converting light energy into electricity.	CO1,CO2
2	Calculate the energy gap in a semiconductor: Determine the forbidden energy gap of a semiconductor material, a crucial parameter for its applications in electronics and optoelectronics.	CO1,CO2
3	Measure the angle of polarization with a half-shade polarimeter: Utilize a half-shade polarimeter to analyze the polarization of light, a technique used in various applications like 3D glasses and glare reduction.	CO2,CO3

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

Learning Resources

Text Books

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

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

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

Prerequisite Courses: Basic knowledge of Physics

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

Course Objectives:

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

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

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

Guidelines for Instructor's Manual

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

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students in the form of a laboratory journal. The journal should consist of a certificate, table of contents, and a printed write-up of each experiment containing the title, date of completion, objectives,

problem statement, hardware requirements, assessment grade/marks with the assessor's signature, and brief theory. It should also include the circuit
diagram, observation table, test cases or test data set (wherever applicable), mathematical model or calculations (wherever applicable), result, and conclusion/analysis. One or two reference journals may be maintained in the laboratory for students' guidance.

Guidelines for Laboratory /Term Work Assessment

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

Guidelines for Laboratory Conduction

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

Virtual Laboratory: (If Any):

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

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Compulsory Assignment)

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

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

26-ESC-1-14: Problem Solving and Programming Lab

Teaching Scheme: **Practical:** 04 Hours/Week	**Credit:** 02	**Examination Scheme:** Termwork (TW) : 25 Marks

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

Companion Course: 26-ESC-1-13: Problem Solving and Programming

Course Objectives:

- To introduce students with programming fundamentals of C language.
- To impart writing skills of programming to the students and solving problems in C.
- To impart the concepts like looping, array, functions, structures.
- To make the student learn file handling concepts in C.

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

CONo	CO	BL
CO1	**Apply** problem-solving skills and effectively develop, compile and debug C programs.	3
CO2	**Construct** a solution for a given problem utilizing control structures.	3
CO3	**Develop** programs using functions	3
CO4	**Utilize** arrays and strings when developing programs.	3
CO5	**Demonstrate** the application of File handling concepts with C programs.	3

Guidelines for 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, 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

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Write a C program to input your monthly income and various expenses (rent, groceries, bills, etc.). Use arithmetic, relational, and conditional operators to: ● Calculate total expenses and remaining balance. ● Check if your expenses exceed your income. ● Suggest saving advice using logical and ternary operators.	CO1,CO2
2.	Write a C program to calculate parking charges based on vehicle type and parking duration. The charges as below ● Truck/ Bus : Rs. 120/- hour ● Car : Rs. 80/- hour ● Motorcycle/Scooter : Rs. 30/- hour ● Bicycle : Rs. 10/- hour Write an algorithm and draw flowchart for the same.	CO1,CO2
3.	Write a C program that allows users to rate multiple movies, calculate the average rating, and provide a recommendation based on the average rating (for/while)	CO2
4.	Create a simple menu-driven calculator that allows the user to perform basic arithmetic operations: addition, subtraction, multiplication, and division. The program should keep running until the user chooses to	CO2

	exit(do-while)	
5.	Write a C program for a small grocery store that tracks inventory using arrays. The program allows the store manager to: ● Add new items to the inventory. ● Update the quantity of existing items. ● Display the current inventory status (items, their quantities, and prices).	CO3,CO4
6.	Write a C Program to Count the Number of Vowels in a String: The program allows the user to: ● Read a string input from the user. ● Count the number of vowels (a, e, i, o, u) in the string. ● Display the result showing the number of vowels present in the input string.	CO4
7.	Write a C program to simulate an online food order system that allows customers to: ● Display a menu using a function (no arguments, no return). ● Take orders from the user using a function (arguments, no return). ● Calculate the total price of the order using a function (arguments with return). ● Generate and return an order ID using a function (no arguments, but returns value).	CO3
8.	Write a C program that stores student data (name, roll number, marks) in a file. ● Use functions to write new records, display all records, and search by roll number. ● Handle file not found or empty file scenarios.	CO3,CO4
9.	Design and Implementation of a Book Information Management System in C Using Structures with Input of Book ID, Title, Author, Price, Year and Formatted Output Display of All Records	CO5
Learning Resources (If applicable)		

Text Books

T1. Yashwant Kanetkar, "Let Us C", BPB Publication, BPB Publications, 15th edition ISBN 13 978-8183331630
T1.E. Balagurusamy , " Programming in ANSI C" , 8e , McGraw Hill Education , 8th edition , 13: 9789353165130

Reference Books :

R1. Harbison and Steele, "C: A Reference Manual", Atlantic Publishers, 5th Edition, ISBN-13: 978-0130895929
R2. Harry. H. Chaudhary, "C Programming :The Definitive Beginner Reference" , Createspace Independent Pub, ISBN-13 : 978-1500481001

Virtual Lab :

- **C Programming :** https://cse02-iiith.vlabs.ac.in/
- **Problem Solving Lab:** http://ps-iiith.vlabs.ac.in/

MOOC Courses links :

- **Introduction To Programming In C :** https://onlinecourses.nptel.ac.in/noc22_cs40/preview

26-VSC-1-02: TechShop

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

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

Course Objectives:

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

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

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

Guidelines for the Instructor's Manual

The instructor's manual shall contain:

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

Guidelines for Students' Laboratory Journal

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

Guidelines for Laboratory /Term Work Assessment

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

Guidelines for Laboratory Conduction

All assignment of each module are compulsory

Suggested List of Laboratory Experiments/Assignments

Module I : Civil Engineering Workshop Assignments (Mandatory Assignments)

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

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

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

Learning Resources (If applicable)

Text Books

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

Reference Books :

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

26-CCC-1-01-Sports and Fitness

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

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

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

Course Objectives:

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

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

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

Course Contents

Unit I	Introduction of Yoga	6 Hours	CO1,CO2

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

Unit II	Surya Namaskar	6 Hours	CO1,CO2

Perform all the postures of Surya Namaskar one by one in a very slow pace, after warming up. Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) . Shavasana is essential for self-relaxation.

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

Learning Resources

Text Books:

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

Reference Books :

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

Additional Resources: (Books, e-Resources)

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

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

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

Prerequisite Courses: History , English

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

Course Objectives:

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

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

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

Course Contents

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

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

Unit II	Sources and Methods of Local History	6 Hours	CO1,CO2,CO3,CO4

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

26-CCC-1-03 : NSS

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

Prerequisites Courses: –

Companion Course: –--

Course Objectives:

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

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

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

Course Contents

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

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

26-CCC-1-04 : Cultural Enrichment

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

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

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

Course Objectives:

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

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

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

Course Contents

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

Dance-Performance Practices :(conventions of performance etiquette, audience engagement, and stage presence in different cultural contexts.), Cultural Exchange: The interchange of cultural aspects between various communities and areas, including movements, rhythms, music, costumes, and themes, has an impact on dance practices.

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

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

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

Prerequisite Courses: Basics of Drawing, Art &Craft

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

Course Objectives:

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

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

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

Course Contents

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

Basics of rhythm, movement, voice, and expression, Introduction to acting, storytelling, mime, and improvisation, Fundamentals of visual and creative expression, Appreciation of Indian and world performing arts traditions.			
Unit III	**Creative Skills and Performance Practice**	**6 Hours**	**CO1,CO2,CO3,CO4**
Individual and group performances ,Creative writing, script development, and stage presentation, Folk songs, dances, skits, and cultural performances , Teamwork, communication, leadership, and stage etiquette			
Unit IV	**Creative Projects and Community Engagement**	**6 Hours**	**CO1,CO2,CO3,CO4**
Planning and organizing cultural events , Performance for social awareness and community outreach Portfolio development and reflective journal , Final performance/project presentation and self-evaluation			
Learning Resources			
Text Books			
T1. The Performing Arts. Pearson Education. **T2.**An Introduction to Indian Art: Part II. National Council of Educational Research and Training, New Delhi.			
Reference Books :			
R1. The Empty Space. Penguin Books, 1995. **R2**.Natyashastra. Translated by Manomohan Ghosh. Asiatic Society, Kolkata.			

Additional Resources: (Books, e-Resources)

- Sangeet Natak Akademi (National Academy of Music, Dance and Drama) – Digital resources on Indian theatre, dance, music, and folk arts. Sangeet Natak Akademi
- National School of Drama (NSD) – Resources on theatre, acting, stagecraft, workshops, and productions. National School of Drama
- Indira Gandhi National Centre for the Arts (IGNCA) – Digital archives on Indian performing arts, manuscripts, and cultural heritage. IGNCA Digital Resources
- eGyanKosh (IGNOU) – Free study materials on performing arts, theatre, music, dance, and cultural studies. eGyanKosh
- SWAYAM – MOOCs on Indian culture, fine arts, communication, and creativity. SWAYAM

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

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

Prerequisite Courses: Basics knowledge of languages.

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

Course Objectives:

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

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

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

Course Contents

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

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

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

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

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

26-IKS-1-01 : Indian Knowledge System

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

Prerequisites Courses: – **History**

Companion Course: – **Nil**

Course Objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of Indian Knowledge System

To make students acquainted with the facets of traditional knowledge & their relevance and help them be able to apply it to their day-to-day life.

Course Outcomes:

After completion of the course, learners should be able to

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

Course Contents

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

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

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

Mapping of Course Outcomes	CO1

Unit II	Indian Mathematics & Astronomy	6 Hours	Book No.: T1, R2, R3.

Introduction to Indian Mathematics : Introduction to Vedic Mathematics, Basic Arithmetic Techniques, Vedic Multiplication Techniques, Division Techniques , Algebra, Geometry, Trigonometry (Sine & Cosine), Magic squares in India. **Introduction to Indian Astronomy**: Indian contributions in astronomy, The celestial coordinate system ,Elements of the Indian calendar , Notion of years and months.			
Exemplar/Case Studies: Aryabhata's astronomical observations and calculations laid the foundation for modern trigonometry and spherical geometry.			
Mapping of Course Outcomes		**CO3**	
Unit III	**Indian Polity and Economy (I)**	**4 Hours**	**Book No.:T1, R1,R3.**
Indian Polity and Economy Indian conception of well-organized Polity and flourishing Economy of handcrafts, textile etc. as introduction, Foundational texts, and The notion of Bharartavarsha as a Chakravarti-Kshetra and important attributes of Chakravartin, King as the protector of Dharma. King as the strength and support of the weak, King as the protector of Varta, King as the protector of the times, Meaning of Varta: Krishi, Gopalana and Vanijya forming the basis of Varta and the core of economic, Activity in society. The importance of sharing, The Grams as the center of the polity.			
Exemplar/Case Studies: The **Mauryan and Gupta empires** exemplified administrative prowess and economic prosperity, with advancements in trade routes, currency systems, and taxation policies.			
Mapping of Course Outcomes		**CO2**	
Unit III	**Trade In Ancient India (II)**	**3 Hours**	**Book No.: T1, R1,R3.**
Trade In Ancient India (II): Types of Trade, Kautilya on Trade, Trade Routes, Port & Sailors, The Famous Silk Route, By product of Trade cultural Exchange.			
Exemplar/Case Studies: The case of the Silk Route and the maritime trade routes highlights India's pivotal role in facilitating exchanges of goods, ideas, and cultures.			
Mapping of Course Outcomes		**CO2**	
Unit IV	**Achievements of India in Engineering & Technology**	**6 Hours**	**Book No.: T1,R1,R2.**
Engineering and Technology in Ancient India, Engineering and Technology in Medieval India, Engineering and Technology in Modern India, Engineering and Technology: Metals and Metalworking, Water Management System.			
Exemplar/Case Studies: The Construction of Monumental Structure of Rangmahal , Renuka Devi Temple Chandwad			
Mapping of Course Outcomes		**CO4**	
10 SIMPLE DAILY RULES Foster Your Spiritual & Physical Well-Being (That Don't Take Time!)			

1. Sunlight
Spend some time sitting in the **sunlight** every day. It improves mood, boosts vitamin-D levels, and enhances overall health.
2. Grounding (Earthing)
Walk **barefoot on the ground** for a few minutes daily. This helps connect with nature and may reduce stress.
3. Breath work
Practice **deep breathing exercises** regularly. Deep breathing relaxes the mind, improves oxygen flow, and reduces anxiety.
4. Nature Connection
Spend time observing **the sky, trees, and natural surroundings**. Connecting with nature helps improve mental peace and emotional balance.
5. Growth
Adopt or nurture a plant. Taking care of plants builds responsibility and strengthens our connection with the environment.
6. Positivity
Smile at yourself in the mirror. Positive self-affirmation improves confidence and creates a positive mindset.
7. Sound Therapy
Listen to **natural sounds like birds chirping or soft music**. It helps calm the mind and promotes relaxation.
8. Gratitude
Touch your feet or express gratitude once a day. Practicing gratitude develops humility and appreciation for life.
9. Mindful Eating
Eat food **mindfully and with your hands** when possible. It increases awareness of taste, digestion, and food appreciation.
10. Reflection
Before going to sleep, **review your day's activities and learn from them.** Self-reflection helps personal growth and better decision-making.

Learning Resources

Text Books

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

Reference Books :

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

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

26-AEC-1-01: Professional Communication Skills

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

Prerequisites Courses: Basic Proficiency in English Language

Companion Course: NA

Course Objectives:

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

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

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

Course Contents

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

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

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

Unit II	Group Discussion	4 Hours	CO1 ,CO2,CO3

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

Exemplar/Case Studies: Having Group Discussion of any given Topics.

Unit III	Presentation Skills & Public Speaking for Engineers	4 Hours	CO2 , CO3

Structuring a compelling presentation, engaging an audience using visual aids effectively, techniques to manage and reduce

public speaking anxiety, making a clear and concise speech outline.			
Exemplar/Case Studies: Having presentation of any given Topics.			
Unit IV	**Professional Writing**	**4 Hours**	**CO4**
Job Application with Resume, Office Drafting: Notice, Email, Technical Articles, Report Writing. Business Correspondence: Enquiry letter, Order letter, Complaint Letter and Adjustment letters			
Exemplar/Case Studies: Write down any one professional writing on following: ● Resume writing ● Leave Application to HOD/Principal ● Blog Writing/Content Writing ● Cover letter for internship application ● Request letter for a Bonafide Certificate/ Enquiry letter			
Learning Resources			
Text Books			
T1. Meenakshi Raman, Sangeeta Sharma, "Technical Communication, Principles and Practice", Oxford University Press- ISBN 978-13-16640-08-1 **T2.** Rajendra Pal, J.S. Korlahalli, "Essential of Business Communication", Sultan Chand & Sons, New Delhi ISBN 9788180547294i			
Reference Books :			
R1. E. H. Mcgrath, "Basic Managerial Skills for All", Prentice Hall India Learning Private Limited; 9 edition (2011), ISBN: 9788120343146 **R2.** R. Subramanian, "Professional Ethics", Oxford University Press; Second edition 17 April 2017, ISBN: 019947			
Additional Resources: (Books, e-Resources) ● https://www.britishcouncil.in ● https://www.chrmp.com/correct-english-usage-for-effective-technical-writing/#:~:text=Write%20in%20plain%20English.,voice%20instead%20of%20passive%20voice/ ● Technical Writing Blogs - https://draft.dev/learn/the-best-technical-writing-blogs.			
MOOC Courses links : ● 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			

SEM-II

26-BSC-1-07: Quantum Physics

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

Prerequisite Courses: Engineering Physics , Classical Mechanics, Basics of Digital Electronics, Basic Mathematics(calculus and algebra) Useful Concepts: Limitation of Classical Mechanics, Need of Quantum Mechanics, Wave Particle Duality, Energy States of Particle, Classical Computing , Limitation of Classical Computing, Concept of Wave Packet, Wave function ,Introduction of Quantum Computing

Companion Course: 26-BSC-1-08: Introduction to Quantum Physics Lab

Course Objectives:

- Introduce students to the fundamentals of modern and quantum physics.
- Develop understanding of wave-particle duality and quantum mechanics.
- Explain the behavior of matter at atomic and subatomic levels.
- Familiarize students with modern quantum materials and technologies.

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

CONo	CO	BL
CO1	Understand the limitations of classical mechanics and the need of quantum mechanics to explain Modern Physics Phenomena .	2
CO2	Understand matter wave behavior using concepts of electron diffraction, wave packet, phase velocity and group velocity.	2
CO3	Apply concepts of wave packets, uncertainty principle and Schrödinger equation to interpret the probabilistic behavior of microscopic particles.	3
CO4	Apply the quantum mechanical behavior of particles in potential wells and the concept of quantum tunneling	3
CO5	Analyze the applications of superconductors and nanomaterials in modern technologies.	4
CO6	Apply fundamental quantum computing concepts such as qubits, superposition and entanglement in quantum information processing.	3

Course Contents

Unit I	Origin of Quantum Mechanics	7 Hours

Difference between Classical and Quantum Mechanics, Limitations of Classical Mechanics and Quantum Mechanical Interpretation of Modern Physics Phenomena like Photoelectric Effect, Black Body Radiation and Atomic Stability, concept of quanta (Photon), Max Planck's quantum hypothesis, Fundamental postulates of Quantum Physics.

Exemplar/Case Studies: Study of Electromagnetic Wave and Electromagnetic Spectrum		
Unit II	**Wave properties of particles**	**7 Hours**
Wave Particle Duality, De Broglie hypothesis, De Broglie wavelength in terms of momentum, energy and potential difference ,Experimental Evidence: Davisson-Germer experiment and Electron diffraction, Properties of matter waves , Concept of wave packet, Concept of phase velocity and group velocity (Qualitative discussion)		
Exemplar/Case Studies: Study the mechanism of X-Ray machine/ Scanning Electron Microscope to understand how electrons behaved like waves		
Unit III	**Fundamental of Quantum Mechanics**	**7 Hours**
Wave function and its physical significance , Heisenberg's Uncertainty Principle, Interpretation of Heisenberg's Uncertainty Principle for narrow and wide wave packets, Matter wave equation (Qualitative),Operators: Introduction to quantum operators (Momentum, Energy: Hamiltonian, Hermitian, Tensor),Time Independent and Time Dependent Schrodinger's Wave Equation**.**		
#Exemplar/Case Studies: Demonstration of narrow and wide wave packets through real life examples.		
Unit IV	**Applications of the Schrodinger's wave equation**	**7 Hours**
Applications of Schrodinger's Equation: Particles trapped in one dimensional infinite potential well (Rigid Box) , Particle inside finite potential well(Non-Rigid box) [Qualitative discussion], Quantum Tunneling and its applications : alpha decay and Scanning Tunneling Microscope (STM).Harmonic Oscillator: Linear harmonic oscillator and Quantum harmonic Oscillator (basic concepts).		
#Exemplar/Case Studies: Quantum Tunneling and Radioactive Decay in Nuclear Reactors .		
Unit V	**Advanced Quantum Materials**	**7 Hours**
Superconducting materials, Superconductivity, Characteristics of Superconductors, Zero Electrical Resistance, Meissner Effect, Critical Magnetic field, Persistent Current, Critical Temperature, Type-I & II Superconductors, Low and High Temperature Superconductor, Introduction of nano technology, Quantum Confinement, Quantum Dots.		
#Exemplar/Case Studies: Report on Hyper loop trains and Maglev Trains		
Unit VI	**Applications of Quantum Mechanics: Quantum Computing**	**7 Hours**
Concept of quantum computing, Difference between classical computing and quantum computing Classical bit and Qubit , Core principles of quantum computing: Superposition , Interference, Entanglement, Measurement, State representation of qubit using Dirac bra-ket notation , Representation of qubit states, Difference between single and multiple qubits, introduction to single qubit gates (NOT Gate, Z gate, Hadamard gate). Quantum circuits and a simple algorithm (brief introduction)		
#Exemplar/Case Studies: Role of Quantum Computing in Modern Cryptography / Cyber security		

Learning Resources
Text Books:

T1. A. Beiser, Concepts of Modern Physics – McGraw Hill Education, 2022.
T2. David J. Griffiths & Darrell F. Schroeter, Introduction to Quantum Mechanics – Cambridge University Press, 2018.
T3. Nouredine Zettili, Quantum Mechanics: Concepts and Applications – Wiley India, 2022.
T4. R. Eisberg & R. Resnick, Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles – Wiley India, 2021.

Reference Books:

R1. J. J. Sakurai & Jim Napolitano, *Modern Quantum Mechanics* – Cambridge University Press, 2021.
R2. Claude Cohen-Tannoudji, Bernard Diu & Franck Laloë, *Quantum Mechanics* – Wiley-VCH, 2019.
R3. Richard P. Feynman, Robert B. Leighton & Matthew Sands, *The Feynman Lectures on Physics, Vol. III* – Basic Books, 2011.
R4. Stephen Gasiorowicz, *Quantum Physics* – Wiley India, 2007.

Additional Resources: (Books, e-Resources)

- Quantum Country – Interactive Learning Resource
  Click Here
- Khan Academy – Quantum Physics
  Click Here
- CERN Educational Resources on Quantum Physics
  Click Here
- Institute of Physics (IOP) – Quantum Physics Resources
  Click Here
- Quantum Mechanics by David Tong (University of Cambridge)
  Click Here
- OpenStax University Physics – Modern Physics and Quantum Theory
  Click Here

MOOC Courses links:

- https://nptel.ac.in/courses/122106034?utm_source=chatgpt.com
- https://onlinecourses-archive.nptel.ac.in/noc19_ph03/preview

26-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

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

Course Contents

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

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

Exemplar/Case Studies: Case study on Correlation.

***Mapping of Course Outcomes**	**CO1,CO2, CO5, CO6**	
Unit II	**Basic Probability & Probability Distribution.**	**7 Hours**
Theorems on Probability, Bayes Theorem, Random variables, Mathematical Expectation, Probability density function, Probability distributions: Binomial, Poisson, Normal and Hypergeometric,Test of Hypothesis: Chi-Square test, t-distribution		
Exemplar/Case Studies: Case study on Probability Distribution		
***Mapping of Course Outcomes**	**CO1,CO2, CO5, CO6**	
Unit III	**Fourier series**	**7 Hours**
Definition ,Dirichlet's Condition, Full Range Fourier Series, Half Range Fourier Series, Harmonic Analysis Parseval's Identity And Application to Engineering problem.		
***Mapping of Course Outcomes**	**CO1,CO5, CO6**	
Unit IV	**Integral Calculus**	**7 Hours**
Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign, Error Function.		
***Mapping of Course Outcomes**	**CO1,CO3, CO4, CO5**	
Unit V	**Curve Tracing**	**7 Hours**
Tracing of Curves – Cartesian, Polar curves, Parametric curves, Rectification of curves.		
***Mapping of Course Outcomes**	**CO1,CO2, CO5, CO6**	
Unit VI	**Multiple Integrals and Its Applications**	**7 Hours**
Double and Triple integral, Change of order of integral Applications to find Area, Volume, Mass, Centre of Gravity and Moment of Inertia.		
***Mapping of Course Outcomes**	**CO1,CO2, CO4, CO5, CO6**	
Learning Resources		
Text Books		
T1. .B. V. Ramana **,"**Higher Engineering Mathematics", (Tata McGraw Hill) (2017, 29th edition) **T2.** B. S. Grewal, "Higher Engineering Mathematics ", (Khanna Publication, Delhi(2014. 2nd edition)		
Reference Books :		
R1. Erwin Kreyszig , " Advanced Engineering Mathematics" , (Wiley Eastern Ltd.), (2014, 9th edition) **R2**. M. D. Greenberg , "Advanced Engineering Mathematics" , (Pearson Education), (2014. 2nd edition)		

R3. Peter V. O'Neil, " Advanced Engineering Mathematics " , (Thomson Learning) , (2013,7th edition)

Additional Resources: (Books, e-Resources)

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

26-ESC-1-03: Engineering Graphics

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

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

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

Course Objectives:

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

Course Outcomes:

After completion of the course, learners should be able to

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

Course Contents		
Unit I	**Projection of Point and line**	**6 Hours**

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

Unit V	**Orthographic Projection**	**6 Hours**
Introduction to First and Third angle Projection methods, Orthographic projection of machine elements/parts along with sectional view by first angle method.		

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

26-ESC-1-15: Digital Electronics and Logic Design

Teaching Scheme: Theory: 2 Hours/Week	**Credit:** 2	**Examination Scheme:** **CIE** : 20 Marks **MSE**: 20 Marks **SEE** : 60 Marks

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

Companion Course: -26-ESC-1-16: Digital Electronics and Logic Design Lab

Course Objectives:

- **To understand** the fundamentals of digital electronics, number systems, binary codes, Boolean algebra, and logic gates.
- **To apply** Boolean algebra and Karnaugh Map techniques to simplify Boolean expressions.
- **To design** combinational and sequential logic circuits using standard digital building blocks such as adders, subtractors, multiplexers, flip-flops, registers, and counters.
- **To understand** sequential system design using Algorithmic State Machine (ASM) charts and programmable logic devices (PLDs, CPLDs, and FPGAs) for digital hardware implementation.

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

CO No.	CO	BL
CO1	**Understand** the fundamentals of digital electronics, number systems, binary codes, Boolean algebra, and logic gates to analyze basic digital logic problems.	2
CO2	**Apply** Boolean algebra, truth tables, SOP/POS forms, Karnaugh Maps, and Don't Care conditions to simplify Boolean functions and design optimized combinational logic circuits.	3
CO3	**Design** combinational logic circuits including adders, subtractors, multiplexers, demultiplexers, comparators, parity generators/checkers, and code converters for digital applications.	3
CO4	**Design** the sequential logic circuits using flip-flops, shift registers, counters.	3
CO5	**Understand** the Algorithmic State Machine (ASM) charts for digital system implementation.	2
CO6	**Understand** the architecture and applications of Programmable Logic Devices (ROM, PAL, PLA, SPLD, CPLD, and FPGA) and implement basic logic functions using programmable logic devices	2

Course Contents

Unit I	**Introduction to Digital Electronics and Number System**	**5 Hours**

Fundamentals of Digital Electronics: Analog vs. Digital systems, advantages and applications of digital electronics. **Logic Gates:** Basic and universal logic gates, logic symbols, truth tables. **Boolean Algebra:** Basic postulates, theorems, properties, simplification of Boolean expressions, and DeMorgan's theorems. **Number Systems:** Decimal, Binary, Octal, and Hexadecimal and their conversions.**Signed Binary Number Representation:** Sign-magnitude, 1's complement, and 2's complement representation.**Binary Codes:** BCD, Excess-3, Gray code, Binary code, code conversions, and applications.		
#Exemplar/Case Studies : Digital locks using logic gates		
***Mapping of Course Outcomes**	**CO1**	
Unit II	**Minimization Technique**	**5 Hours**
Representation of Boolean functions using Truth Tables ,**Standard forms of Boolean expressions:**Sum of Products (SOP),Product of Sums (POS) ,Simplification of logical functions, Minimization of SOP and POS forms . **Minimization Technique**s:K-map (Karnaugh map) (up to 4 variables) ,Minimization of SOP and POS expressions using K-Maps,Simplification using Don't Care Conditions		
#Exemplar/Case Studies: Design of a Smart Home Security Alarm System using Truth Tables, SOP/POS representations, Karnaugh Map minimization, and Don't Care conditions for optimized combinational logic design		
***Mapping of Course Outcomes**	**CO2**	
Unit III	**Combinational Logic Design**	**6 Hours**
Introduction to combinational logic circuits and their applications. Design of Half Adder, Full Adder, Half Subtractor, and Full Subtractor. Binary addition using 4-bit Binary Adder and BCD Adder. Multiplexers (MUX) , cascading multiplexers, Demultiplexers (DEMUX). Realization of Sum of Products (SOP) and Product of Sums (POS) logic functions using MUX and DEMUX. Design 2-bit Comparators, Parity Generators and Parity Checkers.		
#Exemplar/Case Studies: Combinational Logic Design of BCD to 7-segment display Controller		
***Mapping of Course Outcomes**	**CO3**	
Unit IV	**Sequential Logic Design**	**6 Hours**
Flip-Flops: SR, JK, D, and T Flip-Flops; Preset and Clear operations; Master-Slave JK Flip-Flop; Conversion between different types of Flip-Flops. **Shift Registers:** Serial-In Serial-Out (SISO), Serial-In Parallel-Out (SIPO), Parallel-In Serial-Out (PISO), and Parallel-In Parallel-Out (PIPO).. **Counters:** Asynchronous (Ripple) Counters, Synchronous Counters, BCD Counters, Modulus (MOD-n) Counters.		
#Exemplar/Case Studies: Digital Clock/Stopwatch using Counters		
***Mapping of Course Outcomes**	**CO4**	
Unit V	**Algorithmic State Machines**	**4 Hours**
Fundamentals of Algorithmic State Machines (ASM) .ASM charts: symbols, notations, and construction. State diagrams,Design of sequential circuits using ASM charts		

#Exemplar/Case Studies: Vending Machine Controller using Algorithmic State Machines		
***Mapping of Course Outcomes**	**CO5**	
Unit VI	**Programmable Logic Devices**	**4 Hours**
Overview of Read-Only Memory (ROM), Programmable Array Logic (PAL), and Programmable Logic Array (PLA). Design of 4-variable Sum of Products (SOP) logic functions using Programmable Logic Devices (PLDs). Basic architecture and features of Simple Programmable Logic Devices (SPLDs) and Complex Programmable Logic Devices (CPLDs).		
#Exemplar/Case Studies:Traffic Light Control System Using PLD		
***Mapping of Course Outcomes**	**CO6**	
Learning Resources		
Text Books		
T1. R.P. Jain, "Modern Digital Electronics ", 3rd Edition, TataMcGraw-Hill, ISBN: 0–07–049492–4 **T2.** G. K. Kharate, "Digital Electronics", Oxford Press, ISBN-10: 0198061838		
Reference Books :		
R1. John Yarbrough, "Digital Logic applications and Design", Cengage Learning, ISBN – 13: 978-81-315-0058-3**.** **R2.** D. Leach, Malvino, Saha, "Digital Principles and Applications"ll, Tata McGraw Hill, ISBN –13:978-0-07-014170-4 **R3.** Anil Maini, "Digital Electronics: Principles and Integrated Circuits"ll, Wiley India Ltd, ISBN:978-81-265-1466-3.		
Additional Resources: (Books, e-Resources) https://www.springer.com/gp/book/9783030361952 https://www.mheducation.co.uk/ebook-fundamentals-of-digital-logic-9780077144227-eme		
MOOC Courses links : • Digital Circuits, by Prof. Santanu Chattopadhyay https://swayam.gov.in/nd1_noc19_ee51/preview • Digital Circuits and Systems, Prof. S. Srinivasan https://nptel.ac.in/courses/117/106/117106086/ • Microprocessors and Interfacing By Prof. Shaik Rafi Ahamed | IIT Guwahati https://swayam.gov.in/nd1_noc20_ee11/preview • Switching Circuits And Logic Design By Prof. Indranil Sengupta https://swayam.gov.in/nd1_noc20_cs67/preview		

26-PCC-CS-1-01: Object Oriented Programming

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

Prerequisite Courses:26-ESC-1-13: Problem Solving and Programming

Companion Course: 26-PCC-CS-1-02: Object Oriented Programming Lab

Course Objectives:

- To understand the fundamentals of platform independent object oriented language Java.
- To demonstrate skills in writing programs using exception handling techniques.
- To understand efficient user interface design techniques.

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

CONo	CO	BL
CO1	**Use** the syntax and semantics of Java programming language and basic concepts of OOP.	3
CO2	**Develop** reusable programs using the concepts of inheritance, polymorphism, interfaces and packages	3
CO3	**Apply** the concept of Exception handling to develop efficient and error free codes.	3
CO4	**Understand** multithreading concepts in Java.	3

Course Contents

Unit I	**Introduction to OOP and Java Program Structure**	**6 Hours**

Overview of Object-Oriented Programming , Principles of OOP: Encapsulation, Abstraction, Inheritance, Polymorphism , Java Programming Language Overview : Java Environment, Data types, Java Program Structure: Main Method and Execution Flow, Data Types and Variables, Basic Input/Output Operations, Type Casting, Wrapper Class, Garbage Collection, Command line Arguments, Array, Strings: String class and its functions

#Exemplar/Case Studies:Demonstrate Online Bookstore Management System for a local bookstore using user input or command-line arguments, store the information, and display the list of books.

***Mapping of Course Outcomes**	**CO1**	
Unit II	**Classes, Objects, and Packages**	**6 Hours**
Defining classes, declaring objects, Instance Variables and Methods, defining methods, passing parameters, Constructors and Initialization, Static Members, Access Modifiers (public, private, protected), this keyword , Encapsulation through private fields and public getter/setter methods, Package: Define Package, naming and creating package, accessing package, import statement.		
#Exemplar/Case Studies: Demonstrate a Java-based Student Management System using core object-oriented programming concepts including class creation, object instantiation, encapsulation, constructors, static members, access modifiers, and package management.		
***Mapping of Course Outcomes**	**CO2**	
Unit III	**Inheritance, Polymorphism and Interface**	**6 Hours**
Inheritance-Types of Inheritance, use of super keyword, Abstract classes and methods Polymorphism - Method overloading and Method Overriding, Interfaces - Interfaces and Multiple Inheritance, Implementing Interfaces		
#Exemplar/Case Studies:Develop a Java-based Payroll System that demonstrates inheritance (single, multilevel), use of super keyword, abstract classes and methods, method overloading and overriding, and interface-based multiple inheritance.		
***Mapping of Course Outcomes**	**CO2**	
Unit IV	**Exception Handling and Multithreading**	**6 Hours**
Error and Exception: Types of errors, exceptions, try and catch statement, nested try statement, throws and finally statement, chained exceptions, custom exceptions Java Thread Model: Main Thread, Life Cycle of thread, Creating thread: Implementing Thread using thread class and Runnable interface. isAlive() and join() , Thread priorities, Synchronization.		
#Exemplar/Case Studies: SmartBank – Exception-Handled Multi-Threaded Banking Application Design and implement a Java-based banking system that uses OOP principles to manage accounts, demonstrates exception handling for real-world banking errors like insufficient funds and invalid account numbers, and uses multithreading to simulate concurrent transactions.		
***Mapping of Course Outcomes**	**CO3 , CO4**	
Learning Resources		
Text Books		

T1. Herbert Schildt, "The Complete Reference Java", 9th Ed, TMH,ISBN: 978-0-07-180856-9.
T2. Balagurusamy E., "Programming with JAVA" , Mcgraw Hill Education(India Private Limited,New Delhi,5th Edition ISBN-13-978-93-51-34-320-2.

Reference Books :

R1. Dr.R.Nageshwar Rao, "Core Java: An Integrated Approach" , "Dreamtech Press, ISBN : 978 - 93 - 5119 - 758-4

Additional Resources: (Books, e-Resources)

- https://docs.oracle.com/javase/8/docs/

MOOC Courses links :

1. **Programming in Java :** https://nptel.ac.in/courses/106105191

26-BSC-1-08: Quantum Physics Laboratory

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

Prerequisites :
Useful Concepts: Black Body Radiation ,Photoelectric Effect ,Compton Effect ,de Broglie Matter Waves, Electron Diffraction, Planck's Law etc.

Companion Course: 26-BSC-1-08: Quantum Physics

Course Objectives:

- To familiarize students with basic quantum phenomena through experiments and simulations.
- To correlate theoretical quantum concepts with practical observations.
- To develop skills in measurement, data analysis, and interpretation of quantum systems.
- To provide hands-on experience with virtual laboratories and computational tools used in quantum physics.

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

CONo	CO	BL
CO1	**Demonstrate** to understand the dual nature of light as both a wave and a particle.	3
CO2	**Apply** the concept of photon energy to relate the wavelength and energy of electromagnetic radiation	3
CO3	**Analyze** diffraction patterns produced by laser light and evaluate the wavelength from experimental observations.	4
CO4	**Apply** the concept of quantum tunneling to explain practical applications such as alpha decay and Scanning Tunneling Microscopy (STM).	3
CO5	**Demonstrate** the characteristics of superconductors and interpret their practical applications using virtual simulation techniques.	3
CO6	**Apply** the principles of quantum computing to represent qubit states, implement single-qubit gates, and analyze quantum phenomena such as superposition, entanglement, and measurement using quantum simulators.	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.

Suggested List of Laboratory Experiments/Assignments

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	To study the effect of frequency and intensity of incident light on photoelectron emission.	CO1, CO2
2.	Determination of Planck's Constant using LED Method	CO1
3.	To study the diffraction pattern produced by a laser beam passing through a diffraction grating and determine the wavelength of the laser light.	CO3
4.	Simulation of Quantum Tunneling Through a Potential Barrier	CO3, CO4
5	Study of Superconductivity Using Virtual Simulation.	CO5
6	Representation of Qubit States Using Dirac Bra-Ket Notation.	CO6
7	Representation of Multiple-Qubit States.	CO6
8	Simulation of Quantum Half Adder	CO6
9	Simulation of Quantum Entanglement and Bell States.	CO6

Learning Resources
Text Books **T1**. David J. Griffiths & Darrell F. Schroeter, *Introduction to Quantum Mechanics* – Cambridge University Press, 2018. **T2**. Nouredine Zettili, *Quantum Mechanics: Concepts and Applications* – Wiley India, 2022
Reference Books : **R1.** J. J. Sakurai & Jim Napolitano, *Modern Quantum Mechanics* – Cambridge University Press, 2021. **R2.** Richard P. Feynman, Robert B. Leighton & Matthew Sands, *The Feynman Lectures on Physics, Vol. III* – Basic Books, 2011. **R3.** Stephen Gasiorowicz, *Quantum Physics* – Wiley India, 2007. **R4**.Michael A. Nielsen & Isaac L. Chuang, *Quantum Computation and Quantum Information* (standard book).
Additional Resources: (Books, e-Resources) **1.**https://www.arvindguptatoys.com/toys.html

26-ESC-1-08: Engineering Graphics Lab

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

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

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

Course Objectives:

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

Course Outcomes:

After completion of the course, learners should be able to

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

Guidelines for Student's Laboratory Journal

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

Guidelines for Laboratory /Term Work Assessment

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

Guidelines for Laboratory Conduction

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

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

Suggested List of Laboratory Assignments

Group A: Assignments (Mandatory Assignment)

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

26-ESC-1-16: Digital Electronics and Logic Design Lab

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

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

Companion Course: 26-ESC-1-15: Digital Electronics and Logic Design.

Course Objectives:

- To implement combinational logic circuits using basic logic gates.
- To develop the ability to realize Boolean functions using multiplexers, decoders, and code converters.
- To impart knowledge of sequential logic circuits, including flip-flops and synchronous/asynchronous counters.

Course Outcomes:

After completion of the course, learners should be able to

CONo	COs	BL
CO1	**Design** combinational logic circuits using basic logic gates, multiplexers, decoders, and code converters.	3
CO2	**Realize** Boolean expressions using standard MSI devices such as multiplexers and decoders.	3
CO3	**Implement** sequential logic circuits, including flip-flop conversions and synchronous /asynchronous counters.	3
CO4	**Apply** digital logic circuits using standard TTL ICs to verify their functionality.	3

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual needs to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration concept, objectives, outcomes, data sheets of various ICs.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students neatly handwritten Laboratory Journal containing the title, objectives, problem statement, course outcome(s), theory, circuit diagram, IC pin configuration (where applicable), procedure, observations/results, conclusion, date of completion, and assessment with the assessor's signature for each experiment. To promote Green IT and environmental sustainability, the use of printed sheets should be avoided wherever possible.

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work shall be carried out based on the student's overall laboratory performance and the successful completion of each experiment. Evaluation shall be based on parameters such as timely completion, understanding and execution of the experiment, accuracy of results, innovation, efficiency, punctuality, and the neatness of the laboratory journal.

Guidelines for Laboratory Conduction

The instructor should design laboratory assignments by considering prerequisite knowledge, current technological developments, practical applications, and recent industry trends. The assignments should cater to students of varying abilities, encouraging both fundamental learning and advanced problem-solving. Different sets of assignments may be assigned to different student batches, and wherever possible, the assignments should be based on real-world applications and engineering problems..

Suggested List of Laboratory Experiments/Assignments

Sr. No.	Assignment Title	*Mapping of Course Outcomes
1.	Design and implement a Full Adder/Subtractor using basic logic gates.	CO1
2.	Design and implement a Binary to Gray Code Converter using combinational logic.	CO1
3.	Realize the given Boolean expression using Multiplexer ICs (74151/74153).	CO2
4.	Realize the given Boolean expression using Decoder/Demultiplexer ICs (74154/74138).	CO2
5.	Design and implement Flip-Flop Conversion: JK Flip-Flop to D Flip-Flop.	CO3
6.	Design and implement a 3-bit Asynchronous (Ripple) Counter using Master-Slave JK Flip-Flops.	CO3, CO4
7.	Design and implement a 3-bit Synchronous Up/Down Counter using T Flip-Flops.	CO3, CO4
8.	Design and implement a Modulo-n Counter using IC 7490.	CO4

Learning Resources

Virtual Lab:

https://de-iitr.vlabs.ac.in/
https://vlabs.iitkgp.ac.in/dec/

Text Books

T1. R.P. Jain, "Modern Digital Electronics ", 3rd Edition, TataMcGraw-Hill, ISBN: 0–07–049492–4
T2. G. K. Kharate, "Digital Electronics", Oxford Press, ISBN-10: 0198061838

Reference Books :

R1. John Yarbrough, "Digital Logic applications and Design", Cengage Learning, ISBN – 13: 978-81-315-0058-3**.**
R2. D. Leach, Malvino, Saha, "Digital Principles and Applications"ll, Tata McGraw Hill, ISBN –13:978-0-07-014170-4
R3. Anil Maini, "Digital Electronics: Principles and Integrated Circuits"ll, Wiley India Ltd, ISBN:978-81-265-1466-3.

26-PCC-CS-1-02: Object Oriented Programming Lab

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

Prerequisite Courses: 26-ESC-1-14: Problem Solving and Programming Lab

Companion Course: 26-PCC-CS-1-01: Object Oriented Programming

Course Objectives:

- To introduce Java compiler and Eclipse platform.
- To write programs for solving real world problems using the Java collection framework.
- To write GUI programs using applet controls in Java.
- To impart hands-on experience with Java programming

Course Outcomes:

After completion of the course, learners should be able to

CONo	CO	BL
CO1	**Apply** object-oriented programming concepts	3
CO2	**Develop** Java programs using arrays and string manipulation techniques	3
CO3	**Design** modular and reusable Java applications using Inheritance,Interface and Packages.	3
CO4	**Use** exception handling and multithreading for robust and concurrent Java applications.	3
CO5	**Demonstrate** problem-solving skills by developing structured and maintainable Java code.	3

Guidelines for 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, 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 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

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy needs to address the average students and inclusive of an element to attract and promote the intelligent students. Use of open source software is encouraged. Based on the concepts learned. Instructors may also set one assignment or mini-project that is suitable to respective branch beyond the scope of the syllabus.

Operating System recommended:- 64-bit Open source Linux or its derivative.

Programming tools recommended: Open Source Eclipse IDE.

Suggested List of Laboratory Experiments/Assignments

Sr No	Assignment Title	*Mapping of Course Outcomes

1.	Create a class Book with data members: title, author, and price. Write methods to accept and display book details. Create another class Library with the main method to create and use objects.	CO1
2.	Create a class StudentMarks that stores the marks of 5 students in an integer array. Accept the marks from the user, display them, and then calculate and display the total marks, average marks, highest mark, and lowest mark among the students.	CO1
3.	**Write a Java program to accept a sentence from the user. The program should:** 1. Count and display the total number of characters using length(). 2. Replace all spaces with dashes using replace(). 3. Extract and display the first 5 characters using substring(). 4. Convert the username to lowercase using toLowerCase(). 5. Convert the username to lowercase using toUpperCase().	CO2
4.	Define a class Book with attributes: title, author, and price. Implement the following constructors: **Default Constructor**: Initializes title = "Unknown", author = "Unknown", price = 0.0. **Parameterized Constructor**: Initializes title, author, and price with given values. **Copy Constructor**: Copies the details from another Book object.	CO1
5.	Write a class Employee with private data members: empId, name. Use getter and setter methods to access the data and print employee details.	CO1,CO2
6.	Design a simple "Smart Vehicle System" where students implement a base Vehicle class with derived classes (Car, Bike) to demonstrate inheritance, and use an ElectricVehicle interface to add electric functionality in ElectricCar.	CO3

7.	Create a Calculator class with overloaded add() methods: one for adding two integers, one for adding two floats, and one for adding three integers. Then, create a subclass AdvancedCalculator that overrides the add(int, int) method to return the sum with a custom message. Demonstrate both method overloading and overriding in the main() method.	CO3
8.	Write a Java program to demonstrate try-catch-finally. Divide two numbers where the denominator is zero to cause an ArithmeticException.Handle the exception using catch and print a message. Use a finally block to print a message that always executes.	CO4
9.	Create two classes, NumberPrinter (prints numbers 1-5 with a 1-second delay) and CharacterPrinter (prints characters A-E with a 1.5-second delay), and run both as separate threads simultaneously in the main class.	CO5

Learning Resources (If applicable)

Text Books

T1. Herbert Schildt, "The Complete Reference Java", 9th Ed, TMH,ISBN: 978-0-07-180856-9.
T2. Balagurusamy E., “Programming with JAVA” , Mcgraw Hill Education(India Private Limited,New Delhi,5th Edition ISBN-13-978-93-51-34-320-2

Reference Books :

R1. Dr.R.Nageshwar Rao, ”Core Java: An Integrated Approach” , ”Dreamtech Press”, ISBN : 978 - 93 - 5119-758-4

Virtual Lab : Core Java Programming

- https://java-iitd.vlabs.ac.in/

MOOC Courses links : Programming in Java

- https://nptel.ac.in/courses/106105191

26-VSC-1-01: TechSkill

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

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

Course Objectives:

Module I

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

Module II

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

Module III

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

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

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

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

Guidelines for Instructor's Manual

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

Guidelines for Student's Laboratory Journal

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

Guidelines for Laboratory /Term Work Assessment

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

Guidelines for Laboratory Conduction

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

Suggested List of Laboratory Experiments/Assignments

Module I : MobiTech Assignments (Mandatory Assignment)

Sr No	Assignment Title	*Mapping of Course Outcomes

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

	switch.	
Module III : Electronics Repair Hub (Mandatory Assignment)		
Sr No	**Assignment Title**	***Mapping of Course Outcomes**
1.	Handling of Electronic Instruments: Multimeter, CRO, DC Power Supply, etc	CO5
2.	Soldering & Desoldering Practice of Electronic Components	CO5
3.	Breadboard-Based Circuit Prototyping using LEDs, Resistors and Switches	CO5
4.	Arduino/ESP32-Based Basic Interfacing Experiment (LED/Switch/Relay)	CO6
5.	Interfacing of Sensors such as LDR/IR/Temperature Sensor (Develop Home Automation system using Arduino)	CO6
6.	Mini Innovation/Automation-Based Prototype Development (Develop Smart City Solution using Arduino)	CO6
Learning Resources (If applicable)		
Text Books		
T1. Chukky Oparandu, "Mobile Phones and Tablets Repairs: A Complete Guide for Beginners and Professionals", ISBN 9789534116 **T2.** Scott Mueller, "Upgrading and Repairing PCs", 16th Edition, BPB Publication, ISBN 81-7635-737-5 **T3.** Manahar Lotia, Pradeep Nair, Payal Lotia, "Modern Computer Hardware Course" , BPB Publication, ISBN: 9788183331678 **T4.** J. A. Sam Wilson, "Electronic Troubleshooting & Servicing Techniques", Thomson Delmar Learning **T5.** Simon Monk, Programming Arduino: Getting Started with Sketches, McGraw Hill.		
Reference Books :		
R1. Lotia M, "Modern Mobile Phone Service Diagram & Troubleshooting", Vol. I, BPB Publication, ISBN 8176563366 **R2.** Mark Edward Soper, "PC REPAIR AND TROUBLESHOOTING GUIDE", BPB Publication, ISBN: 9788183335096 **R3.** S. P. Bali, "Consumer Electronics", Pearson Education, 2nd Edition		
Additional Resources: (Books, e-Resources) **Module I** Link /scmp/assets/image/1179656187-CCTV_Installation_Technician English.pdf **Module II**		

Link **Module III** • https://www.arduino.cc/en/Tutorial/HomePage • https://randomnerdtutorials.com/projects-esp32/
MOOC Courses links : **Module II** Link Link

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

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

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

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

Course Objectives:

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

Course Outcomes:

After completion of the course, learners should be able to

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

Guidelines for Mentor:

1. Initiate Design Thinking Mindset

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

2. Defining Objectives – Innovation for Social Impact

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

3. Brainstorming and Idea Generation

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

4. Think Creatively to Solve the Problem

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

5. Build Prototypes and Test Ideas

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

Selection of Project/Problem/Theme :

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

Assessment:

- The college, department, and mentors regularly check student progress and how well the program is working.
- The Co-curricular Course-II is reviewed from time to time to ensure quality work.
- Both individual and group performance are observed during the course.
- Mentors and college authorities keep an eye on all activities and do regular assessments.
- Students should show teamwork, self-motivation, and take responsibility for their learning.
- The department supports students by giving proper guidance, orientation, and required resources.
- Mentors and students both take part in the assessment process.
- Students can show their learning through presentations, reports, or models.
- Assessment looks at each student's role, involvement, and performance in the group.
- Group work is also assessed based on teamwork, communication, task sharing, and cooperation.
- Proper documentation and clear presentations are an important part of the evaluation.

Evaluation and Continuous Assessment:

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

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

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

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

Curriculum and Evaluation Scheme for First Year B. Tech. in Artificial Intelligence & Data Science Engineering with Multidisciplinary Minor

To be implemented for 2026-30 Batch

(With Effect from Academic Year 2026-27)

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

Instructions to the candidates:

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

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

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

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

Curriculum and Evaluation Scheme for First Year B. Tech. in Artificial Intelligence & Data Science Engineering with Multidisciplinary Minor

To be implemented for 2026-30 Batch

(With Effect from Academic Year 2026-27)

Semester End Examination (Regular) : Month Year

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

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

Academic Year: **Pattern:**

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

Instructions to the candidates:

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

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

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

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

Curriculum and Evaluation Scheme for First Year B. Tech. in Artificial Intelligence & Data Science Engineering with Multidisciplinary Minor

To be implemented for 2026-30 Batch

(With Effect from Academic Year 2026-27)

Supporting Document

Sr.No.	Syllabus Contains	Short Answer	Yes / No	Page No. (In Syllabus)
1	अभ्यासक्रम	Enclosed in Syllabus	Yes	**01**
2	पात्रता	(As per the Rules and Regulations mentioned in MoM)	Yes	**96**
3	अभ्यासक्रमाची उद्दिष्टे	Enclosed in Syllabus	Yes	**13**
4	विषयाचे नाव	Enclosed in Syllabus	Yes	**08**
5	घटकांचा तपशील	Enclosed in Syllabus	Yes	**08**
6	तासिका	Enclosed in Syllabus	Yes	**08**
7	श्रेयांक पद्धत	Enclosed in Syllabus	Yes	**08**
8	संदर्भ साहित्य	Enclosed in Syllabus	Yes	**15**
9	संदर्भ ग्रंथ	Enclosed in Syllabus	Yes	**15**
10	प्रश्नपत्रिकेचे स्वरूप	Enclosed in Syllabus	Yes	**94**
11	अंतर्गत मूल्यमापनाचे स्वरूप	Enclosed in Syllabus	Yes	**08**
12	सत्र परीक्षेचे स्वरूप	Enclosed in Syllabus	Yes	**95**
13	गुणांकन	Enclosed in Syllabus	Yes	**08**