Academic Syllabus

1st & 2nd Semester

Common to All Undergraduate Engineering Programs

AY 2026-27



Prerana Educational and Social Trust (R)

PES Institute of Technology & Management

An Autonomous Institution | Affiliated to Visvesvaraya Technological University, Belagavi
Approved by AICTE, New Delhi | Recognized by Government of Karnataka
Accredited by NAAC with 'A' Grade | NBA Accredited Programs - CV, CSE, ISE, EEE, ECE & ME

NH-206, Sagar Road, Shivamogga-577204, Karnataka

www.pestrust.edu.in/pesitm

Prerana Educational and Social Trust (R)

PES Institute of Technology & Management

NH-206, Sagar Road, Shivamogga-577204, Karnataka

Vision of the Institution

To be the most preferred institution for engineering & management education, research & entrepreneurship by creating professionally superior & ethically strong global manpower

Mission of the Institution

M1. Provide high-quality engineering and management education with technical excellence for global requirements.

M2. Promote research and entrepreneurship with collaboration, modern facilities, and strong mentorship.

M3. Build ethically grounded graduates who succeed globally, lead with integrity and commit to lifelong learning and social responsibility.

1st & 2nd Semester
Undergraduate Programs in Engineering

2026 Scheme & Syllabus

Prerana Educational and Social Trust (R)
PES Institute of Technology & Management
NH-206, Sagar Road, Shivamogga-577204, Karnataka

FIRST YEAR ACADEMICS | 2026 SCHEME OF TEACHING & EXAMINATION

Semester: 1st | **Stream: Computer Science & Allied (CSE, AIML, DS)** | **Cycle: Chemistry**

Course Type	Code	Course Title	TD	PSB	Teaching-Learning					Credits	Examination			
					CI (Hours per Semester)		LI (Hours per Semester)	TW & SL (per semester)	Total Hour (per semester)		Duration (hrs.)	CIE Marks	SEE Marks	Total Marks
					L	T	P							
ASC	26MATS101	Calculus & Linear Algebra: CSE Stream	MATHS	MATHS	45	30	-	45	120	4	3	50	50	100
ASC(IC)	26CHES102	Applied Chemistry for Smart Systems: CSE Stream	CHEMISTRY	CHEMISTRY	45	-	30	45	120	4	3	50	50	100
ETC	26IAIS103	Introduction to Artificial Intelligence	AI / DS	AI & DS	45	-	-	45	90	3	3	50	50	100
ESC	26ECES104	AIML - Electronics & Communication Engineering	ECE	ECE	45	-	-	45	90	3	3	50	50	100
	26IMES104	DS - Introduction to Mechanical Engineering	ME	ME										
	26IEES104	CSE - Introduction to Electrical Engineering	EEE	EEE										
PLC(IC)	26IPPS105	CSE-Introduction to Python Programming	CSE	AI & DS	45	-	30	45	120	4	3	50	50	100
		AIML & DS-Introduction to Python Programming	AI & DS											
SDC	26IDTX106	Innovation and Design Thinking Lab	CSE / ISE	CSE & ISE	-	-	30	-	30	1	3	50	50	100
HSMC	26ENGX107	Communication Skills (English)	BS & H	BS & H	15	-	-	15	30	1	2	50	50	100
AEC	26ICEX108	Indian Constitution & Engineering Ethics	BS & H	BS & H	15	-	-	-	-	PP	-	100	-	100
SDC	26SKLX109	Skill Lab	Resp. Dept.	Resp. Dept.	-	-	15	15	30	1	-	100	-	100
TOTAL					**255**	**30**	**105**	**255**	**630**	**21**	**20**	**550**	**350**	**900**

FIRST YEAR ACADEMICS | 2026 SCHEME OF TEACHING & EXAMINATION															
Semester: 2nd		**Stream: Computer Science & Allied (CSE, AIML, DS)**									**Cycle: Physics**				
Course Type	**Code**	**Course Title**	**TD**	**PSB**	**Teaching-Learning**						**Examination**			
					CI (Hours per Semester)		**LI (Hours per Semester)**	**TW & SL (per semester)**	**Total Hour (per semester)**	**Credits**	**Duration (hrs.)**	**CIE Marks**	**SEE Marks**	**Total Marks**
					L	**T**	**P**							
ASC	26MATS201	Numerical Methods: CSE Stream	MATHS	MATHS	45	30	-	45	120	4	3	50	50	100
ASC (IC)	26PHYS202	Quantum Physics and Applications: CSE Stream	PHYSICS	PHYSICS	45	-	30	45	120	4	3	50	50	100
ESC	26CEDS203	Computer Aided Engineering Drawing: CSE Stream	ME	ME	30	-	30	30	90	3	3	50	50	100
ESC	26IMES204	AIML - Introduction to Mechanical Engineering	ME	ME	45	-	-	45	90	3	3	50	50	100
	26ECES204	CSE & DS - Electronics & Communication Engineering	ECE	ECE										
PSC	26PCLS205	CSE-Programming in C Language	CSE	CSE & ISE	45	-	-	45	90	3	3	50	50	100
		AIML & DS-Programming in C Language	AI & DS											
PSCL	26CPLS206	CSE-C Programming Laboratory	CSE	CSE & ISE	-	-	30	-	30	1	3	50	50	100
		AIML & DS-C Programming Laboratory	AI & DS											
SDC	26IDPX206	Interdisciplinary Project-Based Learning	CSE/ISE	CSE & ISE	-	-	30	-	30	1	3	50	50	100
AEC	26KANX208	Samskruthika Kannada/ Balake Kannada	BS & H	BS & H	15	-	-	15	30	1	1	50	50	100
NCMC	26SSX209	Soft skills	BS & H	BS & H	15	-	-	-	-	PP	-	100	-	100
TOTAL					**240**	**30**	**120**	**225**	**600**	**20**	**22**	**500**	**400**	**900**

FIRST YEAR ACADEMICS | 2026 SCHEME OF TEACHING & EXAMINATION														
Semester: 1st		**Stream: Computer Science & Allied (ISE)**									**Cycle: Physics**			
Course Type	**Code**	**Course Title**	**TD**	**PSB**	**Teaching-Learning**						**Examination**			
					CI (Hours per Semester)		**LI** (Hours per Semester)	**TW & SL** (per semester)	**Total Hour** (per semester)	**Credits**	**Duration (hrs.)**	**CIE Marks**	**SEE Marks**	**Total Marks**
					L	**T**	**P**							
ASC	26MATS101	Calculus and Linear Algebra: CSE Stream	MATHS	MATHS	45	30	-	45	120	4	3	50	50	100
ASC (IC)	26PHYS102	Quantum Physics and Applications: CSE Stream	PHYSICS	PHYSICS	45	-	30	45	120	4	3	50	50	100
ESC	26CEDS103	Computer Aided Engineering Drawing: CSE Stream	ME	ME	30	-	30	30	90	3	3	50	50	100
ESC	26BSMS104	Building Sciences & Mechanics	CV	CV	45	-	-	45	90	3	3	50	50	100
PSC	26PCLS105	Programming in C Language	ISE	CSE & ISE	45	-	-	45	90	3	3	50	50	100
PSCL	26CPLS106	C Programming Laboratory	ISE	CSE & ISE	-	-	30	-	30	1	3	50	50	100
SDC	26IDTX106	Innovation and Design Thinking Lab	ISE	CSE & ISE	-	-	30	-	30	1	3	50	50	100
AEC	26KANX108	Samskruthika Kannada/ Balake Kannada	BS & H	BS & H	15	-	-	15	30	1	1	50	50	100
NCMC	26SSX109	Soft skills	BS & H	BS & H	15	-	-	-	-	PP	-	100	-	100
TOTAL					**240**	**30**	**120**	**225**	**600**	**20**	**22**	**500**	**400**	**900**

FIRST YEAR ACADEMICS | 2026 SCHEME OF TEACHING & EXAMINATION															
Semester: 2nd		**Stream: Computer Science & Allied (ISE)**									**Cycle: Chemistry**				
Course Type	**Code**	**Course Title**	**TD**	**PSB**	**Teaching-Learning**						**Examination**			
					CI (Hours per Semester)		**LI (Hours per Semester)**	**TW & SL (per semester)**	**Total Hour (per semester)**	**Credits**	**Duration (hrs.)**	**CIE Marks**	**SEE Marks**	**Total Marks**
					L	**T**	**P**							
ASC	26MATS201	Numerical Methods: CSE Stream	MATHS	MATHS	45	30	-	45	120	4	3	50	50	100
ASC(IC)	26CHES202	Applied Chemistry for Smart Systems: CSE Stream	CHEMISTRY	CHEMISTRY	45	-	30	45	120	4	3	50	50	100
ETC	26IAIS203	Introduction to Artificial Intelligence	AI / DS	AI & DS	45	-	-	45	90	3	3	50	50	100
ESC	26ECES204	Electronics & Communication Engineering	ECE	EEE & ECE	45	-	-	45	90	3	3	50	50	100
PLC(IC)	26IPPS205	Introduction to Python Programming	ISE	AI & DS	45	-	45	30	120	4	3	50	50	100
SDC	26IDPX206	Interdisciplinary Project-Based Learning	ISE	CSE & ISE	-	-	30	-	30	1	3	50	50	100
HSMC	26ENGX207	Communication Skills (English)	BS & H	BS & H	15	-	-	15	30	1	2	50	50	100
AEC	26ICEX208	Indian Constitution & Engineering Ethics	BS & H	BS & H	15	-	-	-	-	PP	-	100	-	100
SDC	26SKLX209	Skill Lab	Resp. Dept.	Resp. Dept.	-	-	15	15	30	1	-	100	-	100
TOTAL					**255**	**30**	**120**	**240**	**630**	**21**	**20**	**550**	**350**	**900**

FIRST YEAR ACADEMICS | 2026 SCHEME OF TEACHING & EXAMINATION															
Semester: 1st		**Stream: Civil Engineering**									**Cycle: Physics**				
Course Type	**Code**	**Course Title**	**TD**	**PSB**	**Teaching-Learning**						**Examination**				
					CI (Hours per Semester)		**LI (Hours per Semester)**	**TW & SL (per semester)**	**Total Hour (per semester)**	**Credits**	**Duration (hrs.)**	**CIE Marks**	**SEE Marks**	**Total Marks**	
					L	**T**	**P**								
ASC	26MATC101	Differential Calculus and Linear Algebra: CV Stream	MATHS	MATHS	45	30	-	45	120	4	3	50	50	100	
ASC (IC)	26PHYC102	Physics for Sustainable Structural Systems: CV Stream	PHYSICS	PHYSICS	45	-	30	45	120	4	3	50	50	100	
ESC	26CEDC103	Computer Aided Engineering Drawing: CV Stream	ME	ME	30	-	30	30	90	3	3	50	50	100	
ESC	26IMEC104	Introduction to Mechanical Engineering	ME	ME	45	-	-	45	90	3	3	50	50	100	
PSC	26ENMC105	Engineering Mechanics	CV	CV	45	-	-	45	90	3	3	50	50	100	
PSCL	26MMLC106	Mechanics & Materials Laboratory	CV	CV	-	-	30	-	30	1	3	50	50	100	
SDC	26IDTX106	Innovation and Design Thinking Lab	CV	CV	-	-	30	-	30	1	3	50	50	100	
AEC	26KANX108	Samskruthika Kannada/ Balake Kannada	BS & H	BS & H	15	-	-	15	30	1	1	50	50	100	
NCMC	26SSX109	Soft skills	BS & H	BS & H	15	-	-	-	-	PP	-	100	-	100	
TOTAL					**240**	**30**	**120**	**225**	**600**	**20**	**22**	**500**	**400**	**900**	

FIRST YEAR ACADEMICS | 2026 SCHEME OF TEACHING & EXAMINATION															
Semester: 2nd		**Stream: Civil Engineering**									**Cycle: Chemistry**				
Course Type	**Code**	**Course Title**	**TD**	**PSB**	**Teaching-Learning**						**Examination**			
					CI (Hours per Semester)		**LI** (Hours per Semester)	**TW & SL** (per semester)	**Total Hour** (per semester)	**Credits**	**Duration (hrs.)**	**CIE Marks**	**SEE Marks**	**Total Marks**
					L	**T**	**P**							
ASC	26MATC201	Differential Calculus and Numerical Methods: CV Stream	MATHS	MATHS	45	30	-	45	120	4	3	50	50	100
ASC(IC)	26CHEC202	Applied Chemistry for Sustainable Structure & Material Design: CV Stream	CHEMISTRY	CHEMISTRY	45	-	30	45	120	4	3	50	50	100
ETC	26IAIC203	Introduction to Artificial Intelligence	AI / DS	AI & DS	45	-	-	45	90	3	3	50	50	100
ESC	26IEEC204	Introduction to Electrical Engineering	EEE	EEE & ECE	45	-	-	45	90	3	3	50	50	100
PLC(IC)	26ICPC205	Introduction to C Programming	CSE / ISE	CSE & ISE	45	-	45	30	120	4	3	50	50	100
SDC	26IDPX206	Interdisciplinary Project-Based Learning	CV	CV	-	-	30	-	30	1	3	50	50	100
HSMC	26ENGX207	Communication Skills (English)	BS & H	BS & H	15	-	-	15	30	1	2	50	50	100
AEC	26ICEX208	Indian Constitution & Engineering Ethics	BS & H	BS & H	15	-	-	-	-	PP	-	100	-	100
SDC	26SKLX209	Skill Lab	Resp. Dept.	Resp. Dept.	-	-	15	15	30	1	-	100	-	100
TOTAL					**255**	**30**	**120**	**240**	**630**	**21**	**20**	**550**	**350**	**900**

FIRST YEAR ACADEMICS | 2026 SCHEME OF TEACHING & EXAMINATION														
Semester: 1st		**Stream: Mechanical Engineering**								**Cycle: Physics**				
Course Type	**Code**	**Course Title**	**TD**	**PSB**	**Teaching-Learning**						**Examination**			
					CI (Hours per Semester)		**LI (Hours per Semester)**	**TW & SL (per semester)**	**Total Hour (per semester)**	**Credits**	**Duration (hrs.)**	**CIE Marks**	**SEE Marks**	**Total Marks**
					L	**T**	**P**							
ASC	26MATM101	Differential Calculus and Linear Algebra: ME Stream	MATHS	MATHS	45	30	-	45	120	4	3	50	50	100
ASC (IC)	26PHYM102	Physics of Materials: ME Stream	PHYSICS	PHYSICS	45	-	30	45	120	4	3	50	50	100
ESC	26CEDM103	Computer Aided Engineering Drawing: ME Stream	ME	ME	30	-	30	30	90	3	3	50	50	100
ESC	26ECEM104	Electronics & Communication Engineering	ECE	EEE & ECE	45	-	-	45	90	3	3	50	50	100
PSC	26EMEM105	Elements of Mechanical Engineering	ME	ME	45	-	-	45	90	3	3	50	50	100
PSCL	26MELM106	Mechanical Engineering Laboratory	ME	ME	-	-	30	-	30	1	3	50	50	100
SDC	26IDTX106	Innovation and Design Thinking Lab	ME	ME	-	-	30	-	30	1	3	50	50	100
AEC	26KANX108	Samskrutika Kannada/ Balake Kannada	BS & H	BS & H	15	-	-	15	30	1	1	50	50	100
NCMC	26SSX109	Softskills	BS & H	BS & H	15	-	-	-	-	PP	-	100	-	100
TOTAL					**240**	**30**	**120**	**225**	**600**	**20**	**22**	**500**	**400**	**900**

FIRST YEAR ACADEMICS | 2026 SCHEME OF TEACHING & EXAMINATION															
Semester: 2nd		**Stream: Mechanical Engineering**								**Cycle: Chemistry**					
Course Type	**Code**	**Course Title**	**TD**	**PSB**	**Teaching-Learning**						**Examination**			
					CI (Hours per Semester)		**LI** (Hours per Semester)	**TW & SL** (per semester)	**Total Hour** (per semester)	**Credits**	**Duration (hrs.)**	**CIE Marks**	**SEE Marks**	**Total Marks**
					L	**T**	**P**							
ASC	26MATM201	Multivariable Calculus and Numerical Methods: ME Stream	MATHS	MATHS	45	30	-	45	120	4	3	50	50	100
ASC(IC)	26CHEM202	Applied Chemistry	CHEMISTRY	CHEMISTRY	45	-	30	45	120	4	3	50	50	100
ETC	26IAIM203	Introduction to Artificial Intelligence	AI / DS	AI & DS	45	-	-	45	90	3	3	50	50	100
ESC	26BSMS204	Building Sciences and Mechanics	CV	CV	45	-	-	45	90	3	3	50	50	100
PLC(IC)	26ICPM205	Introduction to C Programming	CSE / ISE	CSE & ISE	45	-	30	45	120	4	3	50	50	100
SDC	26IDPX206	Interdisciplinary Project-Based Learning	ME	ME	-	-	30	-	30	1	3	50	50	100
HSMC	26ENGX207	Communication Skills (English)	BS & H	BS & H	15	-	-	15	30	1	2	50	50	100
AEC	26ICEX208	Indian Constitution & Engineering Ethics	BS & H	BS & H	15	-	-	-	-	PP	-	100	-	100
SDC	26SKLX209	Skill Lab	Resp. Dept.	Resp. Dept.	-	-	15	15	30	1	-	100	-	100
TOTAL					**255**	**30**	**105**	**255**	**630**	**21**	**20**	**550**	**350**	**900**

FIRST YEAR ACADEMICS | 2026 SCHEME OF TEACHING & EXAMINATION															
Semester: 1st		**Stream: Electrical (EEE & ECE)**									**Cycle: Physics**				
Course Type	**Code**	**Course Title**	**TD**	**PSB**	**Teaching-Learning**						**Examination**			
					CI (Hours per Semester)		**LI** (Hours per Semester)	**TW & SL** (per semester)	**Total Hour** (per semester)	**Credits**	**Duration (hrs.)**	**CIE Marks**	**SEE Marks**	**Total Marks**
					L	**T**	**P**							
ASC	26MATE101	Differential Calculus and Linear Algebra: EEE Stream	MATHS	MATHS	45	30	-	45	120	4	3	50	50	100
ASC (IC)	26PHEC102	Quantum Physics and Electronic Sensors: ECE	PHYSICS	PHYSICS	45	-	30	45	120	4	3	50	50	100
	26PHEE102	Physics of Electrical Engineering Materials: EEE												
ESC	26CEDE103	Computer Aided Engineering Drawing: EEE Stream	ME	ME	30	-	30	30	90	3	3	50	50	100
ESC	26EITE104	Essentials of Information Technology	CSE/ISE	CSE & ISE	45	-	-	45	90	3	3	50	50	100
PSC	26ECEE105	ECE-Fundamentals of Electronics & Communication Engineering	ECE	EEE & ECE	45	-	-	45	90	3	3	50	50	100
	26BEEE105	EEE-Basics of Electrical Engineering	EEE											
PSCL	26FELE106	ECE-Fundamentals of Electronics Laboratory	ECE	EEE & ECE	-	-	30	-	30	1	3	50	50	100
	26BEEL106	EEE-Basic Electrical Engineering Laboratory	EEE											
SDC	26IDTX106	Innovation and Design Thinking Lab	EEE & ECE	EEE & ECE	-	-	30	-	30	1	3	50	50	100
AEC	26KANX108	Samskruthika Kannada/ Balake Kannada	BS & H	BS & H	15	-	-	15	30	1	1	50	50	100
NCMC	26SSX109	Soft skills	BS & H	BS & H	15	-	-	-	-	PP	-	100	-	100
TOTAL					**240**	**30**	**120**	**225**	**600**	**20**	**22**	**500**	**400**	**900**

FIRST YEAR ACADEMICS | 2026 SCHEME OF TEACHING & EXAMINATION															
Semester: 2nd		**Stream: Electrical (EEE & ECE)**								**Cycle: Chemistry**					
Course Type	**Code**	**Course Title**	**TD**	**PSB**	**Teaching-Learning**						**Examination**			
					CI (Hours per Semester)		**LI (Hours per Semester)**	**TW & SL (per semester)**	**Total Hour (per semester)**	**Credits**	**Duration (hrs.)**	**CIE Marks**	**SEE Marks**	**Total Marks**
					L	**T**	**P**							
ASC	26MATE201	Calculus, Laplace Transform And Numerical Techniques: EEE Stream	MATHS	MATHS	45	30	-	45	120	4	3	50	50	100
ASC(IC)	26CHEE202	Applied Chemistry for Emerging Electronics and Futuristic Devices: EEE Stream	CHEMISTRY	CHEMISTRY	45	-	30	45	120	4	3	50	50	100
ETC	26IAIE203	Introduction to Artificial Intelligence	AI / DS	AI & DS	45	-	-	45	90	3	3	50	50	100
ESC	26ECEE204	EEE-Electronics & Communication Engineering	ECE	ECE	45	-	-	45	90	3	3	50	50	100
	26IEEE204	ECE-Introduction to Electrical Engineering	EEE	EEE										
PLC(IC)	26ICPE205	Introduction to C Programming	CSE / ISE	CSE & ISE	45	-	45	30	120	4	3	50	50	100
SDC	26IDPX206	Interdisciplinary Project-Based Learning	EEE & ECE	EEE & ECE	-	-	30	-	30	1	3	50	50	100
HSMC	26ENGX207	Communication Skills (English)	BS & H	BS & H	15	-	-	15	30	1	2	50	50	100
AEC	26ICEX208	Indian Constitution & Engineering Ethics	BS & H	BS & H	15	-	-	-	-	PP	-	100	-	100
SDC	26SKLX209	Skill Lab	Resp. Dept.	Resp. Dept.	-	-	15	15	30	1	-	100	-	100
TOTAL					**255**	**30**	**120**	**240**	**630**	**21**	**20**	**550**	**350**	**900**

Syllabus of Applied Science Courses

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MATHEMATICS

Course Name: **Calculus and Linear Algebra: CS Stream** | Semester: 1st

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26MATS101	45	30	0	75	45	120	4

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1 Hr 30 min	3 Hrs	Descriptive

Course Learning Objectives

The purpose of the course is to facilitate the learners in:

CLO1: Determine the rank, consistency, and solutions of linear systems using elementary row transformations and numerical methods, with applications to traffic flow.

CLO2: Apply concepts of vector spaces, linear transformations, rank, nullity, and invertibility

CLO3: Apply partial derivatives, Jacobians, extrema, and vector calculus to solve multivariable problems.

Module 1	**System of Linear Equations**	Duration: L+T – 9+6 Hours

Elementary row transformation of a matrix using Echelon form: Rank of a matrix. Consistency and solution of system of linear equations: Gauss elimination method, Gauss Jordan method, Gauss Seidel method. Applications: Traffic flow.

Module 2	**Vector Space**	Duration: L+T – 9+6 Hours

Vector spaces and subspaces: definition and examples. Linear Combinations, linear span, linearly independent and dependent sets, basis and dimension, row space and column space of a matrix, Coordinates vector, inner products and orthogonality.

Module 3	**Linear Transformation**	Duration: L+T – 9+6 Hours

Definition and examples, algebra of linear transformations, matrix of a linear transformation. Singular, non-singular linear transformations and invertible linear transformations. Rank and nullity of linear transformations, Rank-Nullity theorem.

Module 4	**Calculus**	Duration: L+T – 9+6 Hours

Partial differentiation, total derivative and chain rule for composite functions, Jacobian, Statement of Taylor's and Maclaurin's series expansion for function of two variables. Maxima and minima for the function of two variables.

Module 5	**Vector Calculus**	Duration: L+T – 9+6 Hours

Scalar and vector fields, Gradient, directional derivatives, divergence and curl, physical interpretation solenoidal vector fields, irrotational vector fields and scalar potential. Introduction to polar coordinates and polar curves. Curvilinear coordinates: Scale factors, base vectors, Cylindrical polar coordinates, Spherical polar coordinates, transformation between cartesian and curvilinear systems, orthogonality.

References:

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley&Sons,10th Ed.,2018.
3. Seymour Lipschutz and Marc Lipson, Linear Algebra, Schaum's outlines series, 4th Ed., 2008.

Reference books:

1. B.V. Ramana, Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017.
2. Gilbert Strang, Linear Algebra and its Applications, Cengage Publications,

4th Ed., 2022.

3. N. P Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
4. James Stewart, Calculus, Cengage Publications, 7thEd., 2019.
5. David Poole, Linear Algebra, a modern introduction, Cengage publishers, 4th Ed., 2014.
6. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.
7. Gareth Williams, Linear Algebra with applications, Jones Bartlett Publishers Inc., 6th Ed., 2017.

Web links and Video Lectures (e-Resources):

http://academicearth.org/
VTU e-Shikshana Program
VTU EDUSAT Program
https://nptel.ac.in/courses/111106135
https://nptel.ac.in/courses/111105160
https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/
https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1	Apply direct and iterative methods to solve system of linear equations.
CO2	Apply the concepts of vector spaces to solve problems in linear algebra.
CO3	Apply linear transformations to solve problems in linear algebra.
CO4	Apply partial differentiation to solve problems involving functions of two variables.
CO5	Apply gradient, directional derivatives, divergence, curl, and curvilinear coordinates to solve problems in vector calculus.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	20
Learning Activity-1: Practicing problems -Average of two objective type / Descriptive type assessments for 30 marks each GATE-based Aptitude Test.	30 Each	60	15	
1 Activity Based Learning for **TW & SL** Course Project / Case Study Presentation / Programming Assignment / Open Book Test (preferably at RBL4 and RBL5 levels) / Assignment (at RBL3, RBL4, or RBL5 levels) / Any other relevant and innovative academic activity	50	50	10	
TOTAL CIE MARKS			50	
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Teamwork & Self Learning Activity (ABL)

Students will undertake a group-based activity related to the applications of mathematics in engineering and present their findings. Each group may consist of a maximum of four students. The activity will focus on applying mathematical concepts, teamwork, problem-solving, creativity, and presentation skills.

TW & SL Details (Duration & Rubrics for Evaluation)

Activity / Description	Duration	Evaluation criteria	Marks
Group-based activity on applications of Mathematics related to the syllabus. Maximum 4 students per group. Each group shall prepare a brief report and present the methodology, mathematical formulation, solution, and Engineering application. The activity may involve the use of MATLAB / Mathematica / Scilab / Python / Maxima or other appropriate mathematical tools.	45 hours	Mathematical Understanding Application of Concepts Team Participation Creativity & Innovation Presentation	10

Rubrics for activity-based Learning - 50 Marks

Performance Indicator	Superior	Good	Fair	Needs Improvement
Problem Understanding (15M)	Clearly identifies and understands the problem 13-15M	Good understanding with minor gaps 10-12M	Basic understanding 7-9M	Poor understanding 0-6M
Design / Implementation (15M)	Correct and systematic design/implementation 13-15M	Good implementation with minor errors- 10-12M	Basic implementation with some errors 7-9M	Incomplete implementation- 0-6M
Results & Presentation (20M)	Accurate results with clear presentation 17-20M	Good results and presentation 13-16M	Basic results and presentation 9-12M	Incomplete results/presentation 0-8M

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MATHEMATICS

Course Name: Differential Calculus & Linear Algebra: CV Stream						Semester: 1st	
Course Code	L (H/W)	T (H/W)	P (H/W)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26MATC101	45	30	0	75	45	120	4
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1 Hr 30 min	3 Hrs	Descriptive

Course Learning Objectives

The purpose of the course is to facilitate the learners in;
CLO1: Understand and apply differential calculus concepts to solve problems on curves and curvature and Multivariable calculus to solve engineering problems.
CLO2: Apply Linear algebra to solve Civil Engineering problems.
CLO3: Understand and solve first-order linear ordinary differential equations both in analytical and numerical methods.

Module 1	**Polar Curves and Curvature**	Duration: L+T – 9+6 Hours

Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between the two curves, Pedal equations—curvature and radius of curvature - Cartesian, parametric, polar and Pedal forms.

Module 2	**Series Expansion, indeterminate forms and multivariable calculus**	Duration: L+T – 9+6 Hours

Statement and problems on Taylor's and Maclaurin's series expansion for one variable. Indeterminate forms - L'Hospital's rule.
Partial differentiation, total derivative, differentiation of composite functions, Jacobian. Maxima and Minima for the function of two variables.

Module 3	**Linear Algebra**	Duration: L+T – 9+6 Hours

Elementary row transformation of a matrix , Rank of a matrix. Consistency and solution of system of linear equations. Gauss elimination method and approximate solution by Gauss -Seidel method, Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. Applications: Traffic flow.

Module 4	**Ordinary differential equations of first Order**	Duration: L+T – 9+6 Hours

Linear and Bernoulli's differential equation. Exact and reducible to exact differential equations with integrating factor $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ Orthogonal trajectories, Law of natural growth and decay.

Module 5	**Numerical solution of first order ODE**	Duration: L+T – 9+6 Hours

Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor-corrector method and Adams-Bashforth predictor-corrector method.

References:

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley &Sons, 10th Ed.,2018.
3. Gilbert Strang, Linear Algebra and its Applications, Cengage Publications,4thEd.,2022.

Reference books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. N. P. Baliand Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10thEd.,2022.
4. H.K. Das and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.

Web links and Video Lectures (e-Resources):

http://academicearth.org/
VTU e-Shikshana Program
VTU EDUSAT Program
https://nptel.ac.in/courses/111106135
https://nptel.ac.in/courses/111105160
https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/
https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1	Apply the Knowledge of calculus to solve the problems related to Polar curves and radius of curvature
CO2	Apply partial differentiation to calculate problems related to composite functions, Jacobians and estimate maxima and minima of multivariable functions.
CO3	Apply the principles of linear algebra to solve systems of linear equations, determine eigenvalues and eigenvectors, and analyze real-world problems such as traffic flow.
CO4	Solve first order ordinary linear differential equation analytically using standard methods and also able to apply in civil engineering applications
CO5	Apply the knowledge of numerical methods in solving physical and civil engineering phenomena

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	20
Learning Activity-1: Practicing problems -Average of two objective type / Descriptive type assessments for 30 marks each -GATE-based Aptitude Test.	30 Each	60	15	
1 Activity Based Learning for **TW & SL** Course Project / Case Study Presentation / Programming Assignment / Open Book Test (preferably at RBL4 and RBL5 levels) / Assignment (at RBL3, RBL4, or RBL5 levels) / Any other relevant and innovative academic activity	50	50	10	
TOTAL CIE MARKS			50	
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Team Work & Self Learning Activity (ABL)

Students will undertake a group-based activity related to the applications of mathematics in engineering and present their findings. Each group may consist of a maximum of four students. The activity will focus on applying mathematical concepts, teamwork, problem-solving, creativity, and presentation skills.

TW & SL Details (Duration & Rubrics for Evaluation)

Activity / Description	Duration	Evaluation criteria	Mars
Group-based activity on applications of Mathematics related to the syllabus. Maximum 4 students per group. Each group shall prepare a brief report and present the methodology, mathematical formulation, solution, and Engineering application. The activity may involve the use of MATLAB / Mathematica / Scilab / Python / Maxima or other appropriate mathematical tools.	45 hours	Mathematical Understanding Application of Concepts Team Participation Creativity & Innovation Presentation	10

Rubrics for activity-based Learning— 50 Marks

Performance Indicator	Superior	Good	Fair	Needs Improvement
Problem Understanding **(15M)**	Clearly identifies and understands the problem **13-15M**	Good understanding with minor gaps **10-12M**	Basic understanding **7-9M**	Poor understanding **0-6M**
Design / Implementation **(15M)**	Correct and systematic design/implementation **13-15M**	Good implementation with minor errors- **10-12M**	Basic implementation with some errors **7-9M**	Incomplete implementation- **0-6M**
Results & Presentation **(20M)**	Accurate results with clear presentation **17-20M**	Good results and presentation **13-16M**	Basic results and presentation **9-12M**	Incomplete results/presentation **0-8M**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MATHEMATICS

Course Name: Differential Calculus and Linear Algebra ME Stream | Semester: 1st

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26MATM101	45	30	0	75	45	120	4

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1 Hr 30 min	3 Hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners in;

CLO1: Understand and apply differential calculus concepts to solve problems on curves and curvature and Multivariable calculus to solve engineering problems.

CLO2: Solve Differential equations and apply them to electrical circuits.

CLO3: Solve Engineering problems using Linear algebra.

Module 1	**Polar Curves and Curvature**	Duration: L+T - 9+6

Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and radius of curvature - Cartesian, parametric, polar and pedal forms.

Module 2	**Series Expansion, Indeterminate Forms and Multivariable Calculus**	Duration: L+T - 9+6

Taylor's (statement only) & Maclaurin's series expansion for one variable, Indeterminate forms - L' Hospital's rule. Partial differentiation, total derivative, differentiation of composite functions. Jacobian. Maxima and minima for the function of two variables.

Module 3	**Ordinary Differential Equations of First Order**	Duration: L+T - 9+6

Linear and Bernoulli's differential equation. Exact and reducible to exact differential equations with integrating factor: $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$. Orthogonal trajectories.

Module 4	**Linear Algebra-1**	Duration: L+T - 9+6

Elementary row transformation of a matrix using echelon form: Rank of a matrix. Consistency and Solution of system of linear equations, Gauss elimination method, Gauss Jordon method, LU decomposition method.

Application to traffic flow.

Module 5	**Linear Algebra-2**	Duration: L+T - 9+6

Guass Seidel method, Eigenvalues and Eigenvectors, Model matrix, Diagonalization of the matrix (2x2 matrix), Rayleigh's power method, Inverse of a matrix by Cayley-Hamilton theorem.

References:

Textbooks:

1. B.S.Grewal,Higher Engineering Mathematics, Khanna Publishers,44th Ed.,2021.
2. E.Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10thEd.,2018.
3. Gilbert Strang, Linear Algebra and its Applications, Cengage Publications, 4th Ed.,2022.

Reference books:

1. B.V.Ramana, Higher Engineering Mathematics, McGraw-Hill Education, 11thEd.,2017
2. Srimanta Pal&SubodhC.Bhunia, Engineering Mathematics, Oxford University Press, 3rdEd., 2016.

3. N.P.Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
4. H.K.Das and Er.Rajnish Verma, Higher Engineering Mathematics, S.Chand Publication, 3rd Ed., 2014.
5. David CLay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.

http://academicearth.org/
VTUe-ShikshanaProgram
VTUEDUSATProgram
https://nptel.ac.in/courses/111106135
https://nptel.ac.in/courses/111105160
https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/
https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/

Expected Course Outcomes:
After successfully completing the course, the student will be able to;

CO1	Apply the concept of differential calculus to solve the problems on polar curves.
CO2	Apply series expansions, L'Hospital's rule, and partial differentiation to solve problems involving functions of one and two variables.
CO3	Apply to solve first-order differential equations.
CO4	Apply direct method to solve system of linear equations
CO5	Apply iterative and matrix methods to solve linear equations and find eigenvalues, eigenvectors, and matrix inverses.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	20
Learning Activity-1: Practicing problems Average of two objective type / Descriptive type assessments for 30 marks each -GATE-based Aptitude Test.	30 Each	60	15	
1 Activity Based Learning for TW & SL Course Project / Case Study Presentation / Programming Assignment / Open Book Test (preferably at RBL4 and RBL5 levels) / Assignment (at RBL3, RBL4, or RBL5 levels) / Any other relevant and innovative academic activity	50	50	10	
TOTAL CIE MARKS			50	
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Team Work & Self Learning Activity (ABL)
Students will undertake a group-based activity related to the applications of mathematics in engineering and present their findings. Each group may consist of a maximum of four students. The activity will focus on applying mathematical concepts, teamwork, problem-solving, creativity, and presentation skills.

TW & SL Details (Duration & Rubrics for Evaluation)

Activity / Description	Duration	Evaluation criteria	Marks
Group-based activity on applications of Mathematics related to the syllabus. Maximum 4 students per group. Each group shall prepare a brief report and present the methodology, mathematical formulation, solution, and Engineering application. The activity may involve the use of MATLAB / Mathematica / Scilab / Python / Maxima or other appropriate mathematical tools.	45 hours	Mathematical Understanding Application of Concepts Team Participation Creativity & Innovation Presentation	10

Rubrics for activity-based Learning— 50 Marks

Performance Indicator	Superior	Good	Fair	Needs Improvement
Problem Understanding **(15M)**	Clearly identifies and understands the problem **13-15M**	Good understanding with minor gaps **10-12M**	Basic understanding **7-9M**	Poor understanding **0-6M**
Design / Implementation **(15M)**	Correct and systematic design/implementation **13-15M**	Good implementation with minor errors- **10-12M**	Basic implementation with some errors **7-9M**	Incomplete implementation- **0-6M**
Results & Presentation **(20M)**	Accurate results with clear presentation **17-20M**	Good results and presentation **13-16M**	Basic results and presentation **9-12M**	Incomplete results/presentation **0-8M**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MATHEMATICS

Course Name: Differential Calculus & Linear Algebra EEE Stream | Semester: 1st

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26MATE101	45	30	0	75	45	120	4

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1 Hr 30 min	3 Hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners in;

CLO1: Understand and apply differential calculus concepts to solve problems on curves and curvature and Multivariable calculus to solve engineering problems.

CLO2: Solve Differential equations and apply them to electrical circuits.

CLO3: Solve Engineering problems using Linear algebra.

Module 1	**Differential Calculus**	Duration: L+T – 9+6 Hours

Polar curves, angle between the radius vector and the tangent, angle between the polar curves, Pedal equations. Curvature and radius of curvature in Cartesian, polar, parametric and Pedal forms.

Module 2	**Power series Expansions, indeterminate forms and multivariable calculus**	Duration: L+T – 9+6 Hours

Statement and problems on Taylor's and Maclaurin's series expansion for one variable. Indeterminate forms - L'Hospital's rule.

Partial Differentiation: Partial derivatives, total derivative, differentiation of composite functions, Jacobians. Maxima and minima for functions of two variables.

Module 3	**Ordinary Differential Equations of first order and first degree and nonlinear ODE**	Duration: L+T – 9+6 Hours

Exact and reducible to exact differential equations. Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ only. Linear and Bernoulli's differential equations. L-R and C-R circuits.

Non-linear differential equations: Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, reducible to Clairaut's equations.

Module 4	**Ordinary differential equations of higher Order**	Duration: L+T – 9+6 Hours

Higher-order linear ordinary differential equations with constant coefficients, homogeneous and non-homogeneous equations e^{ax}, $\sin(ax+b)$, $\cos(ax+b)$, x^n. Cauchy's and Legendre's homogeneous differential equations, L-C-R circuits.

Module 5	**Linear Algebra**	Duration: L+T – 9+6 Hours

Elementary transformations of a matrix using Echelon form, Rank of a matrix, consistency of a system of linear equations. Gauss elimination and Gauss –Seidel method to solve system of linear equations. Eigen values and eigen vectors of a matrix: power method to determine the dominant eigen value and corresponding eigen vector of a matrix. Applications: Traffic flow

References:

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.

2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.,2018.

3. Gilbert Strang, Linear Algebra and its Applications, Cengage Publications,4thEd.,2022.

Reference books:

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3. N. P. Baliand Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed.,2022.
4. H.K. Das and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.

Web links and Video Lectures (e-Resources):

http://academicearth.org/
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https://nptel.ac.in/courses/111105160
https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/
https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1	Apply the concept of differential calculus to solve the problems on polar curves
CO2	Apply series expansions, L'Hospital's rule, and partial differentiation to solve prob involving functions of one and two variables.
CO3	Apply methods of integrating factors, linear, Bernoulli's and non-linear differential equat including Clairaut's forms-to evaluate general and singular solutions.
CO4	Apply to solve higher-order linear differential equations.
CO5	Apply direct and iterative methods to solve system of linear equations

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimu Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	20
Learning Activity-1: Practicing problems -Average of two objective type / Descriptive type assessments for 30 marks each -GATE-based Aptitude Test.	30 Each	60	15	
1 Activity Based Learning for **TW & SL** Course Project / Case Study Presentation / Programming Assignment / Open Book Test (preferably at RBL4 and RBL5 levels) / Assignment (at RBL3, RBL4, or RBL5 levels) / Any other relevant and innovative academic activity	50	50	10	
TOTAL CIE MARKS			50	
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Team Work & Self Learning Activity (ABL)

Students will undertake a group-based activity related to the applications of mathematics in engineering and present their findings. Each group may consist of a maximum of four students. The activity will focus on applying mathematical concepts, teamwork, problem-solving, creativity, and presentation skills.

TW & SL Details (Duration & Rubrics for Evaluation)

ctivity / Description	**Duration**	**Evaluation criteria**	**Marks**
roup-based activity on applications of athematics related to the syllabus. aximum 4 students per group. Each group hall prepare a brief report and present the ethodology, mathematical formulation, olution, and Engineering application. The ctivity may involve the use of MATLAB / athematica / Scilab / Python / Maxima or ther appropriate mathematical tools.	45 hours	Mathematical Understanding Application of Concepts Team Participation Creativity & Innovation Presentation	10

Rubrics for activity-based Learning— 50 Marks

Performance Indicator	**Superior**	**Good**	**Fair**	**Needs Improvement**
Problem Understanding **-15M**	Clearly identifies and understands the problem **13-15M**	Good understanding with minor gaps **10-12M**	Basic understanding **7-9M**	Poor understanding **0-6M**
Design / Implementation **-15M**	Correct and systematic design/implementation **13-15M**	Good implementation with minor errors- **10-12M**	Basic implementation with some errors **7-9M**	Incomplete implementation**-** **0-6M**
Results & Presentation **-20M**	Accurate results with clear presentation **17-20M**	Good results and presentation **13-16M**	Basic results and presentation **9-12M**	Incomplete results/presentation **0-8M**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF CHEMISTRY

Course Name: Applied Chemistry for CSE Streams						Semester: 1st / 2nd	
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26CHES102/202	45	-	30	75	45	120	04
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1.5h	3h	Descriptive

Course Learning Objectives:
The purpose of the course is to facilitate learners to;
CLO1: Explain the principles and applications of sensors and corrosion control.
CLO2: Apply electrochemical principles to batteries, fuel cells, and solar energy devices.
CLO3: Explain quantum materials, polymers, and conducting polymers for engineering applications.
CLO4: Describe functional materials used in memory and display technologies.
CLO5: Explain green materials, biomaterials, and sustainable e-waste management.
CLO6: Demonstrate proficiency in quantitative chemical analysis and apply experimental skills to address engineering problems effectively

Module 1	**Sensors and Corrosion Science**	Duration: 09 Hours

Sensors: Introduction, terminologies- transducers, actuators, and sensors. Conductometric sensor-principle, construction, and its application in the estimation of acid mixture. Colorimetric sensor-principle, instrumentation, and its application in the estimation of copper in PCB. Biosensor-principle, construction, and working for the detection of glucose in biofluids.
Corrosion: Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration corrosion-waterline and pitting corrosion. Corrosion control-galvanization and anodization. Vapour corrosion inhibitors for protecting computer circuit boards, corrosion penetration rate (CPR)-definition and numerical problems.
Self-Study: Electrochemical gas sensors- principle, construction and its application in the detection of NOx and SOx in air samples.

Module 2	**Sustainable Energy Systems**	Duration: 09 Hours

Energy Systems: Introduction, basic overview of the Nernst equation, construction and working of a concentration cell and numerical problems. Batteries: classification of batteries, construction, working, and applications of Li-Ion battery.
Next-Generation Energy Devices: Introduction, construction and working of sodium-ion battery for EV applications. Construction and working of ultra-small asymmetric supercapacitor and its applications in IoT/wearable devices.
Sustainable Energy Devices: Introduction, fuel cells, difference between fuel cell and battery. Construction, working principle, applications, and limitations of solid-oxide fuel cell (SOFCs) and solar photovoltaic cell (PV cell). Production of green hydrogen by photocatalytic water splitting by TiO_2 catalyst and its advantages.
Self-Study: Difference between Li- ion battery and Na-Ion battery. Applications of lithium iron phosphate battery.

Module 3	**Quantum Materials and Polymers**	Duration: 09 Hours

Quantum Dots: Introduction, size-dependent properties- quantum confinement effect, surface-to-volume ratio & band gap. Synthesis of Cd-Se Quantum dots by wet chemical method and its applications. Construction, working principle, and applications of quantum dot-sensitized solar cells (QDSSCs).
Polymer: Introduction, number-average and weight-average molecular weight of the polymers and numerical problems. Synthesis and properties of nylon-6,6 and its advantages in 3D printing applications. Synthesis and properties of chlorinated polyvinyl chloride (CPVC), and polymethyl methacrylate (PMMA) and their uses in device applications. Synthesis and properties of nylon-6,6 and its advantages in 3D printing applications.
Conducting polymers: Introduction, synthesis of polyaniline, conduction mechanism, and its engineering applications.

Self-Study: Structure-properties relationship of polymers (Crystallinity, Strength, Elasticity and Chemical resistivity).		
Module 4	**Functional Materials for Memory and Display Systems**	Duration: 09 Hours
Introduction, organic semiconductors; types of organic semiconductors used in memory devices, p-type semiconductor-pentacene and n-type semiconductor-perfluoropentacene. Differences between organic and inorganic memory devices. Construction, working, and advantages of pentacene semiconductor chip. **Resistive RAM (ReRAM) Materials:** Introduction, synthesis of TiO_2 nanomaterial for RAM by sol-gel method, properties and applications. **Display Systems:** Introduction, liquid crystals (LCs)-classification, properties, and their applications. Construction, working principle, and applications of Organic Light Emitting Diodes (OLEDs), Active-Matrix Organic Light Emitting Diodes (AMOLEDs), and Quantum Light Emitting Diodes (QLEDs). **Self-study:** Construction, working principle and applications of Light Emitting Diodes (LEDs)		
Module 5	**Green Materials and E-Waste Management**	Duration: 09 Hours
Green Chemistry: Introduction, synthesis and properties of glycerol trioleate ester and its uses in IT infrastructure applications. Green synthesis of ZnO nanoparticles and their uses in magnetic Radio Frequency Identification (RFID) and Internet of Nano Things (IONT) system applications. **Biomaterials:** Introduction, synthesis and properties of polylactic Acid (PLA) and polyethylene glycol (PEG) and their uses in touchscreen applications. Synthesis and properties of Alginate Hydrogel and its uses in brain-computer interfaces (BCIs) applications. **E-waste:** Introduction, sources, composition of e-waste, effects of e-waste on the environment and human health, Artificial intelligence in e-waste management, extraction of gold from e-waste by the hydrometallurgy method. **Self-Study:** Properties and applications of green solvents for server heat management.		
PRACTICAL COMPONENTS OF IPCC LIST OF EXPERIMENTS 1. Estimation of total hardness of water by EDTA method. 2. Determination of chemical oxygen demand (COD) of industrial effluent sample. 3. Estimation of iron in TMT bar by diphenylamine indicator method. 4. Determination of total alkalinity of given water sample. 5. Determination of acid value of solder flux using KOH 6. Estimation of acid mixture using conductometric sensor (Conductometry). 7. Estimation of iron in rust sample using potentiometric sensor (Potentiometry). 8. Determination of pKa of cooling fluids using pH sensor (Glass electrode). 9. Estimation of copper present in e-waste using optical sensor (Colorimetry). 10. Determination of viscosity coefficient of liquid coolant sample. 11. Interpretation of pKa values of a cooling fluid using Origin software. 12. Chemical structure drawing using software: Chem Draw/ Chem Sketch.		
References:	**Text Books:** • Engineering Chemistry: Jain & Jain, Publisher: Dhanpat Rai Publishing Company, ISBN: 978- 935316118. • A Textbook of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016. • Engineering Chemistry, Suba Ramesh, Vairam, Ananda Murthy, 2011, Wiley India, ISBN: 9788126519880. • Engineering Chemistry, Suba Ramesh, Vairam, Ananda Murthy, 2011, Wiley India, ISBN: 9788126519880. • A Textbook of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016. **Reference Books** • Conducting Polymers, Fundamentals and Applications: Including Carbon Nanotubes and Graphene – Prasanna Chandrasekhar, Springer, 2019 (2nd ed.), ISBN: 9783030098858. • Quantum Dots and Polymer Nanocomposites: Synthesis, Chemistry, and Applications – Jyotishkumar Parameswaranpillai, Poushali Das, Sayan Ganguly, CRC Press, 2022, ISBN: 9781032210148.	

	• High Quality Liquid Crystal Displays and Smart Devices – Ishihara, Kobayashi & Ukai, IET, 2019, ISBN: 9781785619397. • Semiconducting Materials and Devices – Deepak Verma, ISBN: 9789394777712. • Green Carbon Quantum Dots: Environmental Applications – Vijay Kumar, Pardeep Singh, Devendra Kumar Singh, Springer Nature Singapore, 2024, ISBN: 9789819762026. • Organic Thin Film Transistor Applications: Materials to Circuits – Brajesh sK. Kaushik et al., ISBN: 9781498736534.

Expected Course Outcomes:
After successfully completing the course, the student will be able to;
CO1: Explain sensors, corrosion mechanisms, and corrosion-control methods.
CO2: Apply electrochemical concepts to energy-storage and conversion devices.
CO3: Relate the properties of quantum materials and polymers to device applications.
CO4: Explain functional materials used in memory and display technologies.
CO5: Analyse green materials, biomaterials, and sustainable e-waste management practices.
CO6: Perform quantitative chemical analysis and apply experimental skills to solve engineering problems effectively.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
Theory Component (25)				
2 Internal Assessments along with SL	50 Each	100	20	08
1 Activity-Based Learning for TW	25	25	05	02
Laboratory Component (25)				
Weekly Evaluation	15 Marks Each	15 x Number of Experiments	15	06
Semester End Test	50	50	10	04
TOTAL CIE MARKS (TC+LC)			25+25	10+10
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Rubrics showing Weekly Evaluation of Laboratory

Assessment component	High	Medium	Low
Conduction/ Preparedness (5 M)	Able to do the experiment set-up and perform the experiment with high accuracy and analyse the data and arrive at a conclusion. **(5-4 M)**	Able to perform the experiment, analyse the data and arrive at a conclusion with little guidance. **(4- 3M)**	Needs more guidance to do the experiment setup, perform the experiment, data analysis and arrive at a conclusion. Fails to submit the results on time. **(2-0M)**
Record Writing (10 M)	All sections well written as per format, and in the correct order. Excellent recording of data obtained and accurate calculation. **(10-8 M)**	Few sections not in order, but readable. Neat /moderate recording of data, but average accuracy obtained in the calculations. **(7-6M)**	Section out of order, some missing, sloppy formatting. Neat/Moderate recording of data with errors in calculations and fails to submit on time. **(5-0M)**

Rubrics showing lab IA Test Evaluation

Assessment component	High	Medium	Low
Write-up (10 M)	All sections well written, and in the correct order with proper mention of the units **(10-7 M)**	Few sections incorrect, with proper mention of the units **(6-4 M)**	Sloppy write-up, incorrect formulae/circuit diagram and no proper units and explanation of terms **(3-0 M)**
Conduction (20 M)	Able to do the experiment set-up and perform the experiment and collect the data with high accuracy **(20-15 M)**	Able to perform the experiment and collect the data. **(14-08 M)**	Able to collect the data **(7-0 M)**
Calculation (10 M)	Explicit and accurate calculation with units **(10-7 M)**	Calculation with average accuracy **(6-3 M)**	Able to do the calculations with low accuracy and errors **(2-0 M)**
Viva-Voce (10 M)	Student is highly knowledgeable, Communicative and has an analytical attitude **(10-7 M)**	Student is knowledgeable and communicative **(6-4 M)**	Student's knowledge levels need to be improved **(3-0 M)**

Chemistry Poster Presentation/Exhibition – Activity Structure

(Activity-Based Learning for TW & SL)

Total Duration: 25 Hours

Sl. No.	Broad Activity / Component	Target Deliverables / Assessment Criteria	Marks Split
1	Topic Selection & Preliminary Planning	Selection of an Applied Chemistry topic (e.g., Water Technology, Nano-materials, Green Chemistry, Energy Storage Systems, Polymers, Materials). Formulation of project objectives. Preliminary discussion on core chemical content and poster/exhibition layout.	**3 Marks**
2	Reference Study and Literature Review	Quality of data collection, journal references, and information sources. Understanding of foundational chemistry principles and reaction pathways.	**4 Marks**
3	Content and Scientific Development	Accuracy of chemical equations, calculations, and mechanisms. Data organization and conceptual depth.	**6 Marks**
4	Poster Design, Layout & Assembly	Visual design, clarity of flowcharts/ diagrams, neatly organized content. Quality of models or visual anchors used for the exhibition.	**6 Marks**
5	Final Presentation/ Demo and Q & A	Communication skills and project demonstration. Ability to answer technical chemistry questions during the viva/Q&A session.	**6 Marks**

Poster Presentation Activity (an Activity-Based Learning)
Rubrics of Evaluation

Valuation Criterion	Excellent	Very Good	Good	Satisfactory
1. Topic Selection & Preliminary Planning **(3 Marks)**	**3 M:** Selects a highly relevant applied chemistry topic, defines clear objectives and presents a well-planned poster/exhibition layout.	**2.5 M:** Selects a relevant topic with clear objectives and good preliminary planning.	**2 M:** Selects an appropriate topic but objectives or planning need improvement.	**1 M:** Topic relevance is limited, with unclear objectives and inadequate planning.
2. Reference Study and Literature Review **(4 Marks)**	**4 M:** Uses reliable scientific literature and recent references; demonstrates excellent understanding of chemical principles and reaction pathways.	**3 M:** Uses relevant references and demonstrates good understanding, with minor gaps.	**2 M:** Uses a limited range of references and demonstrates partial understanding of chemical principles.	**1 M:** Uses inadequate references and demonstrates limited understanding of the topic.
3. Content and Scientific Development **(6 Marks)**	**6 M:** Presents scientifically accurate chemical equations, calculations, mechanisms and data with excellent organization and conceptual depth.	**5 M:** Presents accurate content with good explanations and organization; minor errors may be present.	**3–4 M:** Presents basic chemical content but has some errors, gaps or limited conceptual depth.	**1–2 M:** Presents incomplete or poorly organized content with significant scientific errors.
4. Poster Design, Layout & Assembly **(6 Marks)**	**6 M:** Poster is highly attractive, clearly organized and scientifically presented, with appropriate diagrams, flowcharts, graphs and well-prepared exhibition models.	**5 M:** Poster is well organized and readable, with relevant diagrams and good visual presentation.	**3–4 M:** Poster is understandable but has some issues with layout, readability, diagrams or assembly.	**1–2 M:** Poster has poor organization, limited visual clarity and inadequate diagrams or exhibition materials.
5. Final Presentation/Demo and Q&A **(6 Marks)**	**6 M:** Explains the topic confidently, demonstrates the application effectively and answers technical chemistry questions accurately.	**5 M:** Presents the topic clearly, demonstrates good understanding and answers most questions correctly.	**3–4 M:** Gives a basic presentation and demonstration but has some difficulty explaining concepts or answering questions.	**1–2 M:** Gives an unclear presentation, demonstrates limited understanding and struggles to answer technical questions.

SL Details (Duration & Rubrics for Evaluation)

Component	Activity	Marks	Duration	Rubrics for Evaluation
Self-Study Component in Each Module	Student Presentations	Included in IA	20 Hours	As per scheme of Evaluation

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF CHEMISTRY

Course Name: **Applied Chemistry for Civil Engineering Stream**						Semester: 1st / 2nd	
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26CHEC102/202	45	-	30	75	45	120	04
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1.5h	3h	Descriptive

Course Learning Objectives:
The purpose of the course is to facilitate learners to;
CLO1: Explain electrochemical principles, energy systems, and green hydrogen technologies.
CLO2: Describe polymers, composites, and nanomaterials used in structural applications.
CLO3: Explain environmental pollution, waste management, and sustainable construction materials.
CLO4: Explain corrosion mechanisms and apply surface protection and metal-finishing methods.
CLO5: Explain the synthesis, properties, and applications of nanomaterials and quantum dots.
CLO6: Apply water chemistry and analytical techniques for environmental and construction applications.

Module 1	**Energy Systems and Green Fuels**	Duration: 09 Hours

Electrochemistry: Introduction, electrode potential, overview of Nernst's equation, concentration cell, numerical problems on concentration cells.
Energy systems: Introduction, classification of batteries, characteristics of battery-capacity, power density, cell balancing and cycle life. Construction, working, and applications of Lithium-ion battery. Fuel cell: definition, difference between battery and fuel cell, construction, working and applications of solid oxide fuel cell and silicon solar cell.
Green Fuels: Introduction, production of green hydrogen by photocatalytic water splitting by TiO_2 catalyst and its advantages.
Self-study: Construction and working of Reference electrode (Calomel electrode) and Ion-selective electrode (pH electrode).

Module 2	**Materials for Structural Integrity**	Duration: 09 Hours

Polymer: Introduction, types of polymerizations, synthesis, properties and engineering applications of chlorinated polyvinyl chloride (CPVC), polymethyl methacrylate (PMMA) and Kevlar fiber. Molecular weight of polymers: Number average and weight average molecular weight of polymers-numerical problems. Properties and industrial applications of carbon-based reinforced composites-graphene/carbon nanotubes as fillers.
Nanomaterials: Introduction, size-dependent properties- surface area, catalytic properties, thermal properties, and antimicrobial activity. Concrete as a composite material, composition of nano concrete, synthesis of TiO_2 nanoparticles by sol-gel method for sensor applications.
Self-study: Biopolymers: Introduction, synthesis, properties and applications of polylactic acid (PLA). Fire-retardant polymers: Recent developments and opportunities.

Module 3	**Conventional and Sustainable Construction Materials and Waste Management**	Duration: 09 Hours

Cement: Introduction, composition, manufacturing process of cement-wet process, process of setting and hardening of cement, special cements-composition, properties and applications.
Waste Management: Waste disposal methods (scientific landfilling, composting, Recycling and reuse).
Photochromic coatings: Introduction, spiropyran as photochromic coating, working principle with chemical reactions and applications in construction.
Piezoelectric cement composites: Introduction, piezoelectric materials in cement composites and its applications in civil engineering.
Self-study: Geopolymer concrete: Introduction, mechanism of geopolymerization and manufacturing process of geopolymer concrete. Construction chemicals: Concrete admixtures, waterproofing compounds, sealants & grouts, curing compounds.

Module 4	**Corrosion Science and Surface Protection**	Duration: 09 Hours

Metals and Alloys: Introduction, classification of metals: ferrous and non-ferrous. Composition, properties, applications of iron alloys - wrought iron, cast iron, pig iron and steel; aluminium alloys- Duralumin and Magnalumin.

Corrosion: Introduction, electrochemical theory of corrosion of steel, types of corrosion-differential metal corrosion, differential aeration corrosion, and stress corrosion in civil structures. Corrosion control by galvanization and anodization. Corrosion penetration rate (CPR)-introduction and numerical problems.

Metal finishing: Introduction, technological importance of metal finishing, electroplating of chromium-decorative and hard chromium.

Self-study: Electrochemical corrosion of steel in concrete, waterline and pitting corrosion.

Module 5	**Water Chemistry and Analytical Techniques**	Duration: 09 Hours

Water Chemistry: Introduction, effect of alkalinity of water in construction. Hard water- Introduction, types, determination of total hardness by EDTA method and numerical problems. Wastewater: Introduction, determination of dissolved oxygen by Winkler's method, determination of chemical oxygen demand (COD) and numerical problems.

Analytical techniques: Potentiometric sensors: Principle, instrumentation, and application in the estimation of iron in industrial effluents. Conductometric sensors: Principle, instrumentation and application in the determination of acid mixture in industrial effluents. Colorimetric sensor: Principle, instrumentation and application in the estimation of copper in brass alloy.

Self-study: Significance of water quality parameters-pH, turbidity, chlorides, and dissolved oxygen.

PRACTICAL COMPONENTS OF IPCC

LIST OF EXPERIMENTS

1. Estimation of total hardness of given water sample by EDTA method.
2. Determination of chemical oxygen demand (COD) of industrial effluents.
3. Estimation of percentage of CaO in cement by complexometric method.
4. Estimation of iron in TMT bar by diphenyl amine indicator method.
5. Determination of total alkalinity of given water sample.
6. Estimation of acid mixture using conductometric sensor.
7. Estimation of iron in rust sample using potentiometric sensor.
8. Determination of pKa value of vinegar solution using pH sensor 9. Estimation of percentage of iron in steel industry effluent by using optical sensor.
10. Determination of viscosity coefficient of green fuel using Ostwald's viscometer.
11. Colorimetric determination of phenolic content in wastewater using smartphone.
12. Interpretation of pKa values of a weak acid using Origin software

References:

Text Books:

- Engineering Chemistry: Jain & Jain, Publisher: Dhanpat Rai Publishing Company, ISBN: 978- 935316118.
- Textbook of Engineering Chemistry: S. S. Dara & S. S. Umare, S. Chand Publishing, ISBN:9788121903593.
- Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi, 1st edition, 2012.
- Engineering Chemistry, Vinuth Mirle and Mohan Kumar, First edition 2022, ISBN: 978-81-960018-3-4, IIP Iterative International Publishers.

Reference Books

- Materials Science: S. K. Malik, Publisher: New Age International Publishers, ISBN: 978- 8122418713.
- Electrochemical Energy System: Dr. K. K. Rajeshwar (IIT Madras), Publisher: IIT Madras Open Courseware (Free PDF & videos), ISBN: N/A (Open Educational Resource).
- Materials Science: S. K. Malik, Publisher: New Age International Publishers, ISBN: 978- 8122418713.
- "Applied Chemistry for Civil Engineering and Allied Branches" by Vrushabendra B, C Manasa and Srikantamurthy N, Publisher: Astitva Prakashan, ISBN: 9788119064465.

Expected Course Outcomes:
After successfully completing the course, the student will be able to;
CO1: Apply electrochemical principles to analyse energy systems and evaluate green hydrogen technologies.
CO2: Relate the structure and properties of polymers, composites, and nanomaterials to their engineering applications.
CO3: Analyse environmental pollution and waste-management practices and evaluate sustainable construction materials.
CO4: Analyse corrosion in civil structures and apply suitable corrosion-control and surface-protection techniques.
CO5: Apply water chemistry and instrumental analytical techniques to assess water and industrial effluent quality.
CO6: Perform quantitative chemical analysis and apply experimental skills to solve engineering problems effectively.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
Theory Component (25)				
2 Internal Assessments along with SL	50 Each	100	20	08
1 Activity-Based Learning for TW	25	25	05	02
Laboratory Component (25)				
Weekly Evaluation	15 Marks Each	15 x Number of Experiments	15	06
Semester End Test	50	50	10	04
TOTAL CIE MARKS (TC+LC)			25+25	10+10
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Rubrics showing Weekly Evaluation of Laboratory

Assessment component	High	Medium	Low
Conduction/ Preparedness (5 M)	Able to do the experiment set-up and perform the experiment with high accuracy and analyse the data and arrive at a conclusion. **(5-4 M)**	Able to perform the experiment, analyse the data and arrive at a conclusion with little guidance. **(4- 3M)**	Needs more guidance to do the experiment setup, perform the experiment, data analysis and arrive at a conclusion. Fails to submit the results on time. **(2-0M)**
Record Writing (10 M)	All sections well written as per format, and in the correct order. Excellent recording of data obtained and accurate calculation. **(10-8 M)**	Few sections not in order, but readable. Neat /moderate recording of data, but average accuracy obtained in the calculations. **(7-6M)**	Section out of order, some missing, sloppy formatting. Neat/Moderate recording of data with errors in calculations and fails to submit on time. **(5-0M)**

Rubrics showing lab IA Test Evaluation

Assessment component	High	Medium	Low
Write-up (10 M)	All sections well written, and in the correct order with proper mention of the units **(10-7 M)**	Few sections incorrect, with proper mention of the units **(6-4 M)**	Sloppy write-up, incorrect formulae/circuit diagram and no proper units and explanation of terms **(3-0 M)**
Conduction (20 M)	Able to do the experiment set-up and perform the experiment and collect the data with high accuracy **(20-15 M)**	Able to perform the experiment and collect the data. **(14-08 M)**	Able to collect the data **(7-0 M)**
Calculation (10 M)	Explicit and accurate calculation with units **(10-7 M)**	Calculation with average accuracy **(6-3 M)**	Able to do the calculations with low accuracy and errors **(2-0 M)**
Viva-Voce (10 M)	Student is highly knowledgeable, Communicative and has an analytical attitude **(10-7 M)**	Student is knowledgeable and communicative **(6-4 M)**	Student's knowledge levels need to be improved **(3-0 M)**

Chemistry Poster Presentation/Exhibition – Activity Structure

(Activity-Based Learning for TW & SL)

Total Duration: 25 Hours

Sl. No.	Broad Activity / Component	Target Deliverables / Assessment Criteria	Marks Split
1	Topic Selection & Preliminary Planning	Selection of an Applied Chemistry topic (e.g., Water Technology, Nano-materials, Green Chemistry, Energy Storage Systems, Polymers, Materials). Formulation of project objectives. Preliminary discussion on core chemical content and poster/exhibition layout.	**3 Marks**
2	Reference Study and Literature Review	Quality of data collection, journal references, and information sources. Understanding of foundational chemistry principles and reaction pathways.	**4 Marks**
3	Content and Scientific Development	Accuracy of chemical equations, calculations, and mechanisms. Data organization and conceptual depth.	**6 Marks**
4	Poster Design, Layout & Assembly	Visual design, clarity of flowcharts/ diagrams, neatly organized content. Quality of models or visual anchors used for the exhibition.	**6 Marks**
5	Final Presentation/ Demo and Q & A	Communication skills and project demonstration. Ability to answer technical chemistry questions during the viva/Q&A session.	**6 Marks**

Poster Presentation Activity (an Activity-Based Learning)
Rubrics of Evaluation

Valuation Criterion	Excellent	Very Good	Good	Satisfactory
1. Topic Selection & Preliminary Planning **(3 Marks)**	**3 M:** Selects a highly relevant applied chemistry topic, defines clear objectives and presents a well-planned poster/exhibition layout.	**2.5 M:** Selects a relevant topic with clear objectives and good preliminary planning.	**2 M:** Selects an appropriate topic but objectives or planning need improvement.	**1 M:** Topic relevance is limited, with unclear objectives and inadequate planning.
2. Reference Study and Literature	**4 M:** Uses reliable scientific literature and recent references; demonstrates excellent	**3 M:** Uses relevant references and demonstrates good	**2 M:** Uses a limited range of references and demonstrates partial understanding	**1 M:** Uses inadequate references and demonstrates limited

Review **(4 Marks)**	understanding of chemical principles and reaction pathways.	understanding, with minor gaps.	of chemical principles.	understanding of the topic.
3. Content and Scientific Development **(6 Marks)**	**6 M:** Presents scientifically accurate chemical equations, calculations, mechanisms and data with excellent organization and conceptual depth.	**5 M:** Presents accurate content with good explanations and organization; minor errors may be present.	**3–4 M:** Presents basic chemical content but has some errors, gaps or limited conceptual depth.	**1–2 M:** Presents incomplete or poorly organized content with significant scientific errors.
4. Poster Design, Layout & Assembly **(6 Marks)**	**6 M:** Poster is highly attractive, clearly organized and scientifically presented, with appropriate diagrams, flowcharts, graphs and well-prepared exhibition models.	**5 M:** Poster is well organized and readable, with relevant diagrams and good visual presentation.	**3–4 M:** Poster is understandable but has some issues with layout, readability, diagrams or assembly.	**1–2 M:** Poster has poor organization, limited visual clarity and inadequate diagrams or exhibition materials.
5. Final Presentation/Demo and Q&A **(6 Marks)**	**6 M:** Explains the topic confidently, demonstrates the application effectively and answers technical chemistry questions accurately.	**5 M:** Presents the topic clearly, demonstrates good understanding and answers most questions correctly.	**3–4 M:** Gives a basic presentation and demonstration but has some difficulty explaining concepts or answering questions.	**1–2 M:** Gives an unclear presentation, demonstrates limited understanding and struggles to answer technical questions.

SL Details (Duration & Rubrics for Evaluation)

Component	Activity	Marks	Duration	Rubrics for Evaluation
Self-Study Component in Each Module	Student Presentations	Included in IA	20 Hours	As per scheme of Evaluation

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF CHEMISTRY

Course Name: Chemistry for Electrical and Electronics Engineering stream | **Semester:** 1st / 2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26CHEE102/202	45	-	30	75	45	120	04

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1.5h	3h	Descriptive

Course Learning Objectives:
The purpose of the course is to facilitate learners to;
CLO1: Explain electrode systems and apply electrochemical sensing methods for chemical analysis.
CLO2: Explain corrosion mechanisms, metal finishing, and sustainable e-waste management methods.
CLO3: Describe semiconductor materials and evaluate energy storage and conversion devices.
CLO4: Explain functional polymers and hybrid composites used in flexible and wearable electronics.
CLO5: Explain the synthesis, properties, and applications of nanomaterials and quantum dots.
CLO6: Demonstrate proficiency in quantitative chemical analysis and apply experimental skills to address engineering problems effectively.

Module 1	**Electrode System and Electrochemical Sensors**	Duration: 09 Hours

Electrode System: Introduction, types of electrodes, overview of Nernst equation, reference electrode construction, working and applications of calomel electrode. Ion-selective electrode: definition, construction, working of glass electrode, determination of pH using glass electrode. Construction and working of concentration cell and numerical problems.
Sensing Methods: Introduction, principle and instrumentation of colorimetric sensors; its application in the estimation of copper in PCBs. Principles and instrumentation of potentiometric sensors and its application in the estimation of iron in steel, conductometric sensors; its application in the estimation of acid mixture in the sample.
Self-Study: Nanosensors for NOx and COx gas detection, Glucose Sensor.

Module 2	**Corrosion Science and E-waste Management**	Duration: 09 Hours

Corrosion Chemistry: Introduction, electrochemical theory of corrosion, types of corrosion, differential metal corrosion in electronic circuits and differential aeration corrosion. Corrosion control- galvanization, anodization, cathodic protection and impressed current method. Corrosion penetration rate (CPR) - definition, importance, and weight loss method-numerical problems.
Metal Finishing: Introduction, technological importance of metal finishing, difference between electroplating & electroless plating, electroplating of chromium for hard and decorative coatings, electroless plating of copper on PCBs.
E-waste: Introduction, sources of e-waste, need of e-waste management & effects of e-waste on the environment and human health. Extraction of gold from e-waste by the hydrometallurgy method.
Self-Study: Waterline and pitting corrosion, Advanced nonmetal coatings for automobiles.

Module 3	**Materials for Energy Devices**	Duration: 09 Hours

Semiconductors: Introduction, n-type and p-type semiconductor materials (organic and inorganic), difference between organic and inorganic semiconductors. Organic photovoltaics - working principle and applications of Poly (3-hexylthiophene) (P3HT) as a donor and Phenyl- C61-butyric acid methyl ester (PCBM) as an acceptor.
Energy Storage Devices: Introduction, classification of batteries-primary, secondary and reserve battery, characteristics - capacity, power density, shelf life & cycle life. Construction and working of lithium-ion battery and its advantages in EV applications. Construction and working of ultra-small asymmetric supercapacitor and its applications in IoT/wearable devices.
Energy Conversion Devices: Introduction, construction, working principle, advantages and limitations of solar photovoltaic cell (PV cell). Working principle and applications of Microelectromechanical systems (MEMS)-based energy harvesters.
Self-Study: Sodium ion battery, construction, materials, mechanism & applications.

Module 4	**Functional Polymers and Hybrid Composites in Flexible Electronics**	Duration: 09 Hours

Stretchable and Wearable Microelectronics: Introduction, basic principle and working of lithography for micro-patterned copper deposition. Synthesis, properties and applications of PDMS (Polydimethylsiloxane) and its uses in e-skin (electronic skin) and RFID applications.
Polymers: Introduction, synthesis, conduction mechanism of polyaniline and its electronic device applications.
Molecular weight of polymers: Number average and weight average molecular weight of polymers-numerical problems. Synthesis and properties of Polyvinylidene Fluoride (PVDF) and its applications in E-nose devices.
Polymer Composites: Introduction, synthesis and properties of epoxy resin-magnetite (Fe_3O_4) composite (ultrasonication method) for sensor applications. Synthesis and properties of Kevlar Fiber Reinforced Polymer (KFRP) for smart electronic devices applications.
Self-study: Electrical properties of biopolymers, advanced semiconductors (eg; Indium-Gallium-Zinc Oxide (IGZO)) for display and memory devices

Module 5	**Nano and Quantum Dot Materials**	Duration: 09 Hours

Nano materials: Introduction, size-dependent properties of nanomaterials - surface area, catalytic, optical properties, and electrical conductivity.
Inorganic Quantum Dot Materials (IQDMs): Introduction to Quantum Dots, synthesis and properties of silicon-based QDs by sol-gel method and Cd-Se Quantum Dots by hot injection method and applications in optoelectronic devices.
Organic Quantum Dot Materials (OQDMs): Introduction, synthesis and properties of chitosan-carbon quantum dots hydrogel and its applications in next-generation flexible and wearable electronics. Synthesis and properties of Graphene Quantum Dots using the citric acid method and its applications in emerging electronics.
Self-study: Synthesis of TiO_2 nanoparticles by sol-gel method and its uses in sensor applications. Quantum Dot Materials: types, optical and electronic properties of quantum dots (QDs).

PRACTICAL COMPONENTS OF IPCC
LIST OF EXPERIMENTS
1. Estimation of total hardness of water by EDTA method.
2. Determination of chemical oxygen demand (COD) of industrial effluent sample.
3. Estimation of iron in TMT bar by diphenyl amine indicator method.
4. Determination of total alkalinity of given water sample.
5. Determination of Hydrogen Peroxide in PCB Cleaner (Permanganate method).
6. Estimation of acid mixture by conductometric sensor (Conductometry).
7. Estimation of iron in rust sample by Potentiometric sensor (Potentiometry).
8. Determination of pKa of vinegar using pH sensor (Glass electrode)
9. Estimation of copper present in e-waste by optical sensor (Colorimetry).
10. Determination of Viscosity coefficient of conductive Inks.
11. Smartphone-Based colorimetric estimation of total phenolic content in coffee products.
12. Green synthesis of copper nanoparticles for conductive ink applications.

References:

Text Books:

- Engineering Chemistry, Suba Ramesh, Vairam, Ananda Murthy, 2011, Wiley India, ISBN: 9788126519880.
- Engineering Chemistry: Jain & Jain, Publisher: Dhanpat Rai Publishing Company, ISBN: 978- 935316118.
- A Textbook of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016.

Reference Books / Manuals

- Engineering Chemistry – Jain & Jain, Dhanpat Rai Publishing Company, ISBN: 9789353161181.
- Energy Storage and Conversion Devices: Supercapacitors, Batteries and Hydroelectric Cells – Anurag Gaur (Ed.), CRC Press, 2021, ISBN: 9781000470512.
- Smart Materials: Handbook of Materials Selection – Harvey, James A., John Wiley & Sons Canada Ltd., 2002, ISBN: 9780471359241.
- Advances in Corrosion Science and Technology – M. G. Fontana & R. W. Staettle, Springer Publications, 2012, ISBN: 9781461590620.

Expected Course Outcomes:
After successfully completing the course, the student will be able to;
CO1: Apply electrochemical principles and sensor techniques for quantitative analysis of engineering samples.
CO2: Analyse corrosion mechanisms and apply corrosion-control, metal-finishing, and e-waste management techniques.
CO3: Evaluate semiconductor, battery, supercapacitor, photovoltaic, and energy-harvesting technologies for smart systems.
CO4: Relate the structure and properties of functional polymers and composites to their applications in flexible, wearable electronics and others.
CO5: Explain and evaluate the synthesis, properties, and applications of nanomaterials and quantum dots in emerging electronic devices.
CO6: Perform quantitative chemical analysis and apply experimental skills to solve engineering problems effectively.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
Theory Component (25)				
2 Internal Assessments along with SL	50 Each	100	20	08
1 Activity-Based Learning for TW	25	25	05	02
Laboratory Component (25)				
Weekly Evaluation	15 Marks Each	15 x Number of Experiments	15	06
Semester End Test	50	50	10	04
TOTAL CIE MARKS (TC+LC)			25+25	10+10
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Rubrics showing Weekly Evaluation of Laboratory

Assessment component	High	Medium	Low
Conduction/ Preparedness (5 M)	Able to do the experiment set-up and perform the experiment with high accuracy and analyse the data and arrive at a conclusion. **(5-4 M)**	Able to perform the experiment, analyse the data and arrive at a conclusion with little guidance. **(4- 3M)**	Needs more guidance to do the experiment setup, perform the experiment, data analysis and arrive at a conclusion. Fails to submit the results on time. **(2-0M)**
Record Writing (10 M)	All sections well written as per format, and in the correct order. Excellent recording of data obtained and accurate calculation. **(10-8 M)**	Few sections not in order, but readable. Neat /moderate recording of data, but average accuracy obtained in the calculations. **(7-6M)**	Section out of order, some missing, sloppy formatting. Neat/Moderate recording of data with errors in calculations and fails to submit on time. **(5-0M)**

Rubrics showing lab IA Test Evaluation

Assessment component	High	Medium	Low
Write-up (10 M)	All sections well written, and in the correct order with proper mention of the units **(10-7 M)**	Few sections incorrect, with proper mention of the units **(6-4 M)**	Sloppy write-up, incorrect formulae/circuit diagram and no proper units and explanation of terms **(3-0 M)**
Conduction (20 M)	Able to do the experiment set-up and perform the experiment and collect the data with high accuracy **(20-15 M)**	Able to perform the experiment and collect the data. **(14-08 M)**	Able to collect the data **(7-0 M)**
Calculation (10 M)	Explicit and accurate calculation with units **(10-7 M)**	Calculation with average accuracy **(6-3 M)**	Able to do the calculations with low accuracy and errors **(2-0 M)**
Viva-Voce (10 M)	Student is highly knowledgeable, Communicative and has an analytical attitude **(10-7 M)**	Student is knowledgeable and communicative **(6-4 M)**	Student's knowledge levels need to be improved **(3-0 M)**

Chemistry Poster Presentation/Exhibition – Activity Structure
(Activity-Based Learning for TW & SL)

Total Duration: 25 Hours

Sl. No.	Broad Activity / Component	Target Deliverables / Assessment Criteria	Marks Split
1	Topic Selection & Preliminary Planning	Selection of an Applied Chemistry topic (e.g., Water Technology, Nano-materials, Green Chemistry, Energy Storage Systems, Polymers, Materials). Formulation of project objectives. Preliminary discussion on core chemical content and poster/exhibition layout.	**3 Marks**
2	Reference Study and Literature Review	Quality of data collection, journal references, and information sources. Understanding of foundational chemistry principles and reaction pathways.	**4 Marks**
3	Content and Scientific Development	Accuracy of chemical equations, calculations, and mechanisms. Data organization and conceptual depth.	**6 Marks**
4	Poster Design, Layout & Assembly	Visual design, clarity of flowcharts/ diagrams, neatly organized content. Quality of models or visual anchors used for the exhibition.	**6 Marks**
5	Final Presentation/ Demo and Q & A	Communication skills and project demonstration. Ability to answer technical chemistry questions during the viva/Q&A session.	**6 Marks**

Poster Presentation Activity (an Activity-Based Learning)
Rubrics of Evaluation

Valuation Criterion	Excellent	Very Good	Good	Satisfactory
1. Topic Selection & Preliminary Planning **(3 Marks)**	**3 M:** Selects a highly relevant applied chemistry topic, defines clear objectives and presents a well-planned poster/exhibition layout.	**2.5 M:** Selects a relevant topic with clear objectives and good preliminary planning.	**2 M:** Selects an appropriate topic but objectives or planning need improvement.	**1 M:** Topic relevance is limited, with unclear objectives and inadequate planning.

2. Reference Study and Literature Review **(4 Marks)**	**4 M:** Uses reliable scientific literature and recent references; demonstrates excellent understanding of chemical principles and reaction pathways.	**3 M:** Uses relevant references and demonstrates good understanding, with minor gaps.	**2 M:** Uses a limited range of references and demonstrates partial understanding of chemical principles.	**1 M:** Uses inadequate references and demonstrates limited understanding of the topic.
3. Content and Scientific Development **(6 Marks)**	**6 M:** Presents scientifically accurate chemical equations, calculations, mechanisms and data with excellent organization and conceptual depth.	**5 M:** Presents accurate content with good explanations and organization; minor errors may be present.	**3–4 M:** Presents basic chemical content but has some errors, gaps or limited conceptual depth.	**1–2 M:** Presents incomplete or poorly organized content with significant scientific errors.
4. Poster Design, Layout & Assembly **(6 Marks)**	**6 M:** Poster is highly attractive, clearly organized and scientifically presented, with appropriate diagrams, flowcharts, graphs and well-prepared exhibition models.	**5 M:** Poster is well organized and readable, with relevant diagrams and good visual presentation.	**3–4 M:** Poster is understandable but has some issues with layout, readability, diagrams or assembly.	**1–2 M:** Poster has poor organization, limited visual clarity and inadequate diagrams or exhibition materials.
5. Final Presentation/Demo and Q&A **(6 Marks)**	**6 M:** Explains the topic confidently, demonstrates the application effectively and answers technical chemistry questions accurately.	**5 M:** Presents the topic clearly, demonstrates good understanding and answers most questions correctly.	**3–4 M:** Gives a basic presentation and demonstration but has some difficulty explaining concepts or answering questions.	**1–2 M:** Gives an unclear presentation, demonstrates limited understanding and struggles to answer technical questions.

SL Details (Duration & Rubrics for Evaluation)

Component	Activity	Marks	Duration	Rubrics for Evaluation
Self-Study Component in Each Module	Student Presentations	Included in IA	20 Hours	As per scheme of Evaluation

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF CHEMISTRY

Course Name: Applied Chemistry for Mechanical Engineering Stream | **Semester:** 1st /2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26CHEE102/202	45	-	30	75	45	120	04

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1.5h	3h	Descriptive

Course Learning Objectives:
The purpose of the course is to facilitate learners to;
CLO1: Understand the fundamental concepts of electrochemistry, corrosion science, and coating technologies used in engineering applications.
CLO2: Explain the fuel characteristics and evaluate sustainable and green fuel technologies.
CLO3: Gain knowledge of the synthesis, properties, and applications of engineering polymers, composites, and biopolymers.
CLO4: Understand nanomaterials, energy systems, and their role in emerging technologies.
CLO5: Understand the principles of fluid technology and smart sensors and their engineering applications
CLO6: Demonstrate proficiency in quantitative chemical analysis and apply experimental skills to address engineering problems effectively.

Module 1	**Corrosion Science and Coating Technologies**	Duration: 09 Hours

Electrochemistry: Introduction, Overview of the Nernst equation, Concentration cells: Numerical Problems.
Corrosion: Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration corrosion-waterline and pitting corrosion, corrosion control-metal coating; galvanization, surface conversion coating; anodization and cathodic protection; sacrificial anode method, corrosion penetration rate (CPR) - Introduction and numerical problems.
Coating Technologies: Introduction, technological importance, electroplating - electroplating of chromium; decorative and hard electroless plating - electroless plating of nickel.
Self-Study: Difference between electroplating and electroless plating.

Module 2	**Sustainable Fuels**	Duration: 09 Hours

Fuels: Introduction, calorific value, determination of calorific value using Bomb calorimeter, numerical problems on GCV and NCV. Knocking in internal combustion (IC) engines - knocking mechanism in IC engines. Anti-knocking agents - methyl tertiary butyl ether (MTBE). Importance of octane and cetane rating of fuel.
Green Fuels: Introduction, power alcohol – properties, applications and its limitations, biodiesel - synthesis by trans-esterification method, advantages and its applications. Production of green hydrogen by photocatalytic water splitting and its advantages, hydrogen storage – introduction, advantages and limitations of metal hydride and ammonia as chemical hydrogen carriers.
Self-Study: Properties of anti-knocking agents, ethyl tert-butyl ether (ETBE) as a modern oxygenate and anti-knock additive.

Module 3	**Materials for Engineering Applications**	Duration: 09 Hours

Engineering Polymers: Introduction, molecular weight of polymers - number average and weight average molecular weight, numerical problems. Synthesis, properties and engineering applications of chlorinated polyvinyl chloride (CPVC). Structure-properties relationship of polymers (Crystallinity, strength, elasticity, and chemical resistivity). Glass transition temperature (Tg), factors affecting Tg and its significance.
Polymer Composites: Introduction, fiber-reinforced polymers (FRPs); Kevlar – Synthesis, properties and industrial applications. Carbon fiber: Preparation from Polyacrylonitrile (PAN), properties and industrial applications.
Biopolymers: Introduction, synthesis, properties and applications of polylactic acid (PLA) resin.
Self-study: Advanced composite material for aerospace applications, Synthesis, properties, and engineering applications of polymethyl methacrylate (PMMA).

Module 4	**Materials for Energy Systems**	Duration: 09 Hours

Nanomaterials: Introduction, synthesis of TiO_2 nanoparticles by sol-gel method and its uses in catalytic converters. Size-dependent properties of nanomaterials: surface area, catalytic, electrical, and thermal conductivity. Graphene - Synthesis by chemical vapor deposition (CVD) method, properties and engineering applications. Carbon Nanotubes (CNTs): Synthesis, properties and applications.

Energy Systems: Batteries - Introduction, classification of batteries. Construction, working, and applications of Li-ion batteries. **Fuel cells:** Introduction, construction and working of solid oxide fuel cells (SOFCs) and its uses in auxiliary power units (APUs). Solar photovoltaic cells (PV cells) - construction, working, advantages and limitations.

Self-Study: Differences between a fuel cell and a battery. Characteristics of batteries: capacity, power density, shelf life and cycle life. Applications of lithium iron phosphate battery.

Module 5	**Fluid Technology and Smart Sensors**	Duration: 09 Hours

Lubricants: Introduction, classification, ideal properties and applications.

Industrial Coolants: Introduction, types - water and oil-based coolants.

Industrial effluents: Introduction, determination of COD, and numerical problems.

Sensors: Introduction (Temperature sensors: Thermocouple, Pressure sensors: Piezoelectric, and Position sensors: Rotary / Angular Position), potentiometric sensor - principle and its application in the estimation of iron in steel industry effluent. Conductometric sensor - principle and its application in the estimation of acid mixture in electrochemical bath effluent. pH sensor - principle and its application in the estimation of pKa of acid electrolyte.

Self-study: Lubricant testing; experimental determination of viscosity using Ostwald's viscometer. Properties and applications of Industrial coolants.

PRACTICAL COMPONENTS OF IPCC

LIST OF EXPERIMENTS

1. Estimation of total hardness of water by EDTA method
2. Determination of chemical oxygen demand (COD) of industrial wastewater
3. Estimation of iron in steel industry effluent by diphenylamine indicator method
4. Determination of total alkalinity of a given boiler water sample
5. Determination of acid value of biofuel
6. Estimation of acid mixture in electrochemical bath effluent using conductometric sensor (Conductometry)
7. Estimation of iron in rust sample by Potentiometric sensor (Potentiometry)
8. Determination of pKa of acid electrolyte using pH sensor (Glass electrode)
9. Estimation of copper present in e-waste by optical sensor (Colorimetry)
10. Determination of viscosity coefficient of lubricant using Ostwald's viscometer
11. Green synthesis of copper nanoparticles
12. Synthesis of polylactic acid (PLA)

References:

Text Books:

- Engineering Chemistry, Vinuth Mirle and Mohan Kumar, First edition 2022, ISBN: 978-81-960018-3-4, IIP Iterative International Publishers.
- Engineering Chemistry, Dr. S. Vairam and Dr. Suba Ramesh, 2nd Edition, 2013, Wiley.
- Applied Chemistry for Mechanical Engineering and Allied Branches, C Manasa, Vrushabendra B, Srikantamurthy N, 2023, Astitva Prakashan.

Reference Books

- Advances in Corrosion Science and Technology, M.G. Fontana and R.W. Staettle, Springer, 2012, ISBN: 9781461590620
- Polymer Science, V R Gowariker, N V Viswanathan, and Jayadev Sreedhar, 4th edition, 2023, Newage International Publishers.
- Bharath Bhushan - Handbook of Nanotechnology, Spinger-Verlag Berlin Heidelberg, New York, 2004.
- Sankar P. Dey, Nayim Sepay - A Textbook of Green Chemistry, 1st edition, Techno World Publisher, 2021.

Expected Course Outcomes:

After successfully completing the course, the student will be able to;
CO1: Apply electrochemical principles to understand corrosion, corrosion control, and coating technologies in engineering applications.
CO2: Evaluate conventional and sustainable fuels based on calorific value, fuel ratings, combustion characteristics, and environmental significance.
CO3: Relate the structure and properties of engineering polymers, composites, and biopolymers to their industrial applications.
CO4: Explain the synthesis, properties, and applications of nanomaterials and evaluate electrochemical and photovoltaic energy systems.
CO5: Apply the principles of lubricants, industrial coolants, and smart sensors to solve relevant engineering and industrial problems.
CO6: Perform quantitative chemical analysis and apply experimental skills to solve engineering problems effectively.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
Theory Component (25)				
2 Internal Assessments along with SL	50 Each	100	20	08
1 Activity-Based Learning for TW	25	25	05	02
Laboratory Component (25)				
Weekly Evaluation	15 Marks Each	15 x Number of Experiments	15	06
Semester End Test	50	50	10	04
TOTAL CIE MARKS (TC+LC)			25+25	10+10
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Rubrics showing Weekly Evaluation of Laboratory

Assessment component	High	Medium	Low
Conduction/ Preparedness (5 M)	Able to do the experiment set-up and perform the experiment with high accuracy and analyse the data and arrive at a conclusion. **(5-4 M)**	Able to perform the experiment, analyse the data and arrive at a conclusion with little guidance. **(4- 3M)**	Needs more guidance to do the experiment setup, perform the experiment, data analysis and arrive at a conclusion. Fails to submit the results on time. **(2-0M)**
Record Writing (10 M)	All sections well written as per format, and in the correct order. Excellent recording of data obtained and accurate calculation. **(10-8 M)**	Few sections not in order, but readable. Neat /moderate recording of data, but average accuracy obtained in the calculations. **(7-6M)**	Section out of order, some missing, sloppy formatting. Neat/Moderate recording of data with errors in calculations and fails to submit on time. **(5-0M)**

Rubrics showing lab IA Test Evaluation

Assessment component	High	Medium	Low
Write-up (10 M)	All sections well written, and in the correct order with proper mention of the units **(10-7 M)**	Few sections incorrect, with proper mention of the units **(6-4 M)**	Sloppy write-up, incorrect formulae/circuit diagram and no proper units and explanation of terms **(3-0 M)**
Conduction (20 M)	Able to do the experiment set-up and perform the experiment and collect the data with high accuracy **(20-15 M)**	Able to perform the experiment and collect the data. **(14-08 M)**	Able to collect the data **(7-0 M)**
Calculation (10 M)	Explicit and accurate calculation with units **(10-7 M)**	Calculation with average accuracy **(6-3 M)**	Able to do the calculations with low accuracy and errors **(2-0 M)**
Viva-Voce (10 M)	Student is highly knowledgeable, Communicative and has an analytical attitude **(10-7 M)**	Student is knowledgeable and communicative **(6-4 M)**	Student's knowledge levels need to be improved **(3-0 M)**

Chemistry Poster Presentation/Exhibition – Activity Structure (Activity-Based Learning for TW & SL)			
Total Duration: 25 Hours			
Sl. No.	**Broad Activity / Component**	**Target Deliverables / Assessment Criteria**	**Marks Split**
1	Topic Selection & Preliminary Planning	Selection of an Applied Chemistry topic (e.g., Water Technology, Nano-materials, Green Chemistry, Energy Storage Systems, Polymers, Materials). Formulation of project objectives. Preliminary discussion on core chemical content and poster/exhibition layout.	**3 Marks**
2	Reference Study and Literature Review	Quality of data collection, journal references, and information sources. Understanding of foundational chemistry principles and reaction pathways.	**4 Marks**
3	Content and Scientific Development	Accuracy of chemical equations, calculations, and mechanisms. Data organization and conceptual depth.	**6 Marks**
4	Poster Design, Layout & Assembly	Visual design, clarity of flowcharts/ diagrams, neatly organized content. Quality of models or visual anchors used for the exhibition.	**6 Marks**
5	Final Presentation/ Demo and Q & A	Communication skills and project demonstration. Ability to answer technical chemistry questions during the viva/Q&A session.	**6 Marks**

Poster Presentation Activity (an Activity-Based Learning) Rubrics of Evaluation

Valuation Criterion	Excellent	Very Good	Good	Satisfactory
1. Topic Selection & Preliminary Planning **(3 Marks)**	**3 M:** Selects a highly relevant applied chemistry topic, defines clear objectives and presents a well-planned poster/exhibition layout.	**2.5 M:** Selects a relevant topic with clear objectives and good preliminary planning.	**2 M:** Selects an appropriate topic but objectives or planning need improvement.	**1 M:** Topic relevance is limited, with unclear objectives and inadequate planning.
2. Reference Study and Literature	**4 M:** Uses reliable scientific literature and recent references;	**3 M:** Uses relevant references and demonstrates good	**2 M:** Uses a limited range of references and demonstrates	**1 M:** Uses inadequate references and demonstrates limited

Review **(4 Marks)**	demonstrates excellent understanding of chemical principles and reaction pathways.	understanding, with minor gaps.	partial understanding of chemical principles.	understanding of the topic.
3. Content and Scientific Development **(6 Marks)**	**6 M:** Presents scientifically accurate chemical equations, calculations, mechanisms and data with excellent organization and conceptual depth.	**5 M:** Presents accurate content with good explanations and organization; minor errors may be present.	**3–4 M:** Presents basic chemical content but has some errors, gaps or limited conceptual depth.	**1–2 M:** Presents incomplete or poorly organized content with significant scientific errors.
4. Poster Design, Layout & Assembly **(6 Marks)**	**6 M:** Poster is highly attractive, clearly organized and scientifically presented, with appropriate diagrams, flowcharts, graphs and well-prepared exhibition models.	**5 M:** Poster is well organized and readable, with relevant diagrams and good visual presentation.	**3–4 M:** Poster is understandable but has some issues with layout, readability, diagrams or assembly.	**1–2 M:** Poster has poor organization, limited visual clarity and inadequate diagrams or exhibition materials.
5. Final Presentation/Demo and Q&A **(6 Marks)**	**6 M:** Explains the topic confidently, demonstrates the application effectively and answers technical chemistry questions accurately.	**5 M:** Presents the topic clearly, demonstrates good understanding and answers most questions correctly.	**3–4 M:** Gives a basic presentation and demonstration but has some difficulty explaining concepts or answering questions.	**1–2 M:** Gives an unclear presentation, demonstrates limited understanding and struggles to answer technical questions.

SL Details (Duration & Rubrics for Evaluation)

Component	Activity	Marks	Duration	Rubrics for Evaluation
Self-Study Component in Each Module	Student Presentations	Included in IA	20 Hours	As per scheme of Evaluation

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF PHYSICS

Course Name: **Quantum Physics And Applications (IPCC) for CSE stream**						Semester: 1st / 2nd	
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26PHYS102/202	45	0	30	75	45	120	4
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1.5 hrs	3 hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners

CLO1: To develop a strong foundation in quantum mechanics by understanding fundamental principles such as wave functions, uncertainty principle, and Schrödinger equation, and their relevance to modern physics.

CLO2: To analyze the electrical and optical properties of materials by applying quantum concepts to metals, semiconductors, superconductors, and photonic systems.

CLO3: To introduce emerging quantum technologies by exploring radiation–matter interaction, photonic devices, and basic concepts of quantum computing and quantum circuits.

Module 1	**Physics of Quantum Computation**	Duration: 9 hours

Black Body radiation problem and Planks Radiation formula, de Broglie Hypothesis, Heisenberg's Uncertainty Principle and its application (Broadneing of Spectral Lines), Principle of Complementarity, Wave Function, Time independent Schrödinger wave equation (Derivation), Physical significance of a wave function and Born Interpretation, Eigen functions and Eigen values, Expectation value and its physical significance, Particle inside one dimensional infinite potential well, Role of higher dimensions (Qualitative), Waveforms and Probabilities, Particle inside a finite poten- tial well and quantum tunneling, Numerical Problems.

Module 2	**Electrical Properties of Metals and Semiconductors**	Duration: 9 hours

Assumptions of Classical free electron theory, mention of the conductivity expression (no derivation), Failures of CFET; Assumptions of Quantum Free Electron Theory, , Fermi Energy, Variation of Fermi Factor With Temperature and Energy, Mention of expression for electrical conductivity, Success of quantum free electron theory of metals. Mention of Density of States expression, Derivation of electron concentration in an intrinsic semiconductor, Expression for electron and hole concentration in extrinsic semiconductor (Qualitative), Fermi level for intrinsic(with derivation) and extrinsic semiconductor (no derivation), Hall effect, Numerical Problems.

Module 3	**Superconductivity**	Duration: 9 hours

Mechanisms of electron scattering in solids, Matheissen's rule, Zero resistance state, Persistent current, Meissner effect, Critical temperature, Critical current (Silsbee Effect) – Derivation of expression of critical current for a cylindrical wire using ampere's law, Critical field, Formation of Cooper pairs - Mediation of phonons, BCS Theory - Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Cooper pair tunneling (Andreev reflection), Josephson junction, Flux quantization, DC and AC SQUID (Qualitative), Numerical Problems.

Module 4	**Photonics**	Duration: 9 hours
Interaction of radiation with matter – Einstein's A and B coefficients and derivation of expression for energy density, Prerequisites for lasing actions, Types of LASER, Semiconductor diode LASER, Use of attenuators for single photon sources, Optical modulators – Pockel's effect, Kerr effect, Photodetectors – Single Photon Avalanche Diode, Superconducting Nanowire Single Photon Detector, Optical fiber, Derivation of Numerical aperture, V-number, Number of modes, losses in optical fiber, Mach-Zehnder interferometer, Numerical problems.		
Module 5	**Quantum Computing**	Duration: 9 hours
Moore's law - limitation of VLSI, Classical vs Quantum Computation, bit, Qubit and its properties, Bloch Sphere, Dirac notation, Brief discussion on types of qubit, Superconducting qubits, Harmonic oscillator (qualitative) – Need for anharmonicity, Charge qubit, Operators and Operations (matrix form), Quantum Gates – Pauli Gates, Phase gate (S, T), Hadamard Gate, Two qubit gates – CNOT gate, Entanglement, Bell States, Predicting the outputs of various combinations of single and two-qubit gates, Numerical Problems.		

PRACTICAL COMPONENTS OF IPCC

1. Determination of wavelength of LASER using Diffraction Grating.
2. Determination of acceptance angle and numerical aperture of the given Optical Fibre.
3. Study the Characteristics of a Photo-Diode and to determine the power responsively
4. Determination of Planck's Constant using LEDs
5. Determination of Fermi Energy of Copper.
6. Black-Box Experiment (Identification of basic Electronic Components)
7. Resonance in LCR circuit and determination of coefficient of self-induction.
8. Study the I-V Characteristics of a Transistor and hence determine α and β.
9. Predicting the outputs of various combinations of single and two-qubit gates using QUIRK Quantum Simulator
10. Experimental Data Analysis using Spread Sheet.
11. Determination of dielectric constant of the material of capacitor by Charging and Discharging method.
12. Air-wedge / Newtons to study the interference by the division of amplitude.
13. Predicting the outputs of various combinations of single and two-qubit gates using QISKIT
14. Determination of Fermi Energy of Copper

1. At least ten laboratory experiments must be conducted.
2. Minimum one simulation experiment is mandatory and should be conducted either in the computer lab for the entire batch or on dedicated systems in the physics lab.

References:

Text books:

T1. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.

T2. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd., 2018

T3. Solid State Physics, S. O. Pillai, New Age International

T4. Basic Electronics, B L Theraja, Multi-color Edition, S Chand, 2006

Reference books / Manuals:

R1. Beiser, A. (2002). Concepts of Modern Physics (6th ed.). McGraw- Hill Education.

R2. Griffiths, D. J. (2018). Introduction to Quantum Mechanics (2nd or 3rd ed.). Pearson.

R3. Tinkham, M. (2004). Introduction to Superconductivity (2nd ed.). Dover Publications.

R4. Mishra, P. K. (2009). Superconductivity – Basics and Applications. Ane Books.

R5. LASERS and Non-Linear Optics, B B Loud, New Age International,

R6. Saleh, B. E. A., & Teich, M. C. (2019). Fundamentals of Photonics (3rd ed.). Wiley

R7. Nielsen, M. A., & Chuang, I. L. (2010). Quantum Computation and Quantum Information (10th Anniversary ed.). Cambridge university Press.

R8. Vishal Sahani, Quantum Computing, McGraw Hill Education, 2007 Edition.

R9. Solid State Physics, A J Dekker (2000), Indian Ed., Macmillan Publishers India, New Delhi.

Expected Course Outcomes:

After successfully completing the course, the student will be able to

CO1: Explain fundamental concepts of quantum Physics

CO2: Analyse electronic behaviour in metals and semiconductors for key material properties.

CO3: Discuss superconductivity phenomena and their role in quantum systems

CO4: Describe radiation–matter interaction and photonic device operation.

CO5: Understand the basics of Quantum Computation

CO6: Practice working in groups to conduct experiments in physics and perform precise and honest measurements

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
Theory Component (25)				
2 Internal Assessment	50 Each	100	20	08
1 Activity Based Learning for TW & SL	50	50	5	2
Laboratory Component (25)				
Weekly Evaluation	15 Marks Each	15 x Number of Experiments	15	06
Semester End Test	50	50	10	04
TOTAL CIE MARKS (TC+LC)			25+25	10+10
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Rubrics showing Weekly Evaluation of Laboratory

Assessment component	***High***	***Medium***	***Low***
Conduction/ Preparedness (5 M)	Able to do the experiment set-up and perform the experiment with high accuracy and analyse the data and arrive at a conclusion. ***(5-4 M)***	Able to perform the experiment, analyse the data and arrive at conclusion with little guidance. ***(4- 3 M)***	Needs more guidance to do the experiment set up, perform the experiment, data analysis and arrive at conclusion. Fails to submit the results on time. ***(2-0 M)***
Record Writing (10 M)	All sections well written as per format, and in the correct order. Excellent recording of data obtained and accurate calculation. ***(10-8 M)***	Few sections not in order, but readable. Neat /moderate recording of data but average accuracy obtained in the calculations. ***(7-5 M)***	Section out of order, some missing, sloppy formatting. Neat/Moderate recording of data with errors in calculations and fails to submit on time. ***(5-0 M)***

Rubrics showing lab IA Test Evaluation

Assessment component	***High***	***Medium***	***Low***
Write-up (10 M)	All sections well written, and in the correct order with proper mention of the units ***(10-7 M)***	Few sections incorrect with proper mention of the units ***(6-4 M)***	Sloppy write-up, incorrect formulae/circuit diagram and no proper units and explanation of terms ***(3-0 M)***
Conduction (20 M)	Able to do the experiment set-up and perform the experiment and collect the data with high accuracy ***(20-15 M)***	Able to perform the experiment, collect the data. ***(14-08 M)***	Able to collect the data ***(7-0 M)***
Calculation (10 M)	Explicit and accurate calculation with units ***(10-7 M)***	Calculation with average accuracy ***(6-3 M)***	Able to do the calculations with low accuracy and errors ***(2-0 M)***
Viva-Voce (10 M)	Student is highly knowledgeable, Communicative and has analytical attitude ***(10-7 M)***	Student is knowledgeable and communicative ***(6-4 M)***	Student knowledge levels need to be improved ***(3-0 M)***

Physics Poster Presentation/Micro-Project – Activity Structure (Activity Based Learning for TW & SL)			
Total Duration: 45 Hours			
Sl. No.	**Broad Activity / Component**	**Hours**	**Activities Covered**
1	Preliminary Discussion, Topic Selection and Planning	5 Hrs	• Selection of Physics topic. • Formulation of objectives. • Preliminary discussion on content and poster layout / micro-project.
2	Reference Study and Resource Collection	5 Hrs	• Collection of reference materials • Study of selected topic-basic concepts, principles • identification of relevant data, images, diagrams • reformulation of objectives
3	Content/Model Development and Scientific Preparation	12 Hrs	• Introduction of the study topic • Explanation with relevant equations and calculations; tables/data • Experiment/Project Model setup, Diagrams and illustrations • Practical applications. Conclusions
4	Model working, Explanation / Poster Preparation, Layout and Design	20 Hrs	• Organisation of content/working of model • Poster layout; design • Preparation and finalization of the poster.
5	Presentation, Q&A, Evaluation and Feedback	3 Hrs	• Poster presentation/ Micro-project model demonstration • Explanation • Question-and-answer session; • Evaluation on students' understanding, organization, presentation skills • Feedback.
	Total	**45 Hrs**	

Poster Presentation Activity (ABL)
Rubrics of Evaluation

Evaluation criterion (Max 10 Marks each)	**Excellent (10 M)**	**V Good (8-9M)**	**Good (5-7 M)**	**Satisfactory (1-4 M)**
Understanding of the Physics principle	Explains the underlying Physics principle accurately, clearly and confidently,	Explains the principle correctly, with minor gaps or inaccuracies.	Demonstrates partial understanding; with some conceptual errors or unclear statements.	Demonstrates limited understanding; unclear or contains significant conceptual errors.
Relevance and depth of research beyond the syllabus	Substantial depth beyond the syllabus; demonstrates clear understanding of the extended topic.	Well beyond the syllabus, understanding is mostly clear.	Shows limited extension/depth beyond the syllabus; basic understanding of additional information is evident.	Mostly confined to syllabus-level content**,** and limited understanding of the additional material.
Practical/engineering applications	Clearly identifies and explains multiple relevant real-world/engineering applications	Relevant engineering applications with good connection to the underlying Physics.	Identifies some practical/engineering applications, but the connection with Physics is basic or partially explained**.**	Mentions limited applications with weak or unclear connection to the Physics concepts.
Poster design, clarity and scientific presentation	Highly clear, well-organized and visually effective poster; appropriate diagrams and logical flow.	Well-organized and clear poster with good visual presentation, appropriate and minor issues in readability.	Adequately organized and understandable, but with some issues in layout, readability.	Poorly organized limited visual clarity with significant issues in layout or content arrangement.
Explanation and response to evaluator's questions	Gives clear, confident and scientifically accurate explanations**.**	Answers most questions appropriately with good conceptual understanding.	Provides a basic explanation; but shows some gaps in conceptual understanding.	Gives limited explanations; and demonstrates inadequate understanding of the topic.

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF PHYSICS

Course Name:
Physics For Sustainable Structural Systems for CV Stream

Semester: 1st /2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26PHYC102/202	45	0	30	75	45	120	4

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1.5 hrs	3 hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to

CLO1: Understand the principles of simple harmonic, damped, and forced oscillations and their engineering applications.

CLO2: Understand the wave and their role in structural behavior of engineering materials and it's engineering significance.

CLO3: Understand the acoustics for civil structure and their engineering application.

CLO4: Understand the need of inspection for material and principle of surface preparation, ultrasonic testing and their role in engineering.

CLO5: Understand the smart materials and sensors for sustainable structures and their engineering applications.

Module 1	**Oscillations**	Duration:9 hours

Simple harmonic motion (SHM), Differential equation for SHM, Springs: Stiffness factor and its physical significance, Series and Parallel combination of springs (Derivation), Types of springs and their applications. Theory of damped oscillations (Qualitative), Types of damping (Graphical Approach). Engineering applications of Damped oscillations, Theory of forced oscillations, Resonance, Sharpness of resonance. Resonance in LCR Circuits (Qualitative), Numerical Problems

Module 2	**Waves and their role in structural behavior**	Duration:9 hours

Types of waves, Wave propagation in beams, rods, and slabs, Boundary effects, Wave dispersion, Damping in structures, Energy dissipation techniques in structures, Introduction to earthquakes, General characteristics, P-waves, S-waves, Love waves, and Rayleigh waves, Ground motion and structural response, Site effects and soil-structure interaction, Physics of earthquakes, Richter scale of measurement and earthquake-resistant measures, Tsunami (causes for tsunami, characteristics, adverse effects, risk reduction measures, engineering structures to withstand tsunami), Seismometer and Seismograph, Accelerometer.

Module 3	**Acoustics for Civil Structures**	Duration:9 hours

Introduction to Acoustics, Types of Acoustics, Sound wave generation and its propagation, Sound interference and Doppler effect, Principles of sound absorbers, Noise and its measurements, Impact of noise in multi-storied buildings. Reverberation and reverberation time, Absorption power and Absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (derivation), Measurement of absorption coefficient, Factors affecting the acoustics and remedial measures, Sound insulation and its measurements, Highway noise barriers, noise attenuations in buildings. Sound insulation materials for civil structures: Acoustic wood panels and wood composites, Numerical Problems.

Module 4	**Non-Destructive Testing**	Duration:9 hours

Introduction to NDT, Need for inspection, Types of inspection system, Benefits of NDT. Visual inspection, Liquid penetration test: Principles surface preparation, Penetrant application and development, Ultrasonic testing: Principle, Generation of Ultrasonic, Properties, Basics of Probes,
Radiography: Radiation sources, Attenuation of radiation, Shadow formation and distortion, Identification Markers, Numerical Problems.

Module 5	**Smart Materials for Sustainable Structures**	Duration:9 hours

Types of smart materials, Piezo, Magnetostrictive, Electrostrictive, Electro-rheological, Magneto-rheological, Shape memory alloys, Phase transformation in shape memory alloys, Overview of sensor technology, uses of sensors in intelligent structures, Classification of sensors, Temperature sensor, Vibration Sensor, Strain Gauge sensors, Basic concepts of structural health monitoring.

PRACTICAL COMPONENTS OF IPCC

LIST OF EXPERIMENTS

1. Study of Forced Mechanical Oscillations and Resonance.
2. Study of the frequency response of Series & Parallel LCR circuits.
3. Determination of effective spring constant of the given springs in series and parallel combinations.
4. Determination of moment of inertia of irregular body.
5. Verification of Inverse Square Law of Intensity of Light.
6. Study on types of damping (Pendulum and Damper)
7. Determination of Young's Modulus of the material of the given bar by uniform bending.
8. Determination of Young's Modulus of the material of the given bar using Single Cantilever
9. Determination of Rigidity modulus of the Material of the wire using Torsional Pendulum.
10. STEP Interactive Physical Simulations. (Relevant to Theory part)
11. PHET Interactive Simulations (Relevant to Theory part)
12. Interpretation of graphs and images using XRD and SEM
13. Simple case study on acoustics (Auditorium, Cinema Hall, Etc)
14. Data Analysis using Spread Sheets.

1. At least ten laboratory experiments must be conducted.
2. Minimum one simulation experiment is mandatory and should be conducted either in the computer lab for the entire batch or on dedicated systems in the physics lab.

References:	**Text books:** 1. Physics, Oscillations and Waves, Optics and Quantum Mechanics, H M Agarwal and R M Agarwal, Pearson, 2025 2. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson,2018. 3. Dynamics of Structures - Theory and Applications to Earthquake Engineering Anil K. Chopra, University of California at Berkeley, Fourth Edition. Prentice Hall 4. Non Destructive Testing - Hull, J. B., & John, V. (2015). Macmillan International Higher Education. 5. Smart Materials in Structural Health Monitoring, Control and Biomechanics, Suresh Bhalla (IIT Delhi), C. K. Soh, Yaowen Yang, Springer. **Reference books/ Manuals:** 1. Engineering Physics, SL Kakani, Shubra Kakani, 3rd Edition, 2020,CBS Publishers and Distributers Pvt. Ltd. 2. Engineering Physics by R.K. Gaur and S.L. Gupta 2001, 8th rev.ed. 3. A Detailed Text Book of Engineering physics by S.P. Basavaraju Year,Ed: 2010, 4. Engineering Physics by G.K Shivakumar, 5. Vibrations and Waves, A P French, MIT introductory Physics, 2003 6. Introduction to Seismology, Earthquakes, and Earth Structure, Stein, Seth, and Michael Wysession. Blackwell Publishing, 2003.

Expected Course Outcomes:

After successfully completing the course, the student will be able to

CO1: Apply simple harmonic, damped, and forced oscillations in mechanical and electrical systems.

CO2: Discuss the role of waves propagation for structural applications, Earthquakes and Tsunami.

CO3: Illustrate the concepts of acoustics for civil engineering construction.

CO4: Describe non-destructive testing of structural materials for their technological applications.

CO5: Analyse the role of smart materials and sensors for sustainable structures.

CO6: Practice working in groups to conduct experiments in physics and perform precise and honest measurements.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
Theory Component (25)				
2 Internal Assessment	50 Each	100	20	08
1 Activity Based Learning for TW & SL	50	50	5	2
Laboratory Component (25)				
Weekly Evaluation	15 Marks Each	15 x Number of Experiments	15	06
Semester End Test	50	50	10	04
TOTAL CIE MARKS (TC+LC)			25+25	10+10
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Rubrics showing Weekly Evaluation of Laboratory

Assessment component	***High***	***Medium***	***Low***
Conduction/ Preparedness (5 M)	Able to do the experiment set-up and perform the experiment with high accuracy and analyse the data and arrive at a conclusion. ***(5-4 M)***	Able to perform the experiment, analyse the data and arrive at conclusion with little guidance. ***(4- 3 M)***	Needs more guidance to do the experiment set up, perform the experiment, data analysis and arrive at conclusion. Fails to submit the results on time. ***(2-0 M)***
Record Writing (10 M)	All sections well written as per format, and in the correct order. Excellent recording of data obtained and accurate calculation. ***(10-8 M)***	Few sections not in order, but readable. Neat /moderate recording of data but average accuracy obtained in the calculations. ***(7-5 M)***	Section out of order, some missing, sloppy formatting. Neat/Moderate recording of data with errors in calculations and fails to submit on time. ***(5-0 M)***

Rubrics showing lab IA Test Evaluation

Assessment component	**High**	**Medium**	**Low**
Write-up (10 M)	All sections well written, and in the correct order with proper mention of the units **(10-7 M)**	Few sections incorrect with proper mention of the units **(6-4 M)**	Sloppy write-up, incorrect formulae/circuit diagram and no proper units and explanation of terms **(3-0 M)**
Conduction (20 M)	Able to do the experiment set-up and perform the experiment and collect the data with high accuracy **(20-15 M)**	Able to perform the experiment, collect the data. **(14-08 M)**	Able to collect the data **(7-0 M)**
Calculation (10 M)	Explicit and accurate calculation with units **(10-7 M)**	Calculation with average accuracy **(6-3 M)**	Able to do the calculations with low accuracy and errors **(2-0 M)**
Viva-Voce (10 M)	Student is highly knowledgeable, Communicative and has analytical attitude **(10-7 M)**	Student is knowledgeable and communicative **(6-4 M)**	Student knowledge levels need to be improved **(3-0 M)**

Physics Poster Presentation/Micro-Project – Activity Structure (Activity Based Learning for TW & SL)			
Total Duration: 45 Hours			
Sl. No.	**Broad Activity / Component**	**Hours**	**Activities Covered**
1	Preliminary Discussion, Topic Selection and Planning	5 Hrs	• Selection of Physics topic. • Formulation of objectives. • Preliminary discussion on content and poster layout / micro-project.

2	Reference Study and Resource Collection	5 Hrs	• Collection of reference materials • Study of selected topic-basic concepts, principles • identification of relevant data, images, diagrams • reformulation of objectives
3	Content/Model Development and Scientific Preparation	12 Hrs	• Introduction of the study topic • Explanation with relevant equations and calculations; tables/data • Experiment/Project Model setup, Diagrams and illustrations • Practical applications. Conclusions
4	Model working, Explanation / Poster Preparation, Layout and Design	20 Hrs	• Organisation of content/working of model • Poster layout; design • Preparation and finalization of the poster.
5	Presentation, Q&A, Evaluation and Feedback	3 Hrs	• Poster presentation/ Micro-project model demonstration • Explanation • Question-and-answer session; • Evaluation on students' understanding, organization, presentation skills • Feedback.
	Total	**45 Hrs**	

Poster Presentation Activity (ABL)
Rubrics of Evaluation

Evaluation criterion (Max 10 Marks each)	**Excellent (10 M)**	**V Good (8-9M)**	**Good (5-7 M)**	**Satisfactory (1-4 M)**
Understanding of the Physics principle	Explains the underlying Physics principle accurately, clearly and confidently,	Explains the principle correctly, with minor gaps or inaccuracies.	Demonstrates partial understanding; with some conceptual errors or unclear statements.	Demonstrates limited understanding; unclear or contains significant conceptual errors.
Relevance and depth of research beyond the syllabus	Substantial depth beyond the syllabus; demonstrates clear understanding of the extended topic.	Well beyond the syllabus, understanding is mostly clear.	Shows limited extension/depth beyond the syllabus; basic understanding of additional information is evident.	Mostly confined to syllabus-level content**,** and limited understanding of the additional material.
Practical/engineering applications	Clearly identifies and explains multiple relevant real-world/engineering applications	Relevant engineering applications with good connection to the underlying Physics.	Identifies some practical/engineering applications, but the connection with Physics is basic or partially explained**.**	Mentions limited applications with weak or unclear connection to the Physics concepts.
Poster design, clarity and scientific presentation	Highly clear, well-organized and visually effective poster; appropriate diagrams and logical flow.	Well-organized and clear poster with good visual presentation, appropriate and minor issues in readability.	Adequately organized and understandable, but with some issues in layout, readability.	Poorly organized limited visual clarity with significant issues in layout or content arrangement.
Explanation and response to evaluator's questions	Gives clear, confident and scientifically accurate explanations**.**	Answers most questions appropriately with good conceptual understanding.	Provides a basic explanation; but shows some gaps in conceptual understanding.	Gives limited explanations; and demonstrates inadequate understanding of the topic.

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF PHYSICS

Course Name: **Physics of Materials (IPCC): ME stream** | Semester: 1st /2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26PHYM102/202	45	0	30	75	45	120	4

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1.5 hrs	3 hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to

CLO1: Understand the principles of simple harmonic, damped, and forced oscillations and their engineering applications.

CLO2: Understand the elastic behaviour of engineering materials under different loading conditions and its engineering significance.

CLO3: Understand thermoelectric phenomena, materials, and devices for energy conversion and thermal management.

CLO4: Understand the principles of low-temperature physics, cryogen production, and their engineering applications.

CLO5: Understand modern material characterization techniques used to analyse material properties at the micro- and nanoscale.

Module 1	**Oscillations**	Duration:9 hours

Simple harmonic motion (SHM), Differential equation for SHM, Springs: Stiffness factor and its physical significance, Series and Parallel combination of springs (Derivation), Types of springs and their applications. Theory of damped oscillations (Qualitative), Types of damping (Graphical Approach). Engineering applications of damped oscillations, Theory of forced oscillations with derivation, Resonance, Resonance in LCR circuits (Qualitative), Comparison of electrical and mechanical resonance (Qualitative) Applications of resonance in machine design, automobile engineering, Numerical problems.

Module 2	**Elasticity**	Duration:9 hours

Elastic Moduli, Poisson's ratio σ, mention limiting values of σ, mention Relation between Y, n and σ, relation between K, Y and σ (with derivation), Bending moment of cantilever beam and derivation of expression, Torsion and mention expression for couple per unit twist, Stress-Strain Curve, Strain hardening and softening, Static and dynamic loading, Stress concentration, Failures of engineering materials - Ductile fracture, Brittle fracture, Fatigue and factors affecting fatigue, S-N Curve (Wohler curve), Numerical problems.

Module 3	**Thermoelectric materials and devices**	Duration:9 hours

Seebeck effect, Seeback coefficient (thermolelectric power), Thermo emf and thermo current, Expression for thermo emf in terms of T1 and T2, Peltier effect, and Peltier coefficients, figure of merit (Mention Expression), material requirements, Engineering Applications: Thermoelectric coolers (TEC), Electronics cooling (CPU, sensors); Construction and working of thermoelectric generators (TEG); TEG in Exhaust of automobiles: waste heat recovery, Space program (Radioisotope Thermoelectric Generator- RTG), Numerical Problems.

Module 4	Cryogenics	Duration:9 hours

Introduction to Thermodynamics (brief), Carnot's principle (brief), Efficiency, Production of low temperature - Joule Thomson effect (Derivation with 3 cases), Porous plug experiment with theory, Thermodynamical analysis of Joule Thomson effect, Liquefaction of Oxygen by cascade process, Lindey's air liquefier, Liquefaction of Helium (principle only) and its properties (superfluidity), Applications of Cryogenics: Aerospace, Dewar Flask (construction and working), cryogenic insulation, Numerical Problems.

Module 5	Quantum Physics and Material Characterisation Techniques	Duration:9 hours

Quantum Concepts: Wave particle dualism, Schrodinger equation (derivation), Interpretation of wave function (physical meaning and significance), Particle in an infinite 1D potential well (qualitative), Quantum confinement in 0, 1, 2 and 3 Dimension (Qualitative), Density of states (Qualitative and graphical representation) and Optical properties due to quantum confinement- absorption and emission phenomena (blue shift), Quantum tunnelling and applications.

Instrumentation Techniques: X-Ray Diffractometer (XRD), Scherrer equation, Atomic Force Microscope (AFM), X-ray Photoelectron Spectroscopy (XPS), Scanning Electron Microscope (SEM), Numerical Problems.

PRACTICAL COMPONENTS OF IPCC

LIST OF EXPERIMENTS

1. Determination of Young's modulus of the material of the given bar Uniform Bending.
2. Determination of Rigidity modulus of the Material of the wire using Torsional Pendulum.
3. Study of Forced Mechanical Oscillations and Resonance.
4. Study of the frequency response of Series & Parallel LCR circuits.
5. Determination of effective spring constant of the given springs in series and parallel combinations.
6. Verification of Newton's Law of Cooling.
7. Determination of Young's modulus of the material of the given bar using Single Cantilever.
8. Determination of Moment of Inertia of a given irregular body by setting torsional oscillations.
9. Determination of Grating constant using LASER Diffraction/Estimation of particle size of lycopodium powder using Laser Diffraction
10. Study the working of Peltier Module.
11. Determination of Planck's constant using LEDs.
12. STEP Interactive Physical Simulations.(Springs, Simple Pendulum)
13. PHET Interactive Simulation
14. Data Analysis using Spread Sheets

1. At least ten laboratory experiments must be conducted.
2. Minimum one simulation experiment is mandatory and should be conducted either in the computer lab for the entire batch or on dedicated systems in the physics lab.

References:

Text books:

1. A Textbook of Engineering Physics by M.N.Avadhanulu,P G. Kshirsagar, S Chand, 2014, Revised Edition.
2. Fundamentals of Cryogenic Engineering, Mamata Mukhopadhyay, PHI Learning (India)
3. Physics, Oscillations and Waves, Optics and Quantum Mechanics, H M Agarwal and R M Agarwal, Pearson, 2025
4. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson,2018.
5. Characterization of Materials- Mitra P.K. Prentice Hall India Learning Private Limited.

Reference books/ Manuals:

1. Engineering Physics, SL Kakani, Shubra Kakani, 3rd Edition, 2020,CBS Publishers and Distributers Pvt. Ltd.
2. Materials Characterization Techniques-Sam Zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008.
3. Elements of Properties of Matter, DS Mathus, S Chand, Reprint 2016
4. Cryogenics: A Text Book, S.S.Thipse, Alpha Science International, Limited, 2013.
5. Treatise on Heat, M N Saha and B N Srivastava, 2nd Edition, Indian Press, 1935 ; Original from, the University of California.

Expected Course Outcomes:

After successfully completing the course, the student will be able to

CO1: Apply the principles of simple harmonic, damped, and forced oscillations to mechanical and electrical oscillatory systems.

CO2: Evaluate the elastic behavior of engineering materials under various loading conditions.

CO3: Explain the principles of thermoelectric effect and assess the thermoelectric materials and devices for energy conversion and thermal management.

CO4: Demonstrate an understanding of low-temperature physics, cryogen production methods, and analyze the applications of cryogenics.

CO5: Discuss the material characterization techniques and instrumentation to analyze the properties of materials on nanometer scale.

CO6: Practice working in groups to conduct experiments in Physics and perform precise and honest measurements.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
Theory Component (25)				
2 Internal Assessment	50 Each	100	20	08
1 Activity Based Learning for TW & SL	50	50	5	2
Laboratory Component (25)				
Weekly Evaluation	15 Marks Each	15 x Number of Experiments	15	06
Semester End Test	50	50	10	04
TOTAL CIE MARKS (TC+LC)			25+25	10+10
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Rubrics showing Weekly Evaluation of Laboratory			
Assessment component	***High***	***Medium***	***Low***
Conduction/ Preparedness (5 M)	Able to do the experiment set-up and perform the experiment with high accuracy and analyse the data and arrive at a conclusion. ***(5-4 M)***	Able to perform the experiment, analyse the data and arrive at conclusion with little guidance. ***(4-3 M)***	Needs more guidance to do the experiment set up, perform the experiment, data analysis and arrive at conclusion. Fails to submit the results on time. ***(2-0 M)***
Record Writing (10 M)	All sections well written as per format, and in the correct order. Excellent recording of data obtained and accurate calculation. ***(10-8 M)***	Few sections not in order, but readable. Neat /moderate recording of data but average accuracy obtained in the calculations. ***(7-5 M)***	Section out of order, some missing, sloppy formatting. Neat/Moderate recording of data with errors in calculations and fails to submit on time. ***(5-0 M)***

Rubrics showing lab IA Test Evaluation			
Assessment component	***High***	***Medium***	***Low***
Write-up (10 M)	All sections well written, and in the correct order with proper mention of the units ***(10-7 M)***	Few sections incorrect with proper mention of the units ***(6-4 M)***	Sloppy write-up, incorrect formulae/circuit diagram and no proper units and explanation of terms ***(3-0 M)***
Conduction (20 M)	Able to do the experiment set-up and perform the experiment and collect the data with high accuracy ***(20-15 M)***	Able to perform the experiment, collect the data. ***(14-08 M)***	Able to collect the data ***(7-0 M)***
Calculation (10 M)	Explicit and accurate calculation with units ***(10-7 M)***	Calculation with average accuracy ***(6-3 M)***	Able to do the calculations with low accuracy and errors ***(2-0 M)***
Viva-Voce (10 M)	Student is highly knowledgeable, Communicative and has analytical attitude ***(10-7 M)***	Student is knowledgeable and communicative ***(6-4 M)***	Student knowledge levels need to be improved ***(3-0 M)***

Physics Poster Presentation/Micro-Project – Activity Structure
(Activity Based Learning for TW & SL)

Total Duration: 45 Hours

Sl. No.	Broad Activity / Component	Hours	Activities Covered
1	Preliminary Discussion, Topic Selection and Planning	5 Hrs	• Selection of Physics topic. • Formulation of objectives. • Preliminary discussion on content and poster layout / micro-project.
2	Reference Study and Resource Collection	5 Hrs	• Collection of reference materials • Study of selected topic-basic concepts, principles • identification of relevant data, images, diagrams

			• reformulation of objectives
3	Content/Model Development and Scientific Preparation	12 Hrs	• Introduction of the study topic • Explanation with relevant equations and calculations; tables/data • Experiment/Project Model setup, Diagrams and illustrations • Practical applications. Conclusions
4	Model working, Explanation / Poster Preparation, Layout and Design	20 Hrs	• Organisation of content/working of model • Poster layout; design • Preparation and finalization of the poster.
5	Presentation, Q&A, Evaluation and Feedback	3 Hrs	• Poster presentation/ Micro-project model demonstration • Explanation • Question-and-answer session; • Evaluation on students' understanding, organization, presentation skills • Feedback.
	Total	**45 Hrs**	

Poster Presentation Activity (ABL)
Rubrics of Evaluation

Evaluation criterion (Max 10 Marks each)	**Excellent (10 M)**	**V Good (8-9M)**	**Good (5-7 M)**	**Satisfactory (1-4 M)**
Understanding of the Physics principle	Explains the underlying Physics principle accurately, clearly and confidently,	Explains the principle correctly, with minor gaps or inaccuracies.	Demonstrates partial understanding; with some conceptual errors or unclear statements.	Demonstrates limited understanding; unclear or contains significant conceptual errors.
Relevance and depth of research beyond the syllabus	Substantial depth beyond the syllabus; demonstrates clear understanding of the extended topic.	Well beyond the syllabus, understanding is mostly clear.	Shows limited extension/depth beyond the syllabus; basic understanding of additional information is evident.	Mostly confined to syllabus-level content, and limited understanding of the additional material.
Practical/engineering applications	Clearly identifies and explains multiple relevant real-world/engineering applications	Relevant engineering applications with good connection to the underlying Physics.	Identifies some practical/engineering applications, but the connection with Physics is basic or partially explained.	Mentions limited applications with weak or unclear connection to the Physics concepts.
Poster design, clarity and scientific presentation	Highly clear, well-organized and visually effective poster; appropriate diagrams and logical flow.	Well-organized and clear poster with good visual presentation, appropriate and minor issues in readability.	Adequately organized and understandable, but with some issues in layout, readability.	Poorly organized limited visual clarity with significant issues in layout or content arrangement.
Explanation and response to evaluator's questions	Gives clear, confident and scientifically accurate explanations.	Answers most questions appropriately with good conceptual understanding.	Provides a basic explanation; but shows some gaps in conceptual understanding.	Gives limited explanations; and demonstrates inadequate understanding of the topic.

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

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DEPARTMENT OF PHYSICS

Course Name: **Quantum Physics And Electronic Sensors for ECE stream**						Semester: 1st /2nd	
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26PHEC102/202	45	0	30	75	45	120	4
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1.5 hrs	3 hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: To develop a strong foundation in quantum mechanics by understanding fundamental principles such as wave functions, uncertainty principle, and Schrödinger equation, and their relevance to modern physics.

CLO2: To analyze the electrical and optical properties of materials by applying quantum concepts to metals, semiconductors, superconductors, and photonic systems.

CLO3: To introduce basic electronic devices and their working principles.

Module 1	**Quantum Mechanics**	Duration:9 hours

Black Body radiation problem and Planks Radiation formula, de Broglie Hypothesis, Heisenberg's Uncertainty Principle and its application (Broadening of Spectral Lines), Principle of Complementarity, Wave Function, Time independent Schrödinger wave equation (Derivation), Physical significance of a wave function and Born Interpretation, Eigen functions and Eigen values, Expectation value and its physical significance, Particle inside one dimensional infinite potential well, Role of higher dimensions (Qualitative), Waveforms and Probabilities, Particle inside a finite potential well and quantum tunneling, Numerical Problems.

Module 2	**Electrical Properties of Metals and Semiconductors**	Duration:9 hours

Assumptions of Classical free electron theory, mention of the conductivity expression (no derivation), Failures of CFET; Assumptions of Quantum Free Electron Theory, , Fermi Energy, Variation of Fermi Factor With Temperature and Energy, Mention of expression for electrical conductivity, Success of quantum free electron theory of metals. Mention of Density of States expression, Derivation of electron concentration in an intrinsic semiconductor, Expression for electron and hole concentration in extrinsic semiconductor (Qualitative), Fermi level for intrinsic(with derivation) and extrinsic semiconductor (no derivation), Hall effect, Numerical Problems.

Module 3	**Superconductivity**	Duration:9 hours

Mechanisms of electron scattering in solids, Matheissen's rule, Zero resistance state, Persistent current, Meissner effect, Critical temperature, Critical current (Silsbee Effect) – Derivation of expression of critical current for a cylindrical wire using ampere's law, Critical field, Formation of Cooper pairs - Mediation of phonons, BCS Theory - Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Cooper pair tunneling (Andreev reflection), Josephson junction, Flux quantization, DC and AC SQUID (Qualitative), Numerical Problems.

Module 4	**Photonics**	Duration:9 hours
Interaction of radiation with matter – Einstein's A and B coefficients and derivation of expression for ener-gy density, Prerequisites for lasing actions, Types of LASER, Semiconductor diode LASER, Use of attenuators for single photon sources, Optical modulators – Pockel's effect, Kerr effect, Photodetectors – Single Photon Avalanche Diode, Superconducting Nanowire Single Photon Detector, Optical fiber, Derivation of Numerical aperture, V-number, Number of modes, losses in optical fiber, Mach-Zehnder interferometer, Numerical problems.		
Module 5	**Semiconductor devices and Sensors**	Duration:9 hours
Direct and indirect band gap, Band gap engineering, Zener Diode, LED, PhotoDiode, Photo Transistor, Light de- pendent resistor, Resistance temperature detectors (high, medium, low), Sensing mechanisms, Piezo electric Sensors, Metal Oxide Semiconductor (MOS) gas sensors, Hall sensor, Superconducting Nanowire Single Photon Detector, Numerical Problems.		

PRACTICAL COMPONENTS OF IPCC

LIST OF EXPERIMENTS

1. Determination of wavelength of LASER using Diffraction Grating.
2. Determination of acceptance angle and numerical aperture of the given Optical Fibre.
3. Study the Characteristics of a Photo-Diode and to determine the power responsivity.
4. Determination of Planck's Constant using LEDs
5. Determination of Fermi Energy of Copper.
6. Black-Box Experiment (Identification of basic Electronic Components)
7. Resonance in LCR circuit and determination of coefficient of self-induction.
8. Study the I-V Characteristics of a Transistor and hence determine α and β.
9. Construction and Analyzing Electronic circuits using Expeyes/circuitlab/falstad
10. Experimental Data Analysis using Spread Sheet.
11. Determination of dielectric constant of the material of capacitor by Charging and Discharging method.
12. Air-wedge / Newton's ring experiment to study the interference by the division of amplitude.
13. Predicting the outputs of various combinations of single and two-qubit gates using QISKIT
14. Determination of Fermi Energy of Copper.

1. At least ten laboratory experiments must be conducted.
2. Minimum one simulation experiment is mandatory and should be conducted either in the computer lab for the entire batch or on dedicated systems in the physics lab.

References:

Text books:

T1. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
T2. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd., 2018
T3. Solid State Physics, S. O. Pillai, New Age International
T4. Basic Electronics, B L Theraja, Multi-color Edition, S Chand, 2006

Reference books / Manuals:

R1. Beiser, A. (2002). Concepts of Modern Physics (6th ed.). McGraw-Hill Education..
R2. Griffiths, D. J. (2018). Introduction to Quantum Mechanics (2nd or 3rd ed.). Pearson.
R3. Tinkham, M. (2004). Introduction to Superconductivity (2nd ed.). Dover Publications.
R4. Mishra, P. K. (2009). Superconductivity – Basics and Applications. Ane Books.
R5. LASERS and Non-Linear Optics, B B Loud, New Age International
R6. Saleh, B. E. A., & Teich, M. C. (2019). Fundamentals of Photonics

(3rd ed.). Wiley
R7. Nielsen, M. A., & Chuang, I. L. (2010). Quantum Computation and Quantum Information (10th Anni- versary ed.). Cambridge University Press.
R8. Vishal Sahani, Quantum Computing, McGraw Hill Education, 2007 Edition.
R9. Solid State Physics, A J Dekker (2000), Indian Ed., Macmillan Publishers India, New Delhi.
R10. Principles of Electronics, V K Mehta & Rohit Mehta, S Chand and Company, 7th Edition 2008.

Expected Course Outcomes:

After successfully completing the course, the student will be able to

CO1: Explain fundamental concepts of quantum Physics.

CO2: Analyse electronic behaviour in metals and semiconductors for key material properties.

CO3: Discuss superconductivity phenomena and their role in quantum systems.

CO4: Describe radiation–matter interaction and photonic device operation.

CO5: Apply principles and applications of semiconductor, optical devices, sensors, and transducers in electronic and photonic systems.

CO6: Practice working in groups to conduct experiments in physics and perform precise and honest measurements.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
Theory Component (25)				
2 Internal Assessment	50 Each	100	20	08
1 Activity Based Learning for TW & SL	50	50	5	2
Laboratory Component (25)				
Weekly Evaluation	10 Marks Each	15 x Number of Experiments	15	06
Semester End Test	50	50	10	04
TOTAL CIE MARKS (TC+LC)			25+25	10+10
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Rubrics showing Weekly Evaluation of Laboratory			
Assessment component	***High***	***Medium***	***Low***
Conduction/ Preparedness (5 M)	Able to do the experiment set-up and perform the experiment with high accuracy and analyse the data and arrive at a conclusion. ***(5-4 M)***	Able to perform the experiment, analyse the data and arrive at conclusion with little guidance. ***(4- 3 M)***	Needs more guidance to do the experiment set up, perform the experiment, data analysis and arrive at conclusion. Fails to submit the results on time. ***(2-0 M)***
Record Writing (10 M)	All sections well written as per format, and in the correct order. Excellent recording of data obtained and accurate calculation. ***(10-8 M)***	Few sections not in order, but readable. Neat /moderate recording of data but average accuracy obtained in the calculations. ***(7-5 M)***	Section out of order, some missing, sloppy formatting. Neat/Moderate recording of data with errors in calculations and fails to submit on time. ***(5-0 M)***

Rubrics showing lab IA Test Evaluation			
Assessment component	***High***	***Medium***	***Low***
Write-up (10 M)	All sections well written, and in the correct order with proper mention of the units ***(10-7 M)***	Few sections incorrect with proper mention of the units ***(6-4 M)***	Sloppy write-up, incorrect formulae/circuit diagram and no proper units and explanation of terms ***(2-0M)***
Conduction (20 M)	Able to do the experiment set-up and perform the experiment and collect the data with high accuracy ***(20-15 M)***	Able to perform the experiment, collect the data. ***(14-08 M)***	Able to collect the data ***(7-0 M)***
Calculation (10 M)	Explicit and accurate calculation with units ***(10-7 M)***	Calculation with average accuracy ***(6-3 M)***	Able to do the calculations with low accuracy and errors ***(2-0 M)***
Viva-Voce (10 M)	Student is highly knowledgeable, Communicative and has analytical attitude ***(10-7 M)***	Student is knowledgeable and communicative ***(6-4 M)***	Student knowledge levels need to be improved ***(3-0 M)***

Physics Poster Presentation/Micro-Project – Activity Structure (Activity Based Learning for TW & SL)			
Total Duration: 45 Hours			
Sl. No.	**Broad Activity / Component**	**Hours**	**Activities Covered**
1	Preliminary Discussion, Topic Selection and Planning	5 Hrs	• Selection of Physics topic. • Formulation of objectives. • Preliminary discussion on content and poster layout / micro-project.
2	Reference Study and Resource Collection	5 Hrs	• Collection of reference materials • Study of selected topic-basic concepts, principles

			• identification of relevant data, images, diagrams • reformulation of objectives
3	Content/Model Development and Scientific Preparation	12 Hrs	• Introduction of the study topic • Explanation with relevant equations and calculations; tables/data • Experiment/Project Model setup, Diagrams and illustrations • Practical applications. Conclusions
4	Model working, Explanation / Poster Preparation, Layout and Design	20 Hrs	• Organisation of content/working of model • Poster layout; design • Preparation and finalization of the poster.
5	Presentation, Q&A, Evaluation and Feedback	3 Hrs	• Poster presentation/ Micro-project model demonstration • Explanation • Question-and-answer session; • Evaluation on students' understanding, organization, presentation skills • Feedback.
	Total	**45 Hrs**	

Poster Presentation Activity (ABL)
Rubrics of Evaluation

Evaluation criterion (Max 10 Marks each)	**Excellent (10 M)**	**V Good (8-9M)**	**Good (5-7 M)**	**Satisfactory (1-4 M)**
Understanding of the Physics principle	Explains the underlying Physics principle accurately, clearly and confidently,	Explains the principle correctly, with minor gaps or inaccuracies.	Demonstrates partial understanding; with some conceptual errors or unclear statements.	Demonstrates limited understanding; unclear or contains significant conceptual errors.
Relevance and depth of research beyond the syllabus	Substantial depth beyond the syllabus; demonstrates clear understanding of the extended topic.	Well beyond the syllabus, understanding is mostly clear.	Shows limited extension/depth beyond the syllabus; basic understanding of additional information is evident.	Mostly confined to syllabus-level content**,** and limited understanding of the additional material.
Practical/engineering applications	Clearly identifies and explains multiple relevant real-world/engineering applications	Relevant engineering applications with good connection to the underlying Physics.	Identifies some practical/engineering applications, but the connection with Physics is basic or partially explained**.**	Mentions limited applications with weak or unclear connection to the Physics concepts.
Poster design, clarity and scientific presentation	Highly clear, well-organized and visually effective poster; appropriate diagrams and logical flow.	Well-organized and clear poster with good visual presentation, appropriate and minor issues in readability.	Adequately organized and understandable, but with some issues in layout, readability.	Poorly organized limited visual clarity with significant issues in layout or content arrangement.
Explanation and response to evaluator's questions	Gives clear, confident and scientifically accurate explanations**.**	Answers most questions appropriately with good conceptual understanding.	Provides a basic explanation; but shows some gaps in conceptual understanding.	Gives limited explanations; and demonstrates inadequate understanding of the topic.

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF PHYSICS

Course Name: Physics of Electrical Engineering Materials						Semester: 1st /2nd	
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26PHEE102/202	45	0	30	75	45	120	4
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1.5 hrs	3 hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to

CLO1: Illustrate dielectric and magnetic properties of materials and apply them in electrical components like transformers, capacitors, and magnetic switches.

CLO2: Summarize thermoelectric phenomena, device construction, and identify suitable materials and applications for energy conversion.

CLO3: Discuss electrical transport mechanisms in metals and semiconductors using classical and quantum models, and perform relevant calculations.

CLO4: Explain superconducting principles, distinguish between types of superconductors, and explain their physical properties and technological uses.

CLO5: Describe the principles, properties, and applications of rare earth, ceramic, and smart materials in energy systems.

Module 1	**Dielectric and Magnetic Materials**	Duration:9 hours

Dielectrics :

Introduction, Electrical Polarization Mechanisms, Internal fields in solids (qualitative), Clausius-Mossotti relation (Derivation) and its implications, Properties and Frequency dependence of Dielectric constant, Dielectric loss(qualitative), Solid, Liquid and Gaseous dielectrics. Application of dielectrics in Capacitors, Transformers (Oils)(Mention), SF6 in High Voltage application, Numerical Problems.

Magnetic material :

Classification of magnetic materials, Weiss Molecular field theory of ferromagnetism(Qualitative), Importance of Curie Temperature, Ferromagnetic Hysteresis and Explanation using Domain theory, Energy loss, Hard and soft ferromagnetic materials and Applications, Transformer Cores, Armature, Inductors and chokes, Permanent Magnets, Numerical Problems.

Module 2	**Thermoelectric materials and devices**	Duration: 9 hours

Thermo emf and thermo current, Seebeck effect, Peltier effect, Seebeck and Peltier coefficients, figure of merit (Mention Expression), laws of thermoelectricity, Expression for thermo emf in terms of T1 and T2; Thermo couples, thermopile, Construction and Working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), Applications: Electronics cooling (CPU, sensors), Exhaust of Automobiles, Refrigerator, Space Program (Radioisotope Thermoelectric Generator), Thermoelectric Nano-Generator (TENG), Numerical Problems.

Module 3	**Electrical Properties of Metals and Semiconductors**	Duration:9 hours

Failures of classical free electron theory, Mechanisms of electron scattering in solids, Matheissen's rule, Assumptions of Quantum Free Electron Theory, Density of States, Fermi Dirac statistics, Fermi Energy, Variation of Fermi Factor With Temperature and Energy, Expression for carrier concentration, Derivation of electron concentration in an intrinsic semiconductor, Expression for electron and hole concentration in extrinsic semi-conductor, Fermi level for intrinsic(with derivation) and extrinsic semiconductor (no derivation), Hall effect, Numerical Problems.

Module 4	**Superconductivity**	Duration:8 hours
Zero resistance state, Persistent current, Meissner effect, Critical temperature, Critical current (Silsbee Effect) – Derivation for a cylindrical wire using ampere's law, Critical field, Formation of Cooper pairs - Mediation of phonons, Two-fluid model, BCS Theory - Phase coherent state, Limitations of BCS theory, Type-I and Type-II superconductors, High T_c superconductors, Formation of Vortices, Explanation for upper critical field, Josephson junction, Flux quantization, DC Squid, Superconducting Magnet, MAGLEV, Numerical Problems.		
Module 5	**Electrical Engineering Materials**	Duration:8 hours
Rare earth materials, Role in energy systems, NdFeB and SmCo Magnets-high magnetic field applications, Ceramics: Types, Materials, Applications, Electrostriction, Strain proportional to square of the electric field, Materials and Applications (Mention), Electrorheological (ER) materials, Principle, Viscosity changes under applied electric field, ER Fluids, Applications (Mention), Magnetorheological (MR) materials, Principle, Magnetic field-induced change in viscosity, MR Fluids, Applications (Mention). Numerical Problems.		

PRACTICAL COMPONENTS OF IPCC

LIST OF EXPERIMENTS

1. Determination of dielectric constant of the material of capacitor by charging and discharging method.
2. Determination of Magnetic Flux Density at any point along the axis of a circular coil.
3. Determination of resistivity of a semiconductor by Four Probe Method.
4. Study the characteristics of the given Photo-Diode and determine the power responsivity.
5. Study the frequency response of Series & Parallel LCR circuits.
6. Determination of Fermi Energy of copper.
7. Study the I-V Characteristics of a Transistor and hence determine α and β.
8. Maxwell's / Wheatstone bridge circuits – Determination of unknown value of inductance / resistance.
9. Experiment on Thermo-emf / Peltier Module.
10. Black-Box Experiment (Identification of basic Electronic/Electrical Components)
11. Determine the Energy Gap of the given Semiconductor.
12. To study the operation of a multimeter and use it for measuring **resistance, current, voltage**, and for testing **diodes, transistors, and continuity in conductors**.
13. Experimental Data Analysis using Spread Sheets.
14. Construction and Analyzing Electronic circuits using one of the following
    1. Expeyes : https://expeyes.in/
    2. Circuit Lab : https://www.circuitlab.com/
    3. Multisim : https://www.multisim.com/
    4. DCAClab : https://dcaclab.com/
    5. Falstad : https://www.falstad.com/circuit/

Note :

1. At least ten laboratory experiments must be conducted.
2. Minimum one simulation experiment is mandatory and should be conducted either in the computer lab for the entire batch or on dedicated systems in the physics lab.

References:	**Text books:** 1. Solid State Physics-S O Pillai, 8th Ed- New Age International Publishers-2018. 2. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018. 3. A Text book of Engineering Physics by M.N. Avadhanulu, P G. Kshirsagar, S Chand, 2014, Revised Edition. 4. Smart Materials and Structures, M. V. Gandhi and B. S. Thompson , Chapman & Hall **Reference books / Manuals:** 1. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd., 2018 2. Tinkham, M. (2004). Introduction to Superconductivity (2nd ed.). Dover Publications. 3. Engineering Physics, Wiley Precise Text Books Series, Wiley,2014 4. Engineering Physics-Gaur and Gupta-Dhanpat Rai Publications-2017. 5. Electrical Engineering Materials, R. K. Shukla, Tata McGraw-Hill Education, India, 2017 reprint edition.

Expected Course Outcomes:

After successfully completing the course, the student will be able to

CO1: Analyse and apply the dielectric and magnetic properties of materials in the selection and operation of electrical components such as capacitors, transformers, and magnetic switches.

CO2: Explain, evaluate, and select suitable thermoelectric materials and devices for thermal-to-electrical and electrical-to-thermal energy conversion and identify their practical applications.

CO3: Analyse and calculate electrical transport properties of metals and semiconductors using classical and quantum models, and apply these concepts to relevant electronic and electrical systems.

CO4: Explain and distinguish the principles, types, and physical properties of superconductors, and evaluate their suitability for technological applications.

CO5: Identify, compare, and select suitable rare-earth, ceramic, and smart materials based on their properties for applications in energy generation, conversion, storage, and related systems.

CO6: Practice working in groups to conduct experiments in Physics and perform precise and honest measurements.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
Theory Component (25)				
2 Internal Assessment	50 Each	100	15	08
1 ABL for TW & SL	50	50	5	2
Laboratory Component (25)				
Weekly Evaluation	15 Marks Each	15 x Number of Experiments	15	06
Semester End Test	50	50	10	04
TOTAL CIE MARKS (TC+LC)			25+25	10+10
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Rubrics showing Weekly Evaluation of Laboratory

Assessment component	***High***	***Medium***	***Low***
Conduction/ Preparedness (5 M)	Able to do the experiment set-up and perform the experiment with high accuracy and analyse the data and arrive at a conclusion. ***(5-4 M)***	Able to perform the experiment, analyse the data and arrive at conclusion with little guidance. ***(4- 3 M)***	Needs more guidance to do the experiment set up, perform the experiment, data analysis and arrive at conclusion. Fails to submit the results on time. ***(2-0 M)***
Record Writing (10 M)	All sections well written as per format, and in the correct order. Excellent recording of data obtained and accurate calculation. ***(10-8 M)***	Few sections not in order, but readable. Neat /moderate recording of data but average accuracy obtained in the calculations. ***(7-5 M)***	Section out of order, some missing, sloppy formatting. Neat/Moderate recording of data with errors in calculations and fails to submit on time. ***(5-0 M)***

Rubrics showing lab IA Test Evaluation

Assessment component	***High***	***Medium***	***Low***
Write-up (10 M)	All sections well written, and in the correct order with proper mention of the units ***(10-7 M)***	Few sections incorrect with proper mention of the units ***(6-4 M)***	Sloppy write-up, incorrect formulae/circuit diagram and no proper units and explanation of terms ***(3-0 M)***
Conduction (20 M)	Able to do the experiment set-up and perform the experiment and collect the data with high accuracy ***(20-15 M)***	Able to perform the experiment, collect the data. ***(14-08 M)***	Able to collect the data ***(7-0 M)***
Calculation (10 M)	Explicit and accurate calculation with units ***(10-7 M)***	Calculation with average accuracy ***(6-3 M)***	Able to do the calculations with low accuracy and errors ***(2-0 M)***
Viva-Voce (10 M)	Student is highly knowledgeable, Communicative and has analytical attitude ***(10-7 M)***	Student is knowledgeable and communicative ***(6-4 M)***	Student knowledge levels need to be improved ***(3-0 M)***

Physics Poster Presentation/Micro-Project – Activity Structure

(Activity Based Learning for TW & SL)

Total Duration: 45 Hours

Sl. No.	**Broad Activity / Component**	**Hours**	**Activities Covered**
1	Preliminary Discussion, Topic Selection and Planning	5 Hrs	• Selection of Physics topic. • Formulation of objectives. • Preliminary discussion on content and poster layout / micro-project.

2	Reference Study and Resource Collection	5 Hrs	• Collection of reference materials • Study of selected topic-basic concepts, principles • identification of relevant data, images, diagrams • reformulation of objectives
3	Content/Model Development and Scientific Preparation	12 Hrs	• Introduction of the study topic • Explanation with relevant equations and calculations; tables/data • Experiment/Project Model setup, Diagrams and illustrations • Practical applications. Conclusions
4	Model working, Explanation / Poster Preparation, Layout and Design	20 Hrs	• Organisation of content/working of model • Poster layout; design • Preparation and finalization of the poster.
5	Presentation, Q&A, Evaluation and Feedback	3 Hrs	• Poster presentation/ Micro-project model demonstration • Explanation • Question-and-answer session; • Evaluation on students' understanding, organization, presentation skills • Feedback.
	Total	**45 Hrs**	

Poster Presentation Activity (ABL)
Rubrics of Evaluation

Evaluation criterion (Max 10 Marks each)	**Excellent (10 M)**	**V Good (8-9M)**	**Good (5-7 M)**	**Satisfactory (1-4 M)**
Understanding of the Physics principle	Explains the underlying Physics principle accurately, clearly and confidently,	Explains the principle correctly, with minor gaps or inaccuracies.	Demonstrates partial understanding; with some conceptual errors or unclear statements.	Demonstrates limited understanding; unclear or contains significant conceptual errors.
Relevance and depth of research beyond the syllabus	Substantial depth beyond the syllabus; demonstrates clear understanding of the extended topic.	Well beyond the syllabus, understanding is mostly clear.	Shows limited extension/depth beyond the syllabus; basic understanding of additional information is evident.	Mostly confined to syllabus-level content**,** and limited understanding of the additional material.
Practical/engineering applications	Clearly identifies and explains multiple relevant real-world/engineering applications	Relevant engineering applications with good connection to the underlying Physics.	Identifies some practical/engineering applications, but the connection with Physics is basic or partially explained**.**	Mentions limited applications with weak or unclear connection to the Physics concepts.
Poster design, clarity and scientific presentation	Highly clear, well-organized and visually effective poster; appropriate diagrams and logical flow.	Well-organized and clear poster with good visual presentation, appropriate and minor issues in readability.	Adequately organized and understandable, but with some issues in layout, readability.	Poorly organized limited visual clarity with significant issues in layout or content arrangement.
Explanation and response to evaluator's questions	Gives clear, confident and scientifically accurate explanations**.**	Answers most questions appropriately with good conceptual understanding.	Provides a basic explanation; but shows some gaps in conceptual understanding.	Gives limited explanations; and demonstrates inadequate understanding of the topic.

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MATHEMATICS

Course Name: **NUMERICAL METHODS: CS Stream** | Semester: 2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26MATS201	45	30	0	75	45	120	4

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1 Hr 30 min	3 Hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners in;

CLO1: Evaluate vector and matrix norms, analyze condition numbers, and determine eigenvalues and eigenvectors using numerical methods.

CLO2: Analyze numerical errors and apply numerical methods for solving algebraic and transcendental equations and performing interpolation.

CLO3: Solve first- and higher-order differential equations and evaluate definite integrals using numerical methods.

Module 1	**Numerical solutions for system of linear equations**	Duration: L+T – 9+6 Hours

Norms: Vector norms and Matrix norms-L_1, L_2 and L_∞, ill conditioned linear system, condition number. Eigenvalues and Eigen vectors: Modal Matrix and diagonalization of the matrix of order 2×2 only, Jacobi's method for 2x2 matrix only, Rayleigh power method.

Module 2	**Introduction to Numerical Methods**	Duration: L+T – 9+6 Hours

Errors and their computation: Round off error, Truncation error, Absolute error, Relative error and Percentage error. Solution of algebraic and transcendental equations: Bisection, Regula-Falsi, Secant and Newton-Raphson methods.

Module 3	**Differential Equations of First and Higher Order**	Duration: L+T – 9+6 Hours

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations with integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$. Homogeneous and non-homogeneous differential equations of higher order with constant coefficients. Inverse differential operators e^{ax}, $\sin(ax+b)$, $\cos(ax+b)$ and x^n.

Module 4	**Interpolation**	Duration: L+T – 9+6 Hours

Finite differences, interpolation using Newton Gregary forward and Backward difference formulae, Newton's divided difference. Lagrange interpolation formulae, Piecewise linear interpolation.

Module 5	**Numerical Integration and Numerical Solution of Differential Equations**	Duration: L+T – 9+6 Hours

Numerical integration: Trapezoidal, Simpson's 1/3rd and Simpson's 3/8th rule. Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector method.

References:	**Textbooks:** 1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8thEd., 2022. 2. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 5th Ed., 2023. 3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEd., 2021. **Reference books:** 1. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017 2. N. P. Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022. 3. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5th Ed. 2012. 4. Steven V. Chapra and Raymond P. Canale, Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rd Ed., 2011. 5. Richard L. Burden, Douglas J. Faires, A. M. Burden, Numerical Analysis, 10th Edition., 2010, Cengage Publishers.

Web links and Video Lectures (e-Resources):

http://academicearth.org/

VTU e-Shikshana Program

VTU EDUSAT Program

https://nptel.ac.in/courses/111105160

https://nptel.ac.in/courses/127106019

https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/

https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/syllabus/

Expected Course Outcomes:

CO1	Use vector and matrix norms and condition numbers to assess conditioned linear-system , and iterative methods to find eigenvalues and eigenvectors.
CO2	Compute numerical errors and apply appropriate iterative methods to obtain approximate solutions of algebraic and transcendental equations.
CO3	Solve first and higher-order differential equations using analytical methods.
CO4	Apply interpolation techniques to estimate unknown values using finite differences.
CO5	Apply numerical methods to solve first-order ordinary differential equations and solve problems on numerical integration.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	20
Learning Activity-1: Practicing problems -Average of two objective type / Descriptive type assessments for 30 marks each -GATE-based Aptitude Test.	30 Each	60	15	
1 Activity Based Learning for **TW & SL** Course Project / Case Study Presentation / Programming Assignment / Open Book Test (preferably at RBL4 and RBL5 levels) / Assignment (at RBL3, RBL4, or RBL5 levels) / Any other relevant and innovative academic activity	50	50	10	
TOTAL CIE MARKS			50	
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Team Work & Self Learning Activity (ABL)

Students will undertake a group-based activity related to the applications of mathematics in engineering and present their findings. Each group may consist of a maximum of four students. The activity will focus on applying mathematical concepts, teamwork, problem-solving, creativity, and presentation skills.

TW & SL Details (Duration & Rubrics for Evaluation)

Activity / Description	Duration	Evaluation criteria	Marks
Group-based activity on applications of Mathematics related to the syllabus. Maximum 4 students per group. Each group shall prepare a brief report and present the methodology, mathematical formulation, solution, and Engineering application. The activity may involve the use of MATLAB / Mathematica / Scilab / Python / Maxima or other appropriate mathematical tools.	45 Hours	Mathematical Understanding Application of Concepts Team Participation Creativity & Innovation Presentation	10

Rubrics for activity-based Learning - 50 Marks

Performance Indicator	**Superior**	**Good**	**Fair**	**Needs Improvement**
Problem Understanding **5M**	Clearly identifies and understands the problem **13-15M**	Good understanding with minor gaps **10-12M**	Basic understanding **7-9M**	Poor understanding **0-6M**
Design / Implementation **15M**	Correct and systematic design/implementation **13-15M**	Good implementation with minor errors- **10-12M**	Basic implementation with some errors **7-9M**	Incomplete implementation- **0-6M**
Results & Presentation **20M**	Accurate results with clear presentation **17-20M**	Good results and presentation **13-16M**	Basic results and presentation **9-12M**	Incomplete results/presentation **0-8M**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MATHEMATICS

Course Name: Differential Calculus, Numerical Techniques CV Stream | Semester: 2nd

Course Code	L (H/W)	T (H/W)	P (H/W)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26MATC201	45	30	0	75	45	120	4
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1 Hr 30 min	3 Hrs	Descriptive

Course Learning Objectives

CLO1: Apply vector calculus and evaluate multiple integrals to solve engineering problems.
CLO2: Solve higher-order linear differential equations and formulate partial differential equations for heat and wave problems
CLO3: Solve algebraic equations, interpolation, and numerical integration using numerical

Module 1	**Vector Calculus**	Duration: L+T – 9+6 Hours

Scalar and vector fields, Gradient, directional derivative, divergence and curl-physical interpretation solenoidal vector fields, irrotational vector fields and scalar potential.

Curvilinear coordinates: Scale factors, base vectors, Cylindrical polar coordinates, Spherical polar coordinates, transformation between cartesian and curvilinear systems, orthogonality.

Module 2	**Integral Calculus**	**Duration: L+T – 9+6 Hours**

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral. Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.

Module 3	**Ordinary Differential Equation (ODE) of Higher Order**	**Duration: L+T – 9+6 Hours**

Higher-order linear ordinary differential equations with constant coefficients, homogeneous and non-homogeneous equations e^{ax}, $\sin(ax+b)$, $\cos(ax+b)$, x^n Cauchy's and Legendre's homogeneous differential equations.

Module 4	**Partial Differential Equations (PDE)**	**Duration: L+T – 9+6 Hours**

Formation of PDEs by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivatives with respect to one independent variable only. Application of PDE: Derivation of one-dimensional heat equation and wave equation.

Module 5	**Numerical Methods-1**	**Duration: L+T – 9+6 Hours**

Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods, problems.

Interpolation: Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula. Numerical integration: Trapezoidal, Simpson's 1/3rd and 3/8th rules.

References:

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.,2018.
3. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8th Ed., 2022.

Reference books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-HillEducation,11thEd., 2017

2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. N. P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications,10thEd.,2022.
4. H. K. Das and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5. Richard L. Burden, Douglas J. Faires and A. M. Burden, Numerical Analysis, 10th Ed., 2010, Cengage Publishers.
6. S.S. Sastry," Introductory Methods of Numerical Analysis", PHI Learning Private, Limited, 5thEd.,2012.
7. Steven V. Chapra and Raymond P. Canale, Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rd Ed., 2011.

http://academicearth.org/
VTU e-Shikshana Program
VTU EDUSAT Program
https://nptel.ac.in/courses/111105160
https://nptel.ac.in/courses/127106019
https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/
https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/syllabus/

Expected Course Outcomes:
After completing the course, the student will be able to;

Course Outcomes	
CO1	Apply gradient, directional derivatives, divergence, curl, and curvilinear coordinates to solve problems in vector calculus.
CO2	Apply the concepts of multiple integrals to solve problems on improper integrals and involving area and volume.
CO3	To solve higher-order linear differential equations.
CO4	Formulate and solve partial differential equations by applying appropriate analytical methods
CO5	Apply numerical techniques to solve problems on interpolation, and definite integrals.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	20
Learning Activity-1: Practicing problems -Average of two objective type / Descriptive type assessments for 30 marks each -GATE-based Aptitude Test.	30 Each	60	15	
1 Activity Based Learning for TW & SL Course Project / Case Study Presentation / Programming Assignment / Open Book Test (preferably at RBL4 and RBL5 levels) / Assignment (at RBL3, RBL4, or RBL5 levels) / Any other relevant and innovative academic activity	50	50	10	
TOTAL CIE MARKS			50	
Semester End Evaluation				
Semester End Examination		100	50	18

TOTAL MARKS (CIE + SEE)	100	40

Team Work & Self Learning Activity (ABL)

Students will undertake a group-based activity related to the applications of mathematics in engineering and present their findings. Each group may consist of a maximum of four students.

The activity will focus on applying mathematical concepts, teamwork, problem-solving, creativity, and presentation skills.

TW & SL Details (Duration & Rubrics for Evaluation)

Activity / Description	Duration	Evaluation criteria	Marks
Group-based activity on applications of Mathematics related to the syllabus. Maximum 4 students per group. Each group shall prepare a brief report and present the methodology, mathematical formulation, solution, and Engineering application. The activity may involve the use of MATLAB / Mathematica / Scilab / Python / Maxima or other appropriate mathematical tools.	45 Hour	Mathematical Understanding Application of Concepts Team Participation Creativity & Innovation Presentation	10

Rubrics for activity-based Learning— 50 Marks

Performance Indicator	Superior	Good	Fair	Needs Improvement
Problem Understanding **15M**	Clearly identifies and understands the problem **13-15M**	Good understanding with minor gaps **10-12M**	Basic understanding **7-9M**	Poor understanding **0-6M**
Design / Implementation **15M**	Correct and systematic design/implementation **13-15M**	Good implementation with minor errors- **10-12M**	Basic implementation with some errors **7-9M**	Incomplete implementation**- 0-6M**
Results & Presentation **20M**	Accurate results with clear presentation **17-20M**	Good results and presentation **13-16M**	Basic results and presentation **9-12M**	Incomplete results/presentation **0-8M**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MATHEMATICS

Course Name: **Multivariable Calculus and Numerical Methods ME Stream**							**Semester: 2nd**
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26MATM201	45	30	0	75	45	120	4
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1 Hr 30 min	3 Hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners in;

CLO1: Evaluate multiple integrals and apply vector calculus to solve engineering problems.

CLO2: Solve problems on interpolation & 1st order ODE using numerical methods.

CLO3: Solve higher-order linear differential equations and apply them to engineering problems.

Module 1	**Integral Calculus**	Duration: L+T – 9+6 Hours

Multiple Integrals: Definition, Evaluation of double and triple integrals, evaluation of double integrals by change of order integration, changing into polar coordinates. Applications to find Area and Volume by a double integral.

Beta and Gamma functions: Definitions, properties, the relation between Beta and Gamma functions.

Module 2	**Numerical Methods-1**	Duration: L+T – 9+6 Hours

Solution of algebraic and transcendental equations: Regula-Falsi and Newton Raphson methods. Interpolation: Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula. Numerical integration: Trapezoidal, Simpson's 1/3rdand3/8thrules.

Module 3	**Numerical Methods-2**	Duration: L+T – 9+6 Hours

Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor-corrector formula and Adams-Bashforth predictor-corrector method.

Module 4	**Vector Calculus**	Duration: L+T – 9+6 Hours

Scalar and vector fields. Gradient, directional derivative, divergence and curl, physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential. Vector Integration: Line integrals, work done by a force and flux. Statement of Green's theorem and Stoke's theorem and problems without verifications.

Module 5	**Ordinary Differential Equations of Higher Order**	Duration: L+T – 9+6 Hours

Higher-order ordinary differential equations with constant coefficients, homogeneous and non-homogeneous equations e^{ax}, $\sin(ax+b), \cos(ax+b)$, x^n only, Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. Applications: mass spring model.

References:	**Textbooks:** 4. B.S.Grewal,HigherEngineeringMathematics,KhannaPublishers,44th Ed.,2021. 5. E.Kreyszig, AdvancedEngineeringMathematics, JohnWiley&Sons,10thEd.,2018. 6. M.K.Jain,S.R.K.IyengarandR.K.Jain,NumericalMethodsforScientificand Engineering Computation,NewAgeInternationalPublishers,8thEd.,2022. **Referencebooks:** 1. B.V.Ramana,HigherEngineeringMathematics,McGraw-HillEducation,11thEd.,2017 2. SrimantaPal&SubodhC.Bhunia,EngineeringMathematics,Oxford University Press, 3rdEd., 2016. 3. N.P.BaliandManishGoyal,ATextbookofEngineeringMathematics,Laxmi Publications,10thEd.,2022. 4. H.K.DasandEr.RajnishVerma,HigherEngineeringMathematics,S.Chand Publication, 3rdEd., 2014. 5. RichardL.Burden,DouglasJ.FairesandA.M.Burden,NumericalAnalysis,10thEd., 2010, Cengage Publishers. 6. S.S.Sastry,"IntroductoryMethodsofNumericalAnalysis", PHILearningPrivate, Limited,5thEd.,2012.

Web links and Video Lectures (e-Resources):

http://academicearth.org/

VTUe-ShikshanaProgram

VTUEDUSATProgram

https://nptel.ac.in/courses/111105160

https://nptel.ac.in/courses/127106019

https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/

https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/syllabus/

Expected Course Outcomes:

After completing the course, the student will be able to;

CO1	Apply the concepts of multiple integrals to solve problems on improper integrals and involving area and volume.
CO2	Apply numerical techniques to find approximate solutions on interpolation, and definite integrals.
CO3	Apply numerical techniques to obtain approximate solutions of first-order ordinary differential equations
CO4	Apply the concepts of vector calculus to solve problems involving line integrals.
CO5	Apply to solve higher-order linear differential equations

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	20
Learning Activity-1: Practicing problems -Average of two objective type / Descriptive type assessments for 30 marks each -GATE-based Aptitude Test.	30 Each	60	15	
1 Activity Based Learning for TW & SL Course Project / Case Study Presentation / Programming Assignment / Open Book Test (preferably at RBL4 and RBL5 levels) / Assignment (at RBL3, RBL4, or RBL5 levels) / Any other relevant and innovative academic activity	50	50	10	
TOTAL CIE MARKS			50	
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Team Work & Self Learning Activity (ABL)

Students will undertake a group-based activity related to the applications of mathematics in engineering and present their findings. Each group may consist of a maximum of four students. The activity will focus on applying mathematical concepts, teamwork, problem-solving, creativity, and presentation skills.

TW & SL Details (Duration & Rubrics for Evaluation)

Activity / Description	Duration	Evaluation criteria	Marks
Group-based activity on applications of Mathematics related to the syllabus. Maximum 4 students per group. Each group shall prepare a brief report and present the methodology, mathematical formulation, solution, and Engineering application. The activity may involve the use of MATLAB / Mathematica / Scilab / Python / Maxima or other appropriate mathematical tools.	45 Hours	Mathematical Understanding Application of Concepts Team Participation Creativity & Innovation Presentation	10

Rubrics for activity-based Learning— 50 Marks

Performance Indicator	Superior	Good	Fair	Needs Improvement
Problem Understanding (15M)	Clearly identifies and understands the problem 13-15M	Good understanding with minor gaps 10-12M	Basic understanding 7-9M	Poor understanding 0-6M
Design / Implementation (15M)	Correct and systematic design/implementation 13-15M	Good implementation with minor errors- 10-12M	Basic implementation with some errors 7-9M	Incomplete implementation- 0-6M
Results & Presentation (20M)	Accurate results with clear presentation 17-20M	Good results and presentation 13-16M	Basic results and presentation 9 -12M	Incomplete results/presentation 0-8M

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MATHEMATICS

Course Name: Calculus, Laplace Transforms and Numerical Techniques							Semester: 2nd
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26MATE201	45	30	0	75	45	120	4
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1 Hr 30 min	3 Hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners in;

CLO1: Evaluate multiple integrals and apply vector calculus to solve engineering problems.

CLO2: Solve problems on interpolation & 1st order ODE using numerical methods.

CLO3: Apply Laplace transforms to solve differential equations.

Module 1	**Integral Calculus and its applications**	Duration: L+T – 9+6 Hours

Multiple Integrals: Evaluation of double and triple integrals, change of order of integration, changing to polar coordinates. Area and volume using double integration.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.

Module 2	**Vector calculus and its applications**	Duration: L+T – 9+6 Hours

Vector differentiation: Scalar and vector fields, gradient of a scalar field, directional derivatives, divergence of a vector field, solenoidal vector, curl of a vector field, irrotational vector, physical interpretation of gradient, divergence, curl and scalar potential. Vector Integration: Line integrals, Statement of Green's and Stokes' theorem without verification problems.

Module 3	**Numerical Methods-1**	Duration: L+T – 9+6 Hours

Solution of algebraic and transcendental equations: Regula-Falsi method and Newton-Raphson method.

Finite Differences and Interpolation: Forward and backward differences, Interpolation: Newton forward and backward interpolation formulae, Newton's divided difference interpolation formula and Lagrange's interpolation formula.

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd rule and Simpson's 3/8th rule.

Module 4	**Numerical Methods-2**	Duration: L+T – 9+6 Hours

Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor-corrector method and Adams-Bashforth predictor-corrector method.

Module 5	**Laplace transforms**	Duration: L+T – 9+6 Hours

Laplace transforms: Definition and Formulae of Laplace Transforms, Laplace Transforms of elementary functions. Properties: linearity, Scaling, shifting property, differentiation in the s-domain, division by t. Laplace Transforms of periodic functions, square wave, saw-tooth wave, triangular wave, full and half wave rectifier, Heaviside Unit step function. Inverse Laplace Transforms: Definition, properties, evaluation of Inverse Laplace Transforms using different methods, and applications to solve ordinary differential equations.

References:	**Textbooks:** 1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021. 2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.,2018. 3. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and

Engineering Computation, New Age International Publishers, 8th Ed., 2022.

Reference books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-HillEducation,11thEd., 2017
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. N. P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications,10thEd.,2022.
4. H. K. Das and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5. Richard L. Burden, Douglas J. Faires and A. M. Burden, Numerical Analysis, 10th Ed., 2010, Cengage Publishers.
6. S.S. Sastry, "Introductory Methods of Numerical Analysis", PHI Learning Private, Limited, 5thEd.,2012.

Web links and Video Lectures (e-Resources):

http://academicearth.org/

VTU e-Shikshana Program

VTU EDUSAT Program

https://nptel.ac.in/courses/111105160

https://nptel.ac.in/courses/127106019

https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/

https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/syllabus/

Expected Course Outcomes:

After completing the course, the student will be able to;

CO1	Apply the concepts of multiple integrals to solve problems on improper integrals and involving area and volume.
CO2	Apply gradient, directional derivatives, divergence, curl, and line integrals to solve problems in vector calculus.
CO3	Apply numerical techniques to find approximate solutions on interpolation, and definite integrals.
CO4	Apply numerical techniques to obtain approximate solutions of first-order ordinary differential equations.
CO5	Apply the properties and techniques of Laplace and inverse Laplace transforms to analyze and solve initial-value ordinary differential equations.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	20
Learning Activity-1: Practicing problems -Average of two objective type / Descriptive type assessments for 30 marks each - GATE-based Aptitude Test.	30 Each	60	15	
1 Activity Based Learning for **TW & SL** Course Project / Case Study Presentation / Programming Assignment / Open Book Test (preferably at RBL4 and RBL5 levels) / Assignment (at RBL3, RBL4, or RBL5 levels) / Any other relevant and innovative academic activity	50	50	10	
TOTAL CIE MARKS			50	
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Team Work & Self Learning Activity (ABL)

Students will undertake a group-based activity related to the applications of mathematics in engineering and present their findings. Each group may consist of a maximum of four students. The activity will focus on applying mathematical concepts, teamwork, problem-solving, creativity, and presentation skills

TW & SL Details (Duration & Rubrics for Evaluation)

Activity / Description	Duration	Evaluation criteria	Marks
Group-based activity on applications of Mathematics related to the syllabus. Maximum 4 students per group. Each group shall prepare a brief report and present the methodology, mathematical formulation, solution, and Engineering application. The activity may involve the use of MATLAB / Mathematica / Scilab / Python / Maxima or other appropriate mathematical tools.	45 Hours	Mathematical Understanding Application of Concepts Team Participation Creativity & Innovation Presentation	10

Rubrics for activity-based Learning— 50 Marks

Performance Indicator	**Superior**	**Good**	**Fair**	**Needs Improvement**
Problem Understanding **(15M)**	Clearly identifies and understands the problem **13-15M**	Good understanding with minor gaps **10-12M**	Basic understanding **7-9M**	Poor understanding **0-6M**
Design / Implementation **(15M)**	Correct and systematic design/implement ation **13-15M**	Good implementation with minor errors- **10-12M**	Basic implementatio n with some errors **7-9M**	Incomplete implementation**-** **0-6M**
Results & Presentation **(20M)**	Accurate results with clear presentation **17-20M**	Good results and presentation **13-16M**	Basic results and presentation **9-12M**	Incomplete results/presentation **0-8M**

Syllabus of Emerging Technology Course

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF AI & ML and CSE(Data Science)

Course Name: Introduction to AI and Applications						**Semester: 1st / 2nd**	
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26IAIS103/203	45	0	0	45	45	90	3
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1.5 Hrs.	3 Hrs.	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

- **CLO 1:** Understand the fundamental concepts, principles, evolution, and functioning of Artificial Intelligence and intelligent systems.
- **CLO 2:** Apply fundamental Artificial Intelligence and Machine Learning concepts, including learning models, regression, classification, clustering, and basic AI techniques, to simple real-world problems.
- **CLO 3:** Apply prompt engineering techniques to formulate effective prompts and interact appropriately with Generative AI systems and AI tools.
- **CLO 4:** Analyze Generative AI, Large Language Models, AI agents, automation workflows, and no-code/low-code AI platforms to understand their components, capabilities, and practical applications.
- **CLO 5:** Evaluate the suitability, benefits, limitations, and potential of AI-based solutions and emerging applications in robotics, drones, healthcare, finance, retail, agriculture, education, transportation, experimentation, and multidisciplinary research.

Module 1	**Introduction to AI & Intelligent Systems**	Duration:9 Hours

Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Machine Learning and Deep Learning.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

Textbook 1: Chapter 1 (1.1-1.3), Chapter 3 (3.1-3.7.2), Chapter 4 (4.1-4.4)

Module 2	**Machine Learning Basics**	Duration:9 Hours

Machine Learning: Techniques in AI, Machine Learning Model, Types of Machine Learning – Supervised, Unsupervised and Reinforcement Learning (conceptual), **Regression – Linear Regression**, **Classification – Naïve Bayes Classification**, **Clustering – K-Means Clustering**, Neural Networks, Support Vector Machine (SVM), and simple real-life applications such as prediction, spam detection and customer grouping.

Textbook 1: Chapter 2 (2.1–2.8)

Module 3	**Generative AI & Prompt Engineering**	Duration:9 Hours

Large Language Models: The Power of AI: Introduction to Generative AI, What LLMs are?, Conceptual understanding of LLMs, How LLM-based Generative AI works at a basic level, Capabilities and limitations, Applications of Generative AI.

Introduction to Prompt Engineering: Introduction, How Does Prompt Engineering Work?, Introduction to ChatGPT,

Prompt Engineering Techniques for ChatGPT: Instructions Prompt Technique: Zero, One and Few Shot Prompting

Textbook 2: Chapter 1 (1.1, 1.3), Chapter 2 (2.1–2.2.5), Chapter 3 (3.1–3.3.3).

Textbook 3: Chapter 1 (1.1–1.5), Chapter 6 (6.1–6.3).

Module 4	**AI Agents and Automation**	Duration:9 Hours

Trends in AI: AI and Ethical Concerns, Recent trends in AI, Expert System, Introduction to No-Code/Low-Code
AI Agents: Introduction to AI Agents, basic components and working of AI Agents, applications of AI Agents such as Personal Assistants, Virtual Assistants and Chatbots
Textbook 1: Chapter 1(1.10–1.11), Chapter 8 (8.1, 8.2, 8.4) Chapter 9(9.1, 9.2 and 9.3)
Textbook 3: Chapter 8 (8.1–8.3), Chapter 9 (9.1–9.3).

Module 5	**Robotics & Industrial Applications**	Duration:9 Hours

Robotics and Emerging AI Applications: Robotics and Robotics as an Application of AI, Components and Types of Robots, Drones Using AI
Industrial Applications of AI: Application of AI in Healthcare, Application of AI in Finance, Application of AI in Retail, Application of AI in Agriculture, Application of AI in Education, Application of AI in Transportation, AI in Experimentation and Multidisciplinary Research
Textbook 4: Chapter 2 (2.5–2.5.3) & Chapter 3 (3.1–3.6), Chapter 5 (5.1)
Textbook 1: Chapter 1 (1.7–1.8, 1.10–1.11)

Text books /References:

1. **Textbook 1:** Reema Thareja, Artificial Intelligence: Beyond Classical AI, Pearson Education, 2023.
2. **Textbook 2:** Ajantha Devi Vairamani and Anand Nayyar, Prompt Engineering: Empowering Communication, 1st Edition, CRC Press, Taylor & Francis Group, 2024. (DOI: https://doi.org/10.1201/9781032692319).
3. **Textbook 3:** Numa Dhamani and Maggie Engler, Introduction to Generative AI: An Ethical, Societal, and Legal Overview, 2nd Edition, Manning.
4. **Textbook 4:** Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti, AI for Everyone – A Beginner's Handbook for Artificial Intelligence, Pearson, 2024.

Web links and Video Lectures (e-Resources):
Module 1: Introduction to AI and Intelligent Systems

Sl. No.	Topic / Resource	Web Link
1	Introduction to Artificial Intelligence	https://www.ibm.com/think/topics/
2	Types of AI and Machine Intelligence	https://www.ibm.com/think/topics/
3	Intelligent Agents and Environments	Agents in AI | Part-1/2 | AI | Artificial Intelligence | Lec - 04 | Bhanu Priya Lec-28: Introduction to Intelligent Agents and their types with Example in Artificial Intelligence
4	Uninformed and Informed Search Algorithms	Lec-5: Uninformed Vs Informed Search in Artificial Intelligence with Example - YouTube
5	Knowledge Representation	Lec-26: Knowledge Representation and Reasoning | Logic, Semantic Net, Frames etc.

Module 2: Machine Learning Basics

Sl. No.	Topic / Resource	Web Link
1	Introduction to Machine Learning	https://developers.google.com/machine-learning/
2	Linear Regression	Machine Learning | Google for Developers
3	Classification Techniques	
4	Naïve Bayes Classification	
5	K-Means Clustering	
6	Neural Networks and Support Vector Machines	

Module 3: Generative AI and Prompt Engineering

Sl. No.	Topic / Resource	Web Link
1	Introduction to Generative AI	Google Skills
2	Large Language Models (LLMs)	large language models explained for beginners - YouTube

Module 4: AI Agents and Automation

Sl. No.	Topic / Resource	Web Link
1	Ethical Issues and Responsible AI	Think Topics | IBM
2	Expert Systems in AI	Expert Systems in Artificial Intelligence and Soft Computing in Hindi - YouTube
3	Introduction to AI Agents	Introduction to Developing AI Agents - Training | Microsoft Learn
5	No-Code and Low-Code AI Platforms	How to Build & Sell AI Automations: Ultimate Beginner's Guide - YouTube

Additional General E-Resources

These resources can support learning activities, assignments, demonstrations, and self-study across all five modules.

Sl. No.	Resource	Web Link
1	NPTEL Online Courses	nptel.ac.in
2	SWAYAM Online Courses	Swayam Central
3	MIT OpenCourseWare – AI	Search | MIT OpenCourseWare | Free Online Course Materials

Six Learning Activities

Module	Learning Activity	Approach	Programming Required
Module 2	1. Identify ML Approach from Data-Based Cases	Dataset/case study	No
Module 2	2. Explore ML Using an AI Tool	Small dataset + AI tool	No
Module 3	3. Prompt Comparison Experiment	ChatGPT/Gemini/Copilot	No
Module 3	4. AI-Assisted Engineering Problem Solving	Prompt refinement + AI tool	No
Module 4	5. Understand an AI Agent Through Workflow Case Study	Case study + flowchart	No
Module 4	6. Explore No-Code AI Using a Simple Case	Faculty demo + no-code tool	Left to the instructors

TW & SL Details (Duration & Rubrics for Evaluation)

Application to TW and SL

Component	How the Rubric is Applied
Term Work (TW)	Evaluates the student's performance during the faculty-guided learning activ including application, analysis, use of AI tools, documentation and presentation.
Self-Learning (SL)	Evaluates the student's independent exploration, interpretation, use of learr resources/AI tools, critical thinking, documentation and reflection.

Module	Learning Activity	Term Work (TW)	Self-Learning (SL)
Module 2 – Machine Learning Basics	LA–1: ML Approach Identification using Data-Based Cases	4 Hrs	10 Hrs
	LA–2: Explore ML Using an AI Tool / Dataset	4 Hrs	
Module 3 – Prompt Engineering	LA–3: Prompt Engineering Challenge	4 Hrs	5 Hrs
	LA–4: AI-Assisted Engineering Problem Solving	4 Hrs	
Module 4 – Generative AI, AI Agents & Automation	LA–5: Design a Simple AI Agent Workflow	5 Hrs	5 Hrs
	LA–6: No-Code AI Automation	4 Hrs	
Total	6 Learning Activities	25 Hrs	20 Hrs

Rubrics for Term Work (TW) & Self-Learning (SL)

Self-Learning Task → Independent Exploration → Evidence/Output → Short Reflection → Viva/Discussion

Rubrics for Activity-Based Learning (ABL)

Component & CO–PO Mapping	Outstanding (5)	Exceeds Expectations (4)	Meets Expectations (3)	Needs Improvement (2)	Unsatisfactory (1)
Content Coverage [CO1–CO4, PO1]	Covers all relevant aspects of the assigned AI/ML activity, including key concepts, techniques and applications, with excellent accuracy.	Covers all major aspects with minor omissions.	Covers the essential concepts and applications with adequate accuracy.	Covers only some relevant aspects, with noticeable omissions or inaccuracies.	Fails to cover the essential concepts or provides largely incorrect information.
Understanding & Analysis [CO1–CO4, PO2]	Demonstrates excellent conceptual understanding, critical analysis and meaningful interpretation of results, with clear justification.	Demonstrates good understanding and analysis, with minor gaps in interpretation or justification.	Demonstrates basic understanding and provides reasonable analysis with some guidance.	Demonstrates limited understanding, with superficial analysis and weak justification.	Demonstrates inadequate understanding and is unable to analyse or interpret the activity meaningfully.
Presentation & Organization [CO1–CO4, PO9, PO11]	Presents the activity in a highly organized, clear and professional manner, with well-structured documentation and effective visual aids.	Presents the work clearly and systematically, with appropriate documentation and minor organizational issues.	Presents adequately organized work with understandable documentation and explanations.	Presents poorly organized work with incomplete documentation or unclear explanations.	Presents disorganized or incomplete work with little or no meaningful documentation.
Viva / Interaction [CO1–CO4, PO1, PO2]	Answers questions confidently and accurately, explains the methodology and outcomes, and independently justifies decisions.	Answers most questions correctly and explains the methodology with minor difficulty.	Answers basic questions and explains the main concepts with some prompting.	Answers few questions correctly and struggles to explain the methodology or outcomes.	Unable to answer basic questions or explain the submitted activity.

Syllabus of Engineering Science Courses

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MECHANICAL ENGINEERING

Course Name: **COMPUTER AIDED ENGINEERING DRAWING for CV Stream** | Semester: 1st / 2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26CEDC103/203	30	0	30	60	30	90	3

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	3 hrs	3 hrs	Practical

Course Learning Objectives:
The purpose of the course is to facilitate the learners to;
CLO1: Understand basic engineering drawing conventions, scales, symbols and CAD tools for preparing simple Civil Engineering drawings.
CLO2: Understand the principles of orthographic projection and apply them to points, lines and planes.
CLO3: Understand and apply projection, principles to represent simple solids in different orientations.
CLO4: Understand sectional views and develop the lateral surfaces of simple solids.
CLO5: Visualize and represent simple solids and engineering components using isometric and orthographic views.

Module 1	**Basics of Engineering Drawing & Applications in Civil Engineering**	Duration: L+P – 6+6 Hours

Basics of Engineering Drawing (for CIE only): Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Applications in Civil Engineering (for ABL with TW and SL): Basic plan, elevation and section of simple buildings, and simple drawings of doors, windows, staircases and brickwork. 3D visualization of simple building components and Civil Engineering structures.

Module 2	**Orthographic Projections of Points, Lines and Planes**	Duration: L+P – 6+6 Hours

Orthographic Projections of Points, Lines and Planes: Introduction to Orthographic projections, Orthographic projections of points in all the quadrants. Orthographic projections of lines (Placed in First quadrant only as per BIS) Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).

Module 3	**Orthographic Projection of Solids**	Duration: L+P – 6+6 Hours

Orthographic Projection of Solids: Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.

Module 4	**Section of Solids and Development of Lateral Surfaces of Solids**	Duration: L+P – 6+6 Hours

Section of Solids: Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice)
Development of Lateral Surfaces of Solids: Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations.

Module 5	**Transformation of Projections and Simple Part Drawing**	Duration: L+P – 6+6 Hours

Isometric Views: Introduction to Isometric views, Isometric projections, Isometric scale. Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids, step block.
Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views. (Limited to simple geometry only).

Text Books and References:	**Text Books:** 1. K. R. Gopalakrishna, & Sudhir Gopalakrishna: A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017 2. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd Edition, Charotar Publishing House Pvt. Limited, 2023. **Reference:** 1. P.J. Shah, Computer Aided Engineering Drawing, S. Chand Publishing, 2021 2. M. B. Shah & B.C. Rana., Engineering Drawing, Pearson Education, Revised Edition, 2009 3. S. N. Lal and T. Madhusudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022.
Web links and Video Lectures (e-Resources):	• https://nptel.ac.in/courses/112104172 • https://nptel.ac.in/courses/112102304 • https://nptel.ac.in/courses/112105294 • https://www.coursera.org/courses?query=3d%20modeling&utm • https://www.gsourcedata.com/a-guide-to-the-world-of-civil-engineering-drawings-the architectural-atlas/

Teaching-Learning Process (Innovative Delivery Methods):	The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching learning process and facilitate the achievement of course outcomes. • Flipped Classroom • Case-Based Teaching • Simulation and Virtual Labs • Partial Delivery of course by Industry expert/ industrial visits • ICT-Enabled Teaching

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1: Apply engineering drawing conventions, scales, symbols and basic CAD tools to prepare simple Civil Engineering drawings.

CO2: Draw orthographic projections of points, lines and simple planes using standard projection methods.

CO3: Construct orthographic projections of prisms, pyramids, cylinders and cones in specified orientations.

CO4: Prepare sectional views and developments of lateral surfaces of simple solids.

CO5: Generate isometric views of simple solids and convert simple isometric views into orthographic views.

Assessment Details (CIE & SEE)

Assessment Structure: The assessment in each course is divided equally between continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks.
- To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks.
- Notwithstanding the above, a student is considered to have passed the course, provided the Combined total of CIE and SEE is at least 40 out of 100 marks.

Continuous Internal Evaluation (CIE):

CIE shall be evaluated for 50 marks as detailed below:

The final CIE (50) = Class work marks (25) + Test marks (15) + ABL (TW&SL) Marks (10)

- **Class work marks** should comprise of continuous evaluation of drawing work of students as and when the Modules are covered based on the weightage as shown in the following table.

Module	**Max. Marks Weightage**	**Evaluation Weightage in marks**	
		Computer display and print out (a)	**Sketching (b)**
Module 1	20	15	05
Module 2	20	15	05
Module 3	20	15	05
Module 4	20	15	05
Module 5	20	15	05
Total	100	75	25
Consideration of Class work		**Total of [(a) + (b)] = 100 , Scaled down to 25 Marks**	

- At least one Test covering all the modules is to be conducted for 100 marks and evaluation to be based as per SEE pattern, and the obtained marks is to be scaled down to **15 Marks.**

Activity-Based Learning (ABL) – Integrating Term Work (TW) and Self-Learning (SL)	
Hours per Semester	**30 Hours**
Activity Description	Students shall undertake activity-based learning through team-based Term Work (TW) and individual Self-Learning (SL). Teams shall select a simple Civil Engineering object, building component, building drawing or construction-related application. They shall explore relevant Engineering Drawing concepts and prepare drawings, models or visual representations. Students shall independently use NPTEL, SWAYAM, MOOCs, library resources and other credible online learning resources and apply the concepts acquired to the selected activity. The activity shall emphasize basic building plans, elevations, sections, component drawings and conceptual 3D visualizations of simple Civil Engineering structures.
Time Allocation	Preliminary discussion – 1 hour; online/library/self-learning resources – 8 hours; selection of model/activity – 1 hour; planning and preparation of drawings/model – 8 hours; presentation preparation – 6 hours; presentation and discussion – 2 hours; feedback, corrections and final submission – 4 hours.
Activity	Students shall work in teams to select a simple Civil Engineering object, building component or drawing application. They shall identify the relevant components, study their functions and applications, and prepare appropriate drawings such as building plans, elevations, sections and detailed drawings of doors, windows, staircases and brickwork. Basic conceptual 3D visualization may be undertaken wherever applicable.
Student Submission	1. Group engineering drawing/activity sheet or portfolio. 2. Short group report. 3. Group presentation. 4. Individual self-learning record. 5. Evidence of learning and individual contribution. 6. Individual engineering drawing, sketch or 3D visualization, wherever applicable.
Performance Indicators and Marks Distribution	
Technical Correctness	10 marks
Team Participation and Contribution	10 marks
Creativity and Application	10 marks
Presentation and Explanation	10 marks
Self-Learning, Individual Application and Documentation	10 marks
TOTAL	**50 marks**

Assessment Note	The total marks obtained out of 50 shall be scaled down to 10 marks: Final ABL score = marks obtained ÷ 5.

Rubrics for - Activity-Based Learning (Through TW & SL): 50 Marks

Performance Indicator	**9–10 Excellent**	**7–8 Very Good**	**5–6 Good**	**3–4 Needs Improvement**	**1–2 Poor**
1. Technical Correctness	Work is accurate, complete, neat and technically correct with excellent understanding of concepts.	Work is technically sound with minor errors.	Work shows good understanding with some errors.	Several technical errors and omissions are present.	Major error with limite understandi
2. Team Participation & Contribution	Actively participates, collaborates effectively and makes a significant contribution to the team.	Participates very well and completes assigned responsibilities.	Participates adequately and completes assigned work.	Limited participation and contribution.	Very little participation contributio
3. Creativity & Application	Demonstrates excellent creativity and applies concepts effectively to a relevant Civil Engineering application.	Shows very good creativity and appropriate application.	Shows good application with some creativity.	Limited creativity or application.	Very limited inappropria applicatior
4. Presentation & Explanation	Presents confidently and explains the work/concepts clearly, accurately and effectively.	Presents clearly with minor gaps in explanation.	Provides a satisfactory explanation of the work.	Explanation is limited or unclear.	Unable to explain th work adequately
5. Self-Learning, Individual Application & Documentation	Demonstrates excellent self-learning, independently applies the learning, and maintains complete and well-organized records/evidence.	Demonstrates very good self-learning and application with minor documentation gaps.	Demonstrates satisfactory learning and application with adequate records.	Limited self-learning/application and incomplete documentation.	Minimal evidence o learning, application documentati

Semester End Examination (SEE):

- SEE shall be conducted in batches similar to practicals and evaluated for maximum of 100 Marks. Obtained marks shall be accounted for SEE final marks, reducing it by 50%.
- Two full questions shall be set from Modules 2, 3, 4 and 5. Students need to answer one full question from each module.
- Two full questions set from each Module shall cover the entire topic of the respective module.
- Question papers shall be provided by the COE for each batch as per schedule.
- SEE shall be conducted by one Internal and one External Examiner.
- Evaluation shall be carried out jointly by both the examiners.
- The student may be awarded full marks, if he/she completes a solution on computer display without sketch.
- The weightage and distribution of marks for each Module is as shown in the following table:

Module	**Max. Marks Weightage**	**Evaluation Weightage in marks**	
		Computer display and print out (a)	**Sketching (b)**
Module 2	20	15	05
Module 3	30	25	05
Module 4	25	20	05
Module 5	25	20	05
Total	**100**	**80**	**20**
Consideration of SEE Marks		**TOTAL (a + b)**	**100**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MECHANICAL ENGINEERING

Course Name: **COMPUTER AIDED ENGINEERING DRAWING: EEE Stream** | Semester: 1st / 2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26CEDE103/203	2	0	2	60	30	90	3

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	3 hrs	3 hrs	Practical

Course Learning Objectives:
The purpose of the course is to facilitate the learners to;
CLO1: Understand the fundamentals of engineering drawing, visualization, BIS conventions and basic CAD tools used in Electrical and Electronics Engineering practice.
CLO2: Understand the principles of orthographic projection and apply them to points, lines and simple planes using standard drafting methods.
CLO3: Understand and apply orthographic projection principles to represent simple solids in different orientations.
CLO4: Understand sectional views and develop the lateral surfaces of simple solids for practical engineering applications.
CLO5: Visualize and represent simple electrical and electronic components and solids using isometric and orthographic views and basic CAD tools.

Module 1	**Basics of Engineering Drawing & Applications in in Electrical and Electronics Engineering**	**Duration: 12**

Basics of Engineering Drawing (for CIE only): Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.
Applications in Electrical and Electronics Engineering (for ABL with TW and SL): Simple electrical wiring and lighting diagrams, including call bell, automatic fire alarm and UPS systems. Simple electronic circuit diagrams using standard electrical and electronic symbols. Basic 3D visualization of commonly used electrical and electronic components and parts (demonstration only).

Module 2	**Orthographic Projections of Points, Lines and Planes**	Duration: L+P – 6+6 Hours

Orthographic Projections of Points, Lines and Planes: Introduction to Orthographic projections, Orthographic projections of points in all the quadrants. Orthographic projections of lines (Placed in First quadrant only as per BIS) Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).

Module 3	**Orthographic Projection of Solids**	Duration: L+P – 6+6 Hours

Orthographic Projection of Solids: Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.

Module 4	**Section of Solids and Development of Lateral Surfaces of Solids**	Duration: L+P – 6+6 Hours

Section of Solids: Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice)
Development of Lateral Surfaces of Solids: Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations.

Module 5	**Transformation of Projections and Simple Part Drawing**	Duration: L+P – 6+6 Hours

Isometric Views: Introduction to Isometric views, Isometric projections, Isometric scale. Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids, step block.
Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views. (Limited to simple geometry only).

Text Books and References:	**Text Books:** 1. K. R. Gopalakrishna, & Sudhir Gopalakrishna: A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017 2. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd Edition, Charotar Publishing House Pvt. Limited, 2023. **Reference:** 1. P.J. Shah, Computer Aided Engineering Drawing, S. Chand Publishing, 2021 2. M. B. Shah & B.C. Rana., Engineering Drawing, Pearson Education, Revised Edition, 2009 3. S. N. Lal and T. Madhusudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022.
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	• https://www.gsourcedata.com/a-guide-to-the-world-of-civil-engineering-drawings-the architectural-atlas/ • https://fiberopticx.com/optical-fiber-cable-structure/ • https://www.newport.com.cn/t/photonic-crystal-fibers
Teaching-Learning Process (Innovative Delivery Methods):	The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching learning process and facilitate the achievement of course outcomes. • Flipped Classroom • Case-Based Teaching • Simulation and Virtual Labs • Partial Delivery of course by Industry expert/ industrial visits • ICT-Enabled Teaching

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1: Apply engineering drawing conventions, scales, symbols and basic CAD tools to prepare simple Electrical and Electronics Engineering drawings.

CO2: Draw orthographic projections of points, lines and simple planes using standard projection methods.

CO3: Construct orthographic projections of prisms, pyramids, cylinders and cones in specified orientations.

CO4: Prepare sectional views and developments of lateral surfaces of simple solids.

CO5: Generate isometric views of simple solids and represent simple electrical and electronic components using isometric and orthographic views.

Assessment Details (CIE & SEE)

Assessment Structure: The assessment in each course is divided equally between continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks.
- To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks.
- Notwithstanding the above, a student is considered to have passed the course, provided the Combined total of CIE and SEE is at least 40 out of 100 marks.

Continuous Internal Evaluation (CIE):

CIE shall be evaluated for 50 marks as detailed below:

The final CIE (50) = Class work marks (25) + Test marks (15) + ABL (TW&SL) Marks (10)

- **Class work marks** should comprise of continuous evaluation of drawing work of students as and when the Modules are covered based on the weightage as shown in the following table.

Module	**Max. Marks Weightage**	**Evaluation Weightage in marks**	
		Computer display and print out (a)	**Sketching (b)**
Module 1	20	15	05
Module 2	20	15	05
Module 3	20	15	05
Module 4	20	15	05
Module 5	20	15	05
Total	100	75	25
Consideration of Class work		**Total of [(a) + (b)] = 100 Scaled down to 25 Marks**	

- At least one Test covering all the modules is to be conducted for 100 marks and evaluation to be based as per SEE pattern, and the obtained marks is to be scaled down to **15 Marks.**

Activity-Based Learning (ABL) – Integrating Term Work (TW) and Self-Learning (SL)	
Hours per Semester	**30 Hours**
Activity Description	Students shall undertake activity-based learning through a combination of team-based and individual learning activities. Teams shall select a simple Electrical and Electronics Engineering application, such as electrical wiring and lighting diagrams, call bell systems, automatic fire alarm systems, UPS systems, or basic electronic circuits. Students shall identify the relevant electrical and electronic components, understand standard circuit symbols, prepare the required circuit diagrams, and present the outcome. Students shall independently use NPTEL, SWAYAM, MOOCs, library resources, and other credible online learning resources to enhance their knowledge and apply the acquired learning to the selected activity. Basic 3D visualization of commonly used electrical and electronic components may be undertaken for demonstration purposes only.
Time Allocation	Preliminary discussion – 1 hour; online/library/self-learning resources – 8 hours; selection of model/activity – 1 hour; planning and preparation of drawings/model – 8 hours; presentation preparation – 6 hours; presentation and discussion – 2 hours; feedback, corrections and final submission – 4 hours.
Activity	Students shall work in teams on a simple Electrical and Electronics Engineering drawing activity based on the syllabus. The activity may involve electrical wiring diagrams, lighting circuits, call bell systems, automatic fire alarm systems, UPS systems, or basic electronic circuit diagrams using standard electrical and electronic symbols. Each student shall also undertake individual self-learning through NPTEL, SWAYAM, MOOCs, library resources, and other credible online resources and apply the acquired knowledge through an individual circuit diagram, sketch, or basic 3D visualization of an electrical or electronic component.
Student Submission	1. Group engineering drawing/activity sheet or portfolio. 2. Short group report.

	3. Group presentation. 4. Individual self-learning record. 5. Evidence of learning and individual contribution. 6. Individual engineering drawing, sketch or 3D visualization, wherever applicable.

Performance Indicators and Marks Distribution	
Technical Correctness	10 marks
Team Participation and Contribution	10 marks
Creativity and Application	10 marks
Presentation and Explanation	10 marks
Self-Learning, Individual Application and Documentation	10 marks
TOTAL	**50 marks**
Assessment Note	The total marks obtained out of 50 shall be scaled down to 10 marks: Final ABL score = marks obtained ÷ 5.

Rubrics for - Activity-Based Learning (Through TW & SL): 50 Marks

Performance Indicator	9–10 Excellent	7–8 Very Good	5–6 Good	3–4 Needs Improvement	1–2 Poor
1. Technical Correctness	Work is accurate, complete, neat and technically correct with excellent understanding of concepts.	Work is technically sound with minor errors.	Work shows good understanding with some errors.	Several technical errors and omissions are present.	Major errors with limited understanding.
2. Team Participation & Contribution	Actively participates, collaborates effectively and makes a significant contribution to the team.	Participates very well and completes assigned responsibilities.	Participates adequately and completes assigned work.	Limited participation and contribution.	Very li participation contribution.
3. Creativity & Application	Demonstrates excellent creativity and applies concepts effectively to a relevant electrical and electronics Engineering application.	Shows very good creativity and appropriate application.	Shows good application with some creativity.	Limited creativity or application.	Very limited inappropriate application.
4. Presentation & Explanation	Presents confidently and explains the work/concepts clearly, accurately and effectively.	Presents clearly with minor gaps in explanation.	Provides a satisfactory explanation of the work.	Explanation is limited or unclear.	Unable to explain work adequately.
5. Self-Learning, Individual Application & Documentation	Demonstrates excellent self-learning, independently applies the learning, and maintains complete and well-organized records/evidence.	Demonstrates very good self-learning and application with minor documentation gaps.	Demonstrates satisfactory learning and application with adequate records.	Limited self-learning/application and incomplete documentation.	Minimal evidence learning, applicat or documentation.

Semester End Examination (SEE):

- SEE shall be conducted in batches similar to practicals and evaluated for maximum of 100 Marks. Obtained marks shall be accounted for SEE final marks, reducing it by 50%.
- Two full questions shall be set from Modules 2, 3, 4 and 5. Students need to answer one full question from each module.
- Two full questions set from each Module shall cover the entire topic of the respective module.
- Question papers shall be provided by the COE for each batch as per schedule.
- SEE shall be conducted by one Internal and one External Examiner.
- Evaluation shall be carried out jointly by both the examiners.
- The student may be awarded full marks, if he/she completes a solution on computer display without sketch.
- The weightage and distribution of marks for each Module is as shown in the following table:

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out (a)	Sketching (b)
Module 2	20	15	05
Module 3	30	25	05
Module 4	25	20	05
Module 5	25	20	05
Total	**100**	**80**	**20**
Consideration of SEE Marks		TOTAL (a + b)	**100**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MECHANICAL ENGINEERING

Course Name: **COMPUTER AIDED ENGINEERING DRAWING: ME Stream** | Semester: 1st /2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26CEDM103	30	0	30	60	30	90	3

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	3 hrs	3 hrs	Practical

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Understand basic engineering drawing conventions, scales, symbols and CAD tools for preparing simple Mechanical Engineering drawings.

CLO2: Understand the principles of orthographic projection and apply them to points, lines and planes.

CLO3: Understand and apply projection principles to represent simple solids in different orientations.

CLO4: Understand sectional views and develop the lateral surfaces of simple solids.

CLO5: Visualize and represent simple solids and engineering components using isometric and orthographic views.

Module 1	**Basics of Engineering Drawing & Applications in Mechanical Engineering**	Duration: L+P – 6+6 Hours

Basics of Engineering Drawing (for CIE only): Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Applications in Mechanical Engineering (for ABL with TW and SL): Simple mechanisms such as gear train, ratchet and pawl mechanism, belt and pulley drive, and chain drive mechanism. Basic machine elements such as bolts, nuts and shafts. Basic 3D visualization of simple mechanical components and assemblies such as automotive panels and HVAC ducting (conceptual exposure only).

Module 2	**Orthographic Projections of Points, Lines and Planes**	Duration: L+P – 6+6 Hours

Orthographic Projections of Points, Lines and Planes: Introduction to Orthographic projections, Orthographic projections of points in all the quadrants. Orthographic projections of lines (Placed in First quadrant only as per BIS) Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method)

Module 3	**Orthographic Projection of Solids**	Duration: L+P – 6+6 Hours

Orthographic Projection of Solids: Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.

Module 4	**Section of Solids and Development of Lateral Surfaces of Solids**	Duration: L+P – 6+6 Hours

Section of Solids: Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice)

Development of Lateral Surfaces of Solids: Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations.

Module 5	**Transformation of Projections and Simple Part Drawing**	Duration: L+P – 6+6 Hours

Isometric Views: Introduction to Isometric views, Isometric projections, Isometric scale. Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids, step block.

Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views. (Limited to simple geometry only).

Text Books and References:

Text Books:

1. K. R. Gopalakrishna, & Sudhir Gopalakrishna: A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017
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2. M. B. Shah & B.C. Rana., Engineering Drawing, Pearson Education, Revised Edition, 2009
3. S. N. Lal and T. Madhusudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022.

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Teaching-Learning Process (Innovative Delivery Methods):	The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching learning process and facilitate the achievement of course outcomes. • Flipped Classroom • Case-Based Teaching • Simulation and Virtual Labs • Partial Delivery of course by Industry expert/ industrial visits • ICT-Enabled Teaching

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1: Apply engineering drawing conventions, scales, symbols and basic CAD tools to prepare simple Mechanical Engineering drawings.

CO2: Draw orthographic projections of points, lines and simple planes using standard projection methods.

CO3: Construct orthographic projections of prisms, pyramids, cylinders and cones in specified orientations.

CO4: Prepare sectional views and developments of lateral surfaces of simple solids.

CO5: Generate isometric views of simple solids and represent simple mechanical components using isometric and orthographic views.

Assessment Details (CIE & SEE)

Assessment Structure: The assessment in each course is divided equally between continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks.
- To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks.
- Notwithstanding the above, a student is considered to have passed the course, provided the Combined total of CIE and SEE is at least 40 out of 100 marks.

Continuous Internal Evaluation (CIE):

CIE shall be evaluated for 50 marks as detailed below:

The final CIE (50) = Class work marks (25) + Test marks (15) + ABL (TW&SL) Marks (10)

- **Class work marks** should comprise of continuous evaluation of drawing work of students as and when the Modules are covered based on the weightage as shown in the following table.

Module	**Max. Marks Weightage**	**Evaluation Weightage in marks**	
		Computer display and print out (a)	**Sketching (b)**
Module 1	20	15	05
Module 2	20	15	05
Module 3	20	15	05
Module 4	20	15	05
Module 5	20	15	05
Total	100	75	25
Consideration of Class work		**Total of [(a) + (b)] = 100 Scaled down to 25 Marks**	

- At least one Test covering all the modules is to be conducted for 100 marks and evaluation to be based as per SEE pattern, and the obtained marks is to be scaled down to **15 Marks.**

Activity-Based Learning (ABL) – Integrating Term Work (TW) and Self-Learning (SL)	
Hours per Semester	**30 Hours**
Activity Description	Students shall undertake activity-based learning through a combination of team-based and individual learning activities. Teams shall select a simple Mechanical Engineering component, machine element, mechanism, or drawing application, explore relevant Engineering Drawing concepts, prepare the required drawings or conceptual model, and present the outcome. Students shall independently use NPTEL, SWAYAM, MOOCs, library resources, and other credible online learning resources to enhance their knowledge and apply the acquired learning to the selected activity.
Time Allocation	Preliminary discussion – 1 hour; online/library/self-learning resources – 8 hours; selection of model/activity – 1 hour; planning and preparation of drawings/model – 8 hours; presentation preparation – 6 hours; presentation and discussion – 2 hours; feedback, corrections and final submission – 4 hours.
Activity	Students shall work in teams on a simple Mechanical Engineering drawing activity based on the syllabus and present their work. Each student shall also undertake individual self-learning through NPTEL, SWAYAM, MOOCs, library resources, and other credible online resources and apply the learning through a simple mechanical component drawing, sketch, or CAD application.
Student Submission	1. Group engineering drawing/activity sheet or portfolio. 2. Short group report. 3. Group presentation.

	4. Individual self-learning record. 5. Evidence of learning and individual contribution. 6. Individual engineering drawing, sketch or 3D visualization, wherever applicable.
Performance Indicators and Marks Distribution	
Technical Correctness	10 marks
Team Participation and Contribution	10 marks
Creativity and Application	10 marks
Presentation and Explanation	10 marks
Self-Learning, Individual Application and Documentation	10 marks
TOTAL	**50 marks**
Assessment Note	The total marks obtained out of 50 shall be scaled down to 10 marks: Final ABL score = marks obtained ÷ 5.

Rubrics for - Activity-Based Learning (Through TW & SL): 50 Marks

Performance Indicator	9–10 Excellent	7–8 Very Good	5–6 Good	3–4 Needs Improvement	1–2 Poor
1. Technical Correctness	Work is accurate, complete, neat and technically correct with excellent understanding of concepts.	Work is technically sound with minor errors.	Work shows good understanding with some errors.	Several technical errors and omissions are present.	Major errors with limited understanding.
2. Team Participation & Contribution	Actively participates, collaborates effectively and makes a significant contribution to the team.	Participates very well and completes assigned responsibilities.	Participates adequately and completes assigned work.	Limited participation and contribution.	Very participation contribution.
3. Creativity & Application	Demonstrates excellent creativity and applies concepts effectively to a relevant Mechanical Engineering application.	Shows very good creativity and appropriate application.	Shows good application with some creativity.	Limited creativity or application.	Very limited inappropriate application.
4. Presentation & Explanation	Presents confidently and explains the work/concepts clearly, accurately and effectively.	Presents clearly with minor gaps in explanation.	Provides a satisfactory explanation of the work.	Explanation is limited or unclear.	Unable to explain work adequately.
5. Self-Learning, Individual Application & Documentation	Demonstrates excellent self-learning, independently applies the learning, and maintains complete and well-organized records/evidence.	Demonstrates very good self-learning and application with minor documentation gaps.	Demonstrates satisfactory learning and application with adequate records.	Limited self-learning/application and incomplete documentation.	Minimal evidence learning, applica or documentation

Semester End Examination (SEE):

- SEE shall be conducted in batches similar to practicals and evaluated for maximum of 100 Marks. Obtained marks shall be accounted for SEE final marks, reducing it by 50%.
- Two full questions shall be set from Modules 2, 3, 4 and 5. Students need to answer one full question from each module.
- Two full questions set from each Module shall cover the entire topic of the respective module.
- Question papers shall be provided by the COE for each batch as per schedule.
- SEE shall be conducted by one Internal and one External Examiner.
- Evaluation shall be carried out jointly by both the examiners.
- The student may be awarded full marks, if he/she completes a solution on computer display without sketch.
- The weightage and distribution of marks for each Module is as shown in the following table:

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out (a)	Sketching (b)
Module 2	20	15	05
Module 3	30	25	05
Module 4	25	20	05
Module 5	25	20	05
Total	**100**	**80**	**20**
Consideration of SEE Marks		TOTAL (a + b)	**100**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MECHANICAL ENGINEERING

Course Name: **COMPUTER AIDED ENGINEERING DRAWING: CSE Stream** | Semester: 1st / 2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26CEDS103/203	30	0	30	60	30	90	3

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	3 hrs	3 hrs	Practical

Course Learning Objectives:
The purpose of the course is to facilitate the learners to;
CLO1: Understand basic engineering drawing conventions, scales, symbols and CAD tools for preparing simple Computer Science and Engineering-related drawings.
CLO2: Understand the principles of orthographic projection and apply them to points, lines and planes.
CLO3: Understand and apply projection principles to represent simple solids in different orientations.
CLO4: Understand sectional views and develop the lateral surfaces of simple solids.
CLO5: Visualize and represent simple solids and **CSE-related components** using isometric and orthographic views.

Module 1	**Basics of Engineering Drawing & Applications in Computer Science and Engineering**	Duration: L+P – 6+6 Hours

Basics of Engineering Drawing (for CIE only): Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Applications in Computer Science & Engineering (for ABL with TW and SL): Basic 2D schematic representation of wired and wireless computer networks, network components and common network topologies such as bus, star, ring and mesh. Basic 3D modelling and visualization of Arduino boards, routers, switches and IoT devices (demonstration only).

Module 2	**Orthographic Projections of Points, Lines and Planes**	Duration: L+P – 6+6 Hours

Orthographic Projections of Points, Lines and Planes: Introduction to Orthographic projections, Orthographic projections of points in all the quadrants. Orthographic projections of lines (Placed in First quadrant only as per BIS) Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).

Module 3	**Orthographic Projection of Solids**	Duration: L+P – 6+6 Hours

Orthographic Projection of Solids: Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.

Module 4	**Section of Solids and Development of Lateral Surfaces of Solids**	Duration: L+P – 6+6 Hours

Section of Solids: Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice)

Development of Lateral Surfaces of Solids: Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations.

Module 5	**Transformation of Projections and Simple Part Drawing**	Duration: L+P – 6+6 Hours

Isometric Views: Introduction to Isometric views, Isometric projections, Isometric scale. Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids, step block.
Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views. (Limited to simple geometry only).

Text Books and References:	**Text Books:** 1. K. R. Gopalakrishna, & Sudhir Gopalakrishna: A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017 2. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd Edition, Charotar Publishing House Pvt. Limited, 2023. **Reference:** 1. P.J. Shah, Computer Aided Engineering Drawing, S. Chand Publishing, 2021 2. M. B. Shah & B.C. Rana., Engineering Drawing, Pearson Education, Revised Edition, 2009 3. S. N. Lal and T. Madhusudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022.

Web links and Video Lectures (e-Resources):	• https://nptel.ac.in/courses/112104172 • https://nptel.ac.in/courses/112102304 • https://nptel.ac.in/courses/112105294 • https://www.coursera.org/courses?query=3d%20modeling&utm • https://www.youtube.com/watch?v=zbqrNg4C98U
Teaching-Learning Process (Innovative Delivery Methods):	The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching learning process and facilitate the achievement of course outcomes. • Flipped Classroom • Case-Based Teaching • Simulation and Virtual Labs • Partial Delivery of course by Industry expert/ industrial visits • ICT-Enabled Teaching

Expected Course Outcomes:
After successfully completing the course, the student will be able to;
CO1: Apply engineering drawing conventions, scales, symbols and basic CAD tools to prepare simple **Computer Science and Engineering-related drawings**.
CO2: Draw orthographic projections of points, lines and simple planes using standard projection methods.
CO3: Construct orthographic projections of prisms, pyramids, cylinders and cones in specified orientations.
CO4: Prepare sectional views and developments of lateral surfaces of simple solids.
CO5: Generate isometric views of simple solids and convert simple isometric views into orthographic views.

Assessment Details (CIE & SEE)
Assessment Structure: The assessment in each course is divided equally between continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks.
- To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks.
- Notwithstanding the above, a student is considered to have passed the course, provided the Combined total of CIE and SEE is at least 40 out of 100 marks.

Continuous Internal Evaluation (CIE):
CIE shall be evaluated for 50 marks as detailed below:

The final CIE (50) = Class work marks (25) + Test marks (15) + ABL (TW&SL) Marks (10)

- **Class work marks** should comprise of continuous evaluation of drawing work of students as and when the Modules are covered based on the weightage as shown in the following table.

Module	**Max. Marks Weightage**	**Evaluation Weightage in marks**	
		Computer display and print out (a)	**Sketching (b)**
Module 1	20	15	05
Module 2	20	15	05
Module 3	20	15	05
Module 4	20	15	05
Module 5	20	15	05
Total	100	75	25
Consideration of Class work		**Total of [(a) + (b)] = 100 Scaled down to 25 Marks**	

- At least one Test covering all the modules is to be conducted for 100 marks and evaluation to be based as per SEE pattern, and the obtained marks is to be scaled down to **15 Marks.**

Activity-Based Learning (ABL) – Integrating Term Work (TW) and Self-Learning (SL)	
Hours per Semester	**30 Hours**
Activity Description	Students shall undertake activity-based learning through a combination of team-based and individual learning activities. Teams shall select a simple CSE-related object, computer hardware component, network layout or IoT application, explore relevant Engineering Drawing concepts, prepare the required drawings/model and present the outcome. Students shall independently use NPTEL, SWAYAM, MOOCs, library resources and other credible online resources to enhance their learning and apply the acquired knowledge to the activity.
Time Allocation	Preliminary discussion – 1 hour; online/library/self-learning resources – 8 hours; selection of model/activity – 1 hour; planning and preparation of drawings/model – 8 hours; presentation preparation – 6 hours; presentation and discussion – 2 hours; feedback, corrections and final submission – 4 hours.
Activity	Students shall work in teams on a simple Computer Science and Engineering drawing activity based on the syllabus and present their work. Each student shall also undertake individual self-learning through NPTEL, SWAYAM, MOOCs and other credible online resources and apply the learning through a simple drawing/sketch or CAD application.
Student Submission	1. Group engineering drawing/activity sheet or portfolio. 2. Short group report. 3. Group presentation. 4. Individual self-learning record.

	5. Evidence of learning and individual contribution. 6. Individual engineering drawing, sketch or 3D visualization, wherever applicable.

Performance Indicators and Marks Distribution	
Technical Correctness	10 marks
Team Participation and Contribution	10 marks
Creativity and Application	10 marks
Presentation and Explanation	10 marks
Self-Learning, Individual Application and Documentation	10 marks
TOTAL	**50 marks**
Assessment Note	The total marks obtained out of 50 shall be scaled down to 10 marks: Final ABL score = marks obtained ÷ 5.

Rubrics for - Activity-Based Learning (Through TW & SL): 50 Marks

Performance Indicator	9–10 Excellent	7–8 Very Good	5–6 Good	3–4 Needs Improvement	1–2 Poor
1. Technical Correctness	Work is accurate, complete, neat and technically correct with excellent understanding of concepts.	Work is technically sound with minor errors.	Work shows good understanding with some errors.	Several technical errors and omissions are present.	Major err with limi understandin
2. Team Participation & Contribution	Actively participates, collaborates effectively and makes a significant contribution to the team.	Participates very well and completes assigned responsibilities.	Participates adequately and completes assigned work.	Limited participation and contribution.	Very participation contribution.
3. Creativity & Application	Demonstrates excellent creativity and applies concepts effectively to a relevant CS Engineering application.	Shows very good creativity and appropriate application.	Shows good application with some creativity.	Limited creativity or application.	Very limited inappropriate application.
4. Presentation & Explanation	Presents confidently and explains the work/concepts clearly, accurately and effectively.	Presents clearly with minor gaps in explanation.	Provides a satisfactory explanation of the work.	Explanation is limited or unclear.	Unable to e the adequately.
5. Self-Learning, Individual Application & Documentation	Demonstrates excellent self-learning, independently applies the learning, and maintains complete and well-organized records/evidence.	Demonstrates very good self-learning and application with minor documentation gaps.	Demonstrates satisfactory learning and application with adequate records.	Limited self-learning/application and incomplete documentation.	Minimal evi of lea application documentatio

Semester End Examination (SEE):

- SEE shall be conducted in batches similar to practicals and evaluated for maximum of 100 Marks. Obtained marks shall be accounted for SEE final marks, reducing it by 50%.
- Two full questions shall be set from Modules 2, 3, 4 and 5. Students need to answer one full question from each module.
- Two full questions set from each Module shall cover the entire topic of the respective module.
- Question papers shall be provided by the COE for each batch as per schedule.
- SEE shall be conducted by one Internal and one External Examiner.
- Evaluation shall be carried out jointly by both the examiners.
- The student may be awarded full marks, if he/she completes a solution on computer display without sketch.
- The weightage and distribution of marks for each Module is as shown in the following table:

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out (a)	Sketching (b)
Module 2	20	15	05
Module 3	30	25	05
Module 4	25	20	05
Module 5	25	20	05
Total	**100**	**80**	**20**
Consideration of SEE Marks		TOTAL (a + b)	**100**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF ELECTRONCIS AND COMMUNICATION

Course Name: Introduction to Electronics and Communication Engineering						Semester: 1st / 2nd	
Course Code	L (H/W)	T (H/W)	P (H/W)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26ECES104/204	45	0	0	45	45	90	03
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1.5 hrs	3 hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to:

CLO1: To introduce the basic concepts of digital electronics and electronic devices, including logic gates, combinational circuits, diodes, transistors, rectifiers and voltage regulators.

CLO2: To familiarize students with the basic principles and applications of operational amplifiers, transducers, oscillators, analog and digital communication techniques and communication interfaces.

CLO3: To provide an overview of embedded systems, including microprocessors, microcontrollers, memory, sensors, actuators and their real-world applications.

Module 1	**Boolean Algebra and Logic Circuits**	Duration:9 hrs

Binary Numbers, Number Base Conversion- Binary, Decimal and Octal and Hexa Decimal Numbers and Vice-Versa, Complements-1's and 2's, Basic Definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates.

Combinational Logic: Introduction, Design Procedure, Adders- Half Adder, Full Adder. (Text Book 1)

Module 2	**Power Supplies, BJT and MOSFET**	Duration:9 hrs

PN–junction, Zener diode, VI characteristics, Block Diagram of Rectifier, Half and Full Wave Rectifiers, Bridge Rectifier Circuit, Reservoir and Smoothing Circuits, Improved Ripple Filters, Voltage Regulators, Output Resistance and Voltage Regulation, Voltage Multipliers: Voltage Doubler. Switched Mode Power Supplies (SMPS). (Text Book 2)

BJT and MOSFET (n-channel Enhancement): Construction, working, characteristics and Applications. (Text Book 5) Case study: Mobile Phone Charging adapter

Module 3	**Operational Amplifier, Transducers, Oscillators**	Duration:9 hrs

Operational Amplifier Parameters, Operational Amplifier Characteristics, Operational Amplifier Configurations, Operational Amplifier Circuits: Inverting, Non-inverting, Voltage follower, Differential amplifier, Differentiator, Integrator, Instrumentation amplifier.

Transducers: Resistive, Capacitive, Optoelectronic and Piezoelectric (Text book 6)

Module 4	**Communication**	Duration:9 hrs

Analog Communication Schemes: Introduction, Modern Communication System Scheme: Information Source and Input Transducer, Transmitter, Channel or Medium, Noise, Receiver, Concept of Modulation, Types of Communication Systems.

Modulation Schemes: AM,FM & PM drawbacks of Analog Communication, Digital Modulation Schemes: ASK, FSK, PSK, (explanation with Waveform) (Text Book 4)

Computer Communication Interface: UART, USB, Bluetooth, WiFi, ZigBee. (Text Book 3)

Module 5	**Embedded System**	Duration:9 hrs

Definition, Embedded Systems Vs General Computing Systems, Classification of Embedded systems, Major application areas of embedded Systems, Elements of an Embedded System: Core of the embedded system: Microprocessors, GPP Vs ASIP, Microcontrollers, Microprocessor Vs Microcontroller, VonNuemann vs Harvard, RISC V/S CISC, Memory, Sensors, Actuators, LED, 7-Segment LED Display.

Integrated Development Environment(IDE).

(Text book 3) Case study: Sensors, Actuators and Display

References:	**Text Books:** 1. Digital Logic and Computer Design, M. Morris Mano, Pearson Education, 2017, ISBN-978-93-325-4252-5. 2. Mike Tooley, 'Electronic Circuits Fundamentals & Applications,' 5th Edition, Elsevier, 2020. 3. K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2019. 4. S L Kakani and Priyanka Punglia, 'Communication Systems', Ist Edition, New Age International Publisher, 2017. 5. Electronic Devices and Circuit, Boylestad & Nashelsky, Eleventh Edition, Pearson, January 2015. 6. H S Kalsi, 'Electronic Instrumentation', Third Edition, McGraw Hill Company. **Reference Books:** 1. D P Kothari, I J Nagrath, Basic Electronics, Second Edition, McGraw Hill Company. 2. Ramakanth A Gayakwad, Op-amps and Linear Integrated Circuits, Pearson Education, 4th Edition

Expected Course Outcomes:
After successfully completing the course, the student will be able to;

CO1: Apply Boolean algebra, number system conversions, and logic gates to design and implement basic combinational logic circuits

CO2: Describe the characteristics of basic semiconductor devices and their application in rectifier, regulator, and power supply circuits

CO3: Describe the operation and applications of operational amplifiers, basic oscillators, and transducers used in electronic and sensor-interfacing systems

CO4: Illustrate the fundamental concepts of analog and digital modulation techniques and computer communication interfaces used in data communication systems.

CO5: Explain the architecture and working of embedded systems and display devices in embedded applications.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	10
Module test/ Improvement Test/ Assignments at RBL3, RBL4/ Open Book Test/ 1 Activity Based Learning for TW & SL	50	50	25	10
TOTAL CIE MARKS			50	20
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

TW & SL Details (Duration & Rubrics for Evaluation)

Sl. No.	Term Work (TW) and Self-Learning (SL) Activity	Hours / Semester
1	Design and simulation of combinational logic circuits using Boolean algebra, logic gates and adder.	45
2	Design the practical applications of semiconductor devices such as PN junction diode, Zener diode in rectifiers, voltage regulators and electronic circuits.	
3	Study and implement the applications of operational amplifiers, oscillators and transducers.	
4	Case Study/mini project on analog/digital communication systems and modern communication interfaces	
5	Explore real-world embedded-system applications involving microprocessors, microcontrollers, memory, sensors, actuators and processor architectures.	

*Students may undertake any one or maximum of two the above-mentioned Term Work (TW) and Self-Learning (SL) activities.

The 45 hours prescribed for the activity-based learning like course project/ simulation-based assignments shall be systematically utilized for the following activities:

- Formation of project teams and selection of the project topic (3 hours).
- Background study and literature survey (9 hours).
- Formulation of the problem statement, methodology and project plan (5 hours).
- Design and implementation of the proposed system (16 hours).
- Analysis of results (6 hours).
- Preparation of project documentation, demonstration and final presentation (6 hours.

Rubrics for activity-based Learning— 50 Marks

Performance Indicator	Superior	Good	Fair	Needs Improvement
Problem Understanding **(15M)**	Clearly identifies and understands the problem **13-15M**	Good understanding with minor gaps **10-12M**	Basic understanding **7-9M**	Poor understanding **0-6M**
Design / Implementation **(15M)**	Correct and systematic design/implementation **13-15M**	Good implementation with minor errors- **10-12M**	Basic implementation with some errors **7-9M**	Incomplete implementation- **0-6M**
Results & Presentation **(20M)**	Accurate results with clear presentation **17-20M**	Good results and presentation **13-16M**	Basic results and presentation **9-12M**	Incomplete results/presentation **0-8M**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MECHANICAL ENGINEERING

Course Name: **INTRODUCTION TO MECHANICAL ENGINEERING** | Semester: 1st / 2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26IMES104/204	45	0	0	45	45	90	3

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1.5 hrs	3 hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Understand the fundamental streams of Mechanical Engineering and the basic principles of energy conversion, vehicle systems and flying machines.

CLO2: Understand the working principles of conventional engines, electric and hybrid vehicles, battery management systems and modern power transmission systems.

CLO3: Understand the classification, properties and applications of engineering, composite and smart materials in mechanical engineering.

CLO4: Understand the basic principles of manufacturing processes, machine tools, joining processes, CNC technology and additive manufacturing.

CLO5: Understand the fundamentals of automation, mechatronics, Industry 4.0, elementary sensors and integrated systems such as ADAS.

Module 1	**Energy Conversions**	**Duration: 09**

Introduction: Streams in mechanical engineering and their relevance/significance, role of mechanical engineers in solving the real case problems (with examples), careers in mechanical engineering. Realization of some of the engineering solutions through principles of mechanical engineering(with a schematic diagram)

Energy conversion: Introduction and basic working principles of solar energy conversion (helio electrical-PV cell, helio thermal liquid flat plate collector), hydroelectric, nuclear power reactor.

Vehicle systems: Identification of parts of vehicle systems such as steering system, brake system, gear system, working principle of Power steering.

Flying machines: Classification, basic parts involved in drone making, working principle of Drones.

Module 2	**Engines and Future Mobility Technologies**	**Duration: 09**

Engines: Introduction, petrol engine, diesel engines, Working of four Stroke engines, basic emission control concepts, applications.

Insight into Future Mobility: Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles, Battery Management System (BMS), charging methods, Advantages and disadvantages of EVs and Hybrid vehicles.

Power Transmission Systems: Classification of gears, simple & compound gear trains, concepts of automatic and CVT transmission, introduction to dual-clutch transmission (DCT).

Module 3	**Engineering Materials**	**Duration: 09**

Engineering Materials: Introduction, Classification, Ferrous and Non-Ferrous metals: Types, Properties, corrosion resistance and their applications.

Composite Materials: Introduction, Constituents of a composite, Classification, Types of Matrix and Reinforcement materials, Manufacturing basics, Advantages, Disadvantages and Applications of composite materials.

Smart Materials: Introduction, Types - Piezoelectric materials, MR fluids, Shape memory alloys, electrochromic materials and Advantages, Disadvantages and Applications.

Module 4	**Machine Tools and its operations**	**Duration: 09**

Manufacturing: Manufacturing overview, classification of manufacturing processes, process selection criterion. Principles of electric arc Welding, TIG, MIG soldering, brazing. **Machine Tools and Operations:** Introduction to machine tools – lathe, drilling and milling machine. Lathe operations, Turning, facing, knurling, Drilling machine operations: Drilling, reaming, tapping. Milling machine operations: End milling, face milling.

Advanced Machine Tools: Introduction to CNC, components, advantages and applications. Basic principles of 3D printing.

Module 5	**Automation and Sensors**	**Duration: 09**

Automation Technology: Definition of automation, types of automation, basic elements of automation, introduction to Industry 4.0 concepts.

Mechatronic Systems: Definition of mechatronics, elements of mechatronics systems, examples, basic IoT-enabled mechatronic applications.

Elementary Sensors: Working principle and applications of Potentiometer, capacitive sensor, optical encoders and proximity sensors.

Integrated System: Need for integration of technologies, ADAS (Advanced Driver Assistance System).

Textbooks and References:	**Text Books:** 1. K R Gopala Krishna, Elements of Mechanical Engineering, Subhash Publications, 2018. 2. Textbook of Elements of Mechanical Engineering, S. Trymbaka Murthy, Medtech, 2019. **Reference:** 1. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003. 2. William D. Callister, Materials Science & Engineering, An Introduction, John Wiley & Sons Inc, 2010. 3. Elements of Mechanical Engineering, Kestoor Praveen, Suggi Publishing, 2019 4. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1 5. Groover M. P.(2008). Automation, production systems, and computer integrated manufacturing, 3rd ed. Prentice Hall.
Web links and Video Lectures (e-Resources):	• https://nptel.ac.in/courses/112104526 • https://nptel.ac.in/courses/112104616 • https://nptel.ac.in/courses/112104769 • https://theconstructor.org/practical-guide/pelton-turbine-parts-working-design aspects/2894/ • https://www.mechstudies.com/centrifugal-pump/ • https://cfdflowengineering.com/working-principle-and-components-of-drone/ • https://youtu.be/i1ojp09VXHY • https://www.theengineerspost.com/automatic-transmission/ • https://learnmech.com/continuously-variable-transmission-components-working-types/
Teaching-Learning Process (Innovative Delivery Methods):	The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes. • Simulation and Virtual Labs • Partial Delivery of course by Industry experts • ICT-Enabled Teaching • Video demonstration

Expected Course Outcomes:
After successfully completing the course, the student will be able to;
CO1: Explain the basic principles of energy conversion systems, vehicle systems, flying machines and their applications in Mechanical Engineering.
CO2: Explain the working principles of petrol and diesel engines, electric and hybrid vehicles, battery management systems and power transmission systems.
CO3: Classify and explain engineering, composite and smart materials based on their properties, characteristics and applications.
CO4: Describe the principles of manufacturing processes, machine tools, joining processes, CNC and additive manufacturing technologies.
CO5: Illustrate the basic elements of automation and mechatronic systems and explain the working principles and applications of sensors and integrated systems such as ADAS.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	10
Activity Based Learning	50	50	25	10
TOTAL CIE MARKS			50	20
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Activity-Based Learning (ABL) Component	
"Activity-Based Learning (ABL) – Integrating Term Work (TW) and Self-Learning (SL)"	**Number of Hours / Semester**
Activity: Case Study Presentation Students shall work in teams to select one real-world Mechanical Engineering case study related to a key learning area of the syllabus. The case study shall explore the working principle, components or technologies involved, practical applications, challenges and recent innovations related to the selected topic. Students shall refer to credible sources such as textbooks, technical articles, industry resources, NPTEL, SWAYAM and other reliable online resources. Each team shall prepare a case study report and presentation highlighting the relevance of the selected technology to engineering practice and industry.	**45**

Preliminary Discussion – 1 Hour, Referring to various online / library / self-learning resources – 8 Hours, Discussion on choosing the mechanical system / application – 1 Hour, Planning and developing the model / demonstration / study with

necessary details – 15 Hours, Individual Self-Learning and application of concepts – 5 Hours, Preparation of Report and Presentation – 6 Hours, Team Demonstration, Presentation and Discussion – 5 Hours, Feedback and Corrections – 4 Hours.

Activity-Based Learning - Assessment and Submission

Component	Activity	Student Submission	Performance Indicator and Marks Distribution	
ABL (TW & SL)	Students shall work in teams to select a real-world Mechanical Engineering case study related to the syllabus and study its working principle, applications, challenges and recent innovations. Each team shall refer to credible learning resources and prepare a case study report and presentation highlighting its relevance to engineering practice and industry.	1. Case study selection and problem statement 2. Group case study report 3. Technical analysis with diagrams/images 4. Individual self-learning record/evidence 5. Group presentation 6. Individual contribution and learning evidence	Technical Understanding & Conceptual Knowledge	10
			Practical Application & Analysis	10
			Challenges & Innovation	10
			Team Participation & Presentation	10
			Self-Learning, Individual Contribution & Documentation	10
			TOTAL	**50**
50 Marks is to be scale down to 25 Marks				

Rubrics for - Activity-Based Learning (Through TW & SL): 50 Marks

Performance Indicator	Excellent (9–10)	Good (7–8)	Satisfactory (5–6)	Needs Improvement (1–4)	Not Demonstrated (0)
Technical Understanding & Conceptual Knowledge (10)	Demonstrates thorough and accurate understanding of the selected technology, working principle and key components.	Demonstrates good understanding with minor gaps.	Demonstrates basic understanding of the selected topic.	Demonstrates limited understanding with significant gaps.	No evidence of conceptual understanding.
Practical Application & Analysis (10)	Clearly relates the technology to real-world applications and provides meaningful technical analysis.	Explains practical applications and provides good analysis with minor gaps.	Identifies basic applications with limited analysis.	Provides limited or partially incorrect application analysis.	No meaningful application or analysis.
Challenges & Innovation (10)	Clearly identifies major challenges and discusses relevant recent innovations or improvements with good technical reasoning.	Identifies challenges and relevant innovations with reasonable explanation.	Identifies basic challenges and some innovations.	Limited identification or explanation of challenges and innovations.	No evidence of understanding challenges or innovations.
Team Participation & Presentation (10)	Demonstrates excellent teamwork and active participation; presents confidently and answers questions accurately.	Demonstrates good teamwork and gives a clear presentation; answers most questions correctly.	Participates adequately and presents the work with some guidance.	Limited participation; presentation lacks clarity and requires considerable guidance.	No meaningful participation or presentation.
Self-Learning, Individual Contribution & Documentation (10)	Demonstrates strong independent learning, significant individual contribution and complete, well-organized documentation using credible sources.	Demonstrates good self-learning and individual contribution with proper documentation.	Demonstrates basic self-learning and contribution with adequate documentation.	Limited evidence of self-learning or individual contribution; documentation is incomplete.	No evidence of self-learning, individual contribution or documentation.

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MECHANICAL ENGINEERING

Course Name: **INTRODUCTION TO MECHANICAL ENGINEERING** | Semester: 1st / 2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26IMEC104/204	45	0	0	45	45	90	3

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1.5 hrs	3 hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Understand the fundamental streams of Mechanical Engineering and the basic principles of energy conversion, vehicle systems and flying machines.

CLO2: Understand the working principles of conventional engines, electric and hybrid vehicles, battery management systems and modern power transmission systems.

CLO3: Understand the classification, properties and applications of engineering, composite and smart materials in mechanical engineering.

CLO4: Understand the basic principles of manufacturing processes, machine tools, joining processes, CNC technology and additive manufacturing.

CLO5: Understand the fundamentals of automation, mechatronics, Industry 4.0, elementary sensors and integrated systems such as ADAS.

Module 1	**Energy Conversions**	**Duration: 09**

Introduction: Streams in mechanical engineering and their relevance/significance, role of mechanical engineers in solving the real case problems (with examples), careers in mechanical engineering. Realization of some of the engineering solutions through principles of mechanical engineering(with a schematic diagram)

Energy conversion: Introduction and basic working principles of solar energy conversion (helio electrical-PV cell, helio thermal liquid flat plate collector), hydroelectric, nuclear power reactor.

Vehicle systems: Identification of parts of vehicle systems such as steering system, brake system, gear system, working principle of Power steering.

Flying machines: Classification, basic parts involved in drone making, working principle of Drones.

Module 2	**Engines and Future Mobility Technologies**	**Duration: 09**

Engines: Introduction, petrol engine, diesel engines, Working of four Stroke engines, basic emission control concepts, applications.

Insight into Future Mobility: Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles, Battery Management System (BMS), charging methods, Advantages and disadvantages of EVs and Hybrid vehicles.

Power Transmission Systems: Classification of gears, simple & compound gear trains, concepts of automatic and CVT transmission, introduction to dual-clutch transmission (DCT).

Module 3	**Engineering Materials**	**Duration: 09**

Engineering Materials: Introduction, Classification, Ferrous and Non-Ferrous metals: Types, Properties, corrosion resistance and their applications.

Composite Materials: Introduction, Constituents of a composite, Classification, Types of Matrix and Reinforcement materials, Manufacturing basics, Advantages, Disadvantages and Applications of composite materials.

Smart Materials: Introduction, Types - Piezoelectric materials, MR fluids, Shape memory alloys, electrochromic materials and Advantages, Disadvantages and Applications.

Module 4	**Machine Tools and its operations**	**Duration: 09**

Manufacturing: Manufacturing overview, classification of manufacturing processes, process selection criterion. Principles of electric arc Welding,TIG, MIG soldering, brazing. **Machine Tools and Operations:** Introduction to machine tools – lathe, drilling and milling machine. Lathe operations, Turning, facing, knurling, Drilling machine operations: Drilling, reaming, tapping. Milling machine operations: End milling, face milling.

Advanced Machine Tools: Introduction to CNC, components, advantages and applications. Basic principles of 3D printing.

Module 5	**Automation and Sensors**	**Duration: 09**

Automation Technology: Definition of automation, types of automation, basic elements of automation, introduction to Industry 4.0 concepts.

Mechatronic Systems: Definition of mechatronics, elements of mechatronics systems, examples, basic IoT-enabled mechatronic applications.

Elementary Sensors: Working principle and applications of Potentiometer, capacitive sensor, optical encoders and proximity sensors.

Integrated System: Need for integration of technologies, ADAS (Advanced Driver Assistance System).

Textbooks and References:	**Text Books:** 3. K R Gopala Krishna, Elements of Mechanical Engineering, Subhash Publications, 2018. 4. Textbook of Elements of Mechanical Engineering, S. Trymbaka Murthy, Medtech, 2019. **Reference:** 6. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003. 7. William D. Callister, Materials Science & Engineering, An Introduction, John Wiley & Sons Inc, 2010. 8. Elements of Mechanical Engineering, Kestoor Praveen, Suggi Publishing, 2019 9. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1 10. Groover M. P.(2008). Automation, production systems, and computer integrated manufacturing, 3rd ed. Prentice Hall.
Web links and Video Lectures (e-Resources):	• https://nptel.ac.in/courses/112104526 • https://nptel.ac.in/courses/112104616 • https://nptel.ac.in/courses/112104769 • https://theconstructor.org/practical-guide/pelton-turbine-parts-working-design aspects/2894/ • • https://www.mechstudies.com/centrifugal-pump/ • https://cfdflowengineering.com/working-principle-and-components-of-drone/ • https://youtu.be/i1ojp09VXHY • https://www.theengineerspost.com/automatic-transmission/ • https://learnmech.com/continuously-variable-transmission-components-working-types/
Teaching-Learning Process (Innovative Delivery Methods):	The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes. • Simulation and Virtual Labs • Partial Delivery of course by Industry experts • ICT-Enabled Teaching • Video demonstration

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1: Explain the basic principles of energy conversion systems, vehicle systems, flying machines and their applications in Mechanical Engineering.

CO2: Explain the working principles of petrol and diesel engines, electric and hybrid vehicles, battery management systems and power transmission systems.

CO3: Classify and explain engineering, composite and smart materials based on their properties, characteristics and applications.

CO4: Describe the principles of manufacturing processes, machine tools, joining processes, CNC and additive manufacturing technologies.

CO5: Illustrate the basic elements of automation and mechatronic systems and explain the working principles and applications of sensors and integrated systems such as ADAS.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	10
Activity Based Learning	50	50	25	10
TOTAL CIE MARKS			50	20
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Activity-Based Learning (ABL) Component	
"Activity-Based Learning (ABL) – Integrating Term Work (TW) and Self-Learning (SL)"	**Number of Hours / Semester**
Activity: Case Study Presentation Students shall work in teams to select one real-world Mechanical Engineering case study related to a key learning area of the syllabus. The case study shall explore the working principle, components or technologies involved, practical applications, challenges and recent innovations related to the selected topic. Students shall refer to credible sources such as textbooks, technical articles, industry resources, NPTEL, SWAYAM and other reliable online resources. Each team shall prepare a case study report and presentation highlighting the relevance of the selected technology to engineering practice and industry.	**45**

Preliminary Discussion – 1 Hour, Referring to various online / library / self-learning resources – 8 Hours, Discussion on choosing the mechanical system / application – 1 Hour, Planning and developing the model / demonstration / study with necessary details – 15 Hours, Individual Self-Learning and application of concepts – 5 Hours, Preparation of Report and Presentation – 6 Hours, Team Demonstration, Presentation and Discussion – 5 Hours, Feedback and Corrections – 4 Hours.

Activity-Based Learning - Assessment and Submission

Component	Activity	Student Submission	Performance Indicator and Marks Distribution	
ABL (TW & SL)	Students shall work in teams to select a real-world Mechanical Engineering case study related to the syllabus and study its working principle, applications, challenges and recent innovations. Each team shall refer to credible learning resources and prepare a case study report and presentation highlighting its relevance to engineering practice and industry.	1. Case study selection and problem statement 2. Group case study report 3. Technical analysis with diagrams/images 4. Individual self-learning record/evidence 5. Group presentation 6. Individual contribution and learning evidence	Technical Understanding & Conceptual Knowledge	10
			Practical Application & Analysis	10
			Challenges & Innovation	10
			Team Participation & Presentation	10
			Self-Learning, Individual Contribution & Documentation	10
			TOTAL	**50**
50 Marks is to be scale down to 25 Marks				

Rubrics for - Activity-Based Learning (Through TW & SL): 50 Marks

Performance Indicator	Excellent (9–10)	Good (7–8)	Satisfactory (5–6)	Needs Improvement (1–4)	Not Demonstrated (0)
Technical Understanding & Conceptual Knowledge (10)	Demonstrates thorough and accurate understanding of the selected technology, working principle and key components.	Demonstrates good understanding with minor gaps.	Demonstrates basic understanding of the selected topic.	Demonstrates limited understanding with significant gaps.	No evidence of conceptual understanding.
Practical Application & Analysis (10)	Clearly relates the technology to real-world applications and provides meaningful technical analysis.	Explains practical applications and provides good analysis with minor gaps.	Identifies basic applications with limited analysis.	Provides limited or partially incorrect application analysis.	No meaningful application or analysis.
Challenges & Innovation (10)	Clearly identifies major challenges and discusses relevant recent innovations or improvements with good technical reasoning.	Identifies challenges and relevant innovations with reasonable explanation.	Identifies basic challenges and some innovations.	Limited identification or explanation of challenges and innovations.	No evidence of understanding challenges or innovations.
Team Participation & Presentation (10)	Demonstrates excellent teamwork and active participation; presents confidently and answers questions accurately.	Demonstrates good teamwork and gives a clear presentation; answers most questions correctly.	Participates adequately and presents the work with some guidance.	Limited participation; presentation lacks clarity and requires considerable guidance.	No meaningful participation or presentation.
Self-Learning, Individual Contribution & Documentation (10)	Demonstrates strong independent learning, significant individual contribution and complete, well-organized documentation using credible sources.	Demonstrates good self-learning and individual contribution with proper documentation.	Demonstrates basic self-learning and contribution with adequate documentation.	Limited evidence of self-learning or individual contribution; documentation is incomplete.	No evidence of self-learning, individual contribution or documentation.

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

Department of Electrical & Electronics Engineering

Course Name:Introduction to Electrical Engineering | Semester: 1st / 2nd

Course Code	L (H/W)	T (H/W)	P (H/W)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26IEES104/204	3	0	0	45	45	90	3

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1:30 Hr	3 Hr	Theory

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Introduce basic concepts of electrical engineering.

CLO2: Understand power generation from conventional and non-conventional sources.

CLO3: Learn fundamental laws and analysis of DC and AC circuits.

CLO4: Study the construction and working of electrical machines and transformers.

CLO5: Understand domestic wiring, electricity billing, and safety measures.

Module 1	**Power Generation & DC circuits**	**Duration: 09**

Power Generation: Conventional and nonconventional energy sources. Single-line diagram of power supply system showing power station, transmission system and distribution system. Definition of power grid and its types.

DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. Problems.

Self learning: Explore the advantages and limitations of renewable energy sources, Solve numerical involving current, voltage, resistance, power, and electrical energy

Module 2	**AC circuits**	**Duration: 09**

Single-Phase Circuits: Generation of single-phase system. Equation of AC voltage and current, average value, RMS value, form factor, peak factor and their relation [No derivations]. Voltage and current relationships in R, L and C circuits, concept of power, reactive power, apparent power and power factor, analysis of R-L, R-C and R-L-C series circuits, illustrative examples.

Three-Phase Circuits: Generation of three-phase systems, advantages and limitations, star and delta connections, relation between phase and line values of voltages and of currents of star and delta connections [No derivations]. Definition of balanced and unbalanced source and load. Power, reactive power and power factor. Problems with balanced loads

Self learning:

Calculation of power, power factor in single phase and three phase AC circuits.

Module 3	**DC Generator & DC Motor**	**Duration:09**

DC Generator: Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Simple problems.

DC Motor: Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and speed control of DC shunt motor. Simple problems.

Self learning:

Applications of DC Generator and Motors, Speed control techniques

Module 4	**Transformers & Three-phase induction Motors**	**Duration:09**

Transformers: Introduction to transformers, necessity of transformer, principles of operation, constructional features of single phase transformers. EMF equation, losses, variation of losses with respect to load. Calculation of efficiency at different loads.

Three-phase induction Motors: Definition of rotating magnetic field (without derivation), Principle of operation. Constructional features of squirrel cage type and wound rotor type induction motor. Slip and its significance, problems.

Self learning: Applications of Three-phase Induction motor, Types of transformer (step up/down)

Module 5	Domestic Wiring, Electricity Bill & Electrical Safety measures	Duration:09

Domestic Wiring: Two-way and three-way control of loads.
Electricity Bill: Definition of "unit" used for consumption of electrical energy, power rating of common household appliances. Two-part electricity tariff.
Equipment Safety measures: Working principle of fuse and miniature circuit breaker (MCB), merits and demerits.
Personal safety measures: Electric shock, safety precautions to avoid shock. Earthing and types: Plate earthing and pipe earthing.
Self learning: Calculation of connected load and maximum demand, House Electricity Bill Explanation.

Text Books:	1. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015. 2. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.
References:	1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.0 2. D. C. Kulshreshtha. (2019). Basic Electrical Engineering (2nd ed.), McGraw Hill.

Expected Course Outcomes:
After successfully completing the course, the student will be able to;
CO1: Understand power generation systems and apply electrical laws to DC circuits.
CO2: Analyze single-phase and three-phase AC circuits and evaluate power parameters.
CO3: Explain the construction and operation of DC generators and DC motors.
CO4: Describe transformers and three-phase induction motors and their applications.
CO5: Understand domestic wiring systems, electricity billing, and safety practices.

Assessment Details (CIE & SEE)
The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.
Out of 50 marks earmarked for CIE, 25 marks shall be assigned for internal tests.A minimum of two Internal Assessment Tests (IA) shall be conducted, carrying a total of 25 marks.
Continuous Comprehensive Assessments (CCA):
CCA will be conducted for a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students. These activities should align with course objectives and promote higher-order thinking and application-based learning.
Learning Activity -1: (Marks- 15)-Self learning assessment at end of the semester.
Learning Activity-2: (Marks-10)-Term work assessment for Industrial Visit & Report Writing/ Case study / Poster Creation & Presentation
To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks.
To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks.
Not- withstanding the above, a student is considered to have passed the course, provided the combined total of CIE and SEE is at least 40 out of 100 marks.

TW & SL Details (Duration & Rubrics for Evaluation)

Sl. No.	Term Work (TW) & Self Learning Activity(SL)	Number of Hours / Semester
1	Self-learning is incorporated into each of the five modules, with 5 hours allocated per module (5 Module * 5 Hour)	25
2	Industrial Visit & Report Writing/ Case study / Poster Creation & Presentation	20
Total		45

Rubric for Term Work (TW) and Self-Learning (SL)

Activity type	Performance Indicator	Excellent (9-10)	Very Good (7-8)	Good (5-6)	Fair (3-4)	Needs Improvement (1-2)	Unacceptable (0)
Industrial Visit Report& Writing	**Submit a comprehensive report.**	Submits a Clear, concise, well - structured, report with relevant attachments.	Submits a clear and structured report with sufficient attachments.	Submits a moderate report without many attachments.	Submits a moderate report devoid of attachments.	Submits a report not following a sequence of events that a report generally demands.	Unattempted or completely inaccurate Work.
Case Study	**Analyse problems using first principles.**	Applies first principles thoroughly to produce logical, and innovative solution.	Applies first principles effectively with minor mistakes.	Applies first principles adequately for regular problems.	Applies first principles to only simple problems.	Applies first principles in an inappropriate way.	No analysis provided.

Activity type	Performance Indicator	Excellent (4-5)	Good (1-3)	Unacceptable (0)
Poster Creation & Presentation on personal safety measures, electric shock causes, emergency first-aid protocols. Plate/pipe earthing mechanics	**Technical Accuracy & Content Depth (5)**	Accurately and comprehensively covers all 4 topics (safety, shock causes, first aid, earthing mechanics) with precise technical detail**.**	Covers most topics accurately but lacks depth in earthing mechanics or first aid.	Unattempted or completely inaccurate work.
	Visual Design & Oral Delivery (5)	Poster is visually appealing with clear diagrams; presentation is confident, well-structured, and engaging.	Poster and delivery are satisfactory but lack visual appeal or confident audience interaction.	Unattempted or completely inaccurate work.

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENTOF CIVIL ENGINEERING

Course Name: BUILDING SCIENCE AND MECHANICS | **Semester: 1st /2nd**

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26BSMS104/204	40	0	0	40	50	90	3

CIE Marks	SEE Marks	Total Marks	CIE:SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1.5 hours	3 hours	Descriptive

Course Learning Objectives:
The purpose of the course is to facilitate the learners to;
CLO1:Learn the scope of various specializations of civil engineering, Basic Materials of Construction, Structural Elements of a Building
CLO2:Learn the concepts of sustainable infrastructure
CLO3:Analyse the problems involving forces, moments with their applications.
CLO4:Compute the resultant and equilibrium of force systems.
CLO5:Find out the center of gravity and their applications.

Module 1	**Introduction to building science**	Duration: 08 hours

Importance and Scope of various fields of Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Water Resources & Irrigation Engineering, Transportation Engineering, Environmental Engineering, Construction Planning and Project Management.
Basic Materials of Construction: Types and Uses of Bricks, Stones, Cement, Structural Steel, Plain Concrete,Reinforced & Pre-stressed Concrete.
Structural Elements of a Building: Concept of Foundation, Plinth, Lintel, Chejja, Masonry wall, Column, Beam, Slab, Flooring and Staircase.

Module 2	**Sustainable Built Environment**	Duration: 08 Hours

Emerging materials: Types and Uses of Autoclaved Aerated Concrete (AAC) blocks, Bamboo and Recycled plastics-Key Sustainability Features,Properties, Smart City concept.
GreenBuilding: Green building materials and rating systems IGBC, LEED, GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights - Point System with Differential weightage.

Module 3	**Force Systems**	Duration: 08 Hours

Concept of idealization, System of forces, Principles of transmissibility of a force, Resolution and composition of forces, Law of Parallelogram of forces, Concurrent and non-concurrent coplanar force systems, Moment of forces, Couple, Varignon's theorem: Numerical examples.

Module 4	**Equilibrium and Support Reactions**	Duration: 08 hours

Free body diagram, equations of equilibrium, Lami's Theorem, Equilibrium of Coplanar Concurrent and non-concurrent force systems: Numerical examples.
Types of loadings, beams and supports, Concept of Statically determinate and indeterminate structures (Definitions with examples only), Support reactions: Numerical examples on Statically determinate beams.

Module 5	**Centroid of Plane areas**	Duration: 08 hours

Introduction, Locating the centroid of rectangle, triangle, circle, semicircle and quadrant of a circle using method of integration, centroid of composite areas and simple built up sections: Numerical examples.

References:	1. Rangwala, Building Construction,33rd Edition, 2016, Charotar Publishing House Pvt. Ltd., ISBN-10 : 9385039040, ISBN-13 : 978-9385039041 2. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 3rd Edition, 2015, Laxmi Publications, ISBN: 9789380856674. 3. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 11th Edition, 2018, Eastern Book Promoters Belgaum [EBPB], ISBN: 5551234003896 4.Bhavikatti SS, Engineering Mechanics, 4th Edition, 2018, New Age International Publications.

Expected Course Outcomes:

After successfully completing the course, the student will be able to;
CO1:Understand the scope & importance of civil engineering, basic construction materials and structural elements of building.
CO2:Evaluate the sustainability aspects of the built environment through appropriate selection of green materials and interpretation of rating systems.
CO3:Compute the resultant of given force system subjected to various loads and comprehend the action of forces, moments on system of rigid bodies
CO4:Apply the principles of force systems and equilibrium to determine to support reactions
CO5:Locate the centroid of simple and composite plane areas using first principles.

Assessment Details (CIE & SEE)

Nature of Assessment		Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation					
2 Internal Assessment		50 Each	100	25	10
CCE	Two Module Test / Two Remedial Test/ Two Improvement Test	25 Each	50	15	06
	ABL	50	50	10	04
TOTAL CIE MARKS				**50**	**20**
Semester End Evaluation					
Semester End Examination			100	50	18
TOTAL MARKS (CIE + SEE)				**100**	**40**

TW & SL Details (Duration & Rubrics for Evaluation)

Component	Activity & Student Submission	Performance Indicator and Marks Distribution	
ABL (TW & SL)	Comparative Study of Conventional and Sustainable Construction Materials for Building Applications	Identification & classification of materials	10
		Types, properties & uses	10
		Conventional materials& sustainable materials	10
		Comparison & sustainability evaluation	10
		Material selection & technical presentation	10
		TOTAL	**50**

Notional Hours of Allocation

A. Batch / group creation – 3 Hours
B. Preliminary Discussion and Work planning- 7 hours
C. Study of conventional construction materials–15 hours
D. Study of sustainable materials -7 hours
E. Data collection & case-study investigation -7 hours
F. Material selection & recommendations –5 hours
G. Report preparation, review & presentation –6 hours

Rubrics for - Activity-Based Learning (Through TW & SL)

Performance Indicator	Excellent (9–10)	Good (7–8)	Satisfactory (5–6)	Needs Improvement (1–4)	Not Demonstrated (0)
Identification & Classification of Materials	Very appropriate choices for the purpose	Appropriate choices for the purpose	Decent choices for the purpose	Not relevant choices for the purpose	Not demonstrated
Types, Properties & Uses	Complete and accurate	Minor errors	Mostly correct	Partially correct	Not demonstrated
Construction Chemicals & Sustainable Materials	Excellent understanding	Basic understanding	Limited understanding	Poor understanding	Not demonstrated
Comparison & Sustainability Evaluation	Comprehensive analysis	Good analysis	Limited analysis	Poor analysis	Not demonstrated
Material Selection & Technical Presentation	Effective Technical &Professional explanation indicating effective learning	Appropriate Technical & Professional explanation indicating good learning	Decent Technical & Professional explanation indicating Satisfactory learning	Mere Technical & Professional explanation indicating non-effective learning	No explanation indicating no learning

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Name: ESSENTIALS OF INFORMATION TECHNOLOGY | **Semester: 1st/2nd**

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26EITE104/204	45	0	0	45	45	90	3

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1.5 hours	3hours	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to:

CLO1: To understand the fundamentals of data storage, binary representation, computer architecture, machine language, program execution, and data manipulation.

CLO2: Explain the basic concepts of operating systems, process management, operating system security, and algorithms and their representations.

CLO3: To understand the fundamentals of computer networking, the Internet, World Wide Web, Internet protocols, web technologies, and basic security concepts.

CLO4: Apply basic software engineering principles, software life-cycle methodologies, modularity, and database concepts including the relational model.

CLO5: To understand cyber security fundamentals, information security practices, cyber hygiene, cyber security roles, ethical issues and social media related risks.

Module 1	**Data Storage and Data Manipulation**	**Duration:9 Hrs**

Data Storage: Bits and their Storage, Main Memory, Mass Storage, Representing Information as Bit Patterns, The Binary System, Storing Integers, Storing Fractions.

Data Manipulation: Computer Architecture, Machine Language, Program Execution, Arithmetic/Logic Instructions, Communicating with Other Devices.

Textbook 1: Chapter-1 (1.1-1.7), Chapter-2 (2.1-2.5)

Module 2	**Operating Systems and Algorithms**	**Duration:9 Hrs**

Operating Systems: The History of Operating Systems, Operating System Architecture, Coordinating the Machine's Activities, Handling Competition Among Processes, Security.

Algorithms: The Concept of an Algorithm, Algorithm Representation, Algorithm Discovery.

Textbook 1: Chapter-3, Chapter-5 (5.1-5.3)

Module 3	**Software Engineering and Database Systems**	**Duration:9 Hrs**

Software Engineering: The Software Engineering Discipline, The Software Life Cycle, Software Engineering Methodologies, Modularity, Tools of the Trade.

Database Systems: Database Fundamentals, The Relational Model.

Textbook 1: Chapter-7 (7.1-7.5), Chapter-9 (9.1-9.2)

Module 4	**Networking, Internet and World Wide Web**	**Duration:9 Hrs**

Networking and the Internet: Network Fundamentals, The Internet, Internet Protocols, Security.

Fundamentals of World Wide Web: The World Wide Web, Web Browsers, Wed Servers, Uniform Resource Locators, Multipurpose Internet Mail Extensions, The Hypertext Transfer Protocol, The Web Programmer's Toolbox.

Textbook 1: Chapter-4 , Textbook 3: Chapter-1(1.2-1.7,1.9)

Module 5	**Cyber security, Ethical Issues in Information Technology and Social Media**	**Duration:9 Hrs**

Cyber security: Overview—What is Cyber security?, Brief History of Cyber security Events, The Basic Information Security Model, Cyber Hygiene, Teams in Cyber security.

Ethical Issues in Information Technology: Overview, Ownership Rules, Ethics and Online Content.

Social Media: Overview, Benefits of Social Media, Risks of Social Media - Professional Risks, Personal Risks.

Textbook 2: Chapter-16, Chapter-17, Chapter-18

Reference:	**Textbooks:** 1. J. Glenn Brookshear and Dennis Brylow, "*Computer Science: An Overview",* 12th Edition, Pearson Education Limited, 2017. 2. Roy, Shambhavi; Daniel, Clinton; and Agrawal, Manish, "*Fundamentals of Information Technology*", Digital Commons at The University of South Florida (2023). https://digitalcommons.usf.edu/dit_tb_eng/19\ 3. Sebesta, Robert W. "*Programming the world wide web",* Addison-Wesley Publishing Company, Fourth Edition, 2015. **Reference Books:** 1. V. Rajaraman, "*Introduction to Information Technology*", Third Edition, PHI Learning, 2018. 2. Pelin Aksoy, "*Information Technology in Theory*", First Edition, Cengage. **Web links and Video Lectures (e-Resources):** **1.** Information Technology [https://onlinecourses.swayam2.ac.in/e-learning/preview/cec20_cs05] **2.** Computer Organization and Architecture [https://nptel.ac.in/courses/106103068] **3.** Operating Systems [https://nptel.ac.in/courses/106105214] **4.** Introduction to Internet [https://nptel.ac.in/courses/106105084] **5.** Software Engineering [https://nptel.ac.in/courses/106105182] **6.** Database Management System [https://onlinecourses-archive.nptel.ac.in/noc18_cs15/preview] **7.** Web Development [https://www.geeksforgeeks.org/web-tech/web-technology] **8.** Web Development [https://developer.mozilla.org/en-US/docs/Learn_web_development]

Expected Course Outcomes:

After successfully completing the course, the student will be able to:

CO1: Illustrate different information representation and manipulation schemes.
CO2: Make use of Information Technology (IT) infrastructure for information exchange
CO3: Apply basic software engineering concepts for website and application development.
CO4: Develop queries for quick insert, access and updating of structured information.
CO5: Identify basic cybersecurity practices, ethical issues and social media risks in the use of Information Technology.

Assessment Details (CIE & SEE):

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks.
- To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks.
- Not withstanding the above, a student is considered to have passed the course, provided the combined total of CIE and SEE is at least 40 out of 100 marks.

Continuous Comprehensive Assessments (CCA):

Learning Activity : Practical Assignment (Individual) (25 marks)

INSTRUCTIONS for Learning Activity :

1. Students must demonstrate the solutions to the course instructor and submit the record containing method (steps), program (if applicable), document (if applicable) and results/output.
2. Course instructor must evaluate the student performance as per the rubrics.

Problem Description:

1. Create files of specific types, changing file properties & permissions, search files based on criteria. Creating hierarchy of folders, folder paths, changing folder properties and related operations on folders. File compressions, file backup using Google Drive.

2. Create word file with suitable content and performs various operations related to document Revision, Proof reading and references (As listed in the Textbook).

3. Consider the following data: Student First Name, Student Last Name, Student Age, Student Grade, Student School, Telephone Number, Sport (Volleyball, Basketball, Softball, Baseball, Soccer, or Football). Considering the data required in the list above, create a spread sheet in a spread sheet application you have access to. Add at least 10 rows of data to your spread sheet. Once you add all the data to the spread sheet, what is the average age for all the students? What formula did you use to calculate the average age?

4. Add a chart to the above spread sheet that illustrates the total number of students for each sport. Which sport has the highest number of students? What formula did you use to count the total number of students for each sport? Use the above spreadsheet to Analysing and Organizing Data with suitable filters, sorting, conditional formatting and pivot tables.
5. Create a presentation (power point) using a presentation application you have access to that meets the requirements of marketing of brand-new product. Apply a theme, background, and professional layout for chosen product.

Rubrics for Learning Activity (Practical Assignment)

Component & CO-PO Mapping	Outstanding (5)	Exceeds Expectations (4)	Meets Expectations (3)	Needs Improvement (1-2)	Unsatisfactory (0)
Clarity & Simplicity of procedure/ method [CO1-5] [PO9]	Procedure/ method is, specific, and well-structured for the intended activity; no ambiguity is present.	Procedure/ methods are clear and mostly specific; minor ambiguity is present.	Procedure/ methods are somewhat clear but could be more specific; moderate ambiguity	Procedure/ methods are vague and lack clarity; high ambiguity.	Procedure/ methods are unclear, incomplete, or irrelevant to the activity.
Appropriate Use of elements/ techniques and design of solution [CO2-5] [PO1, PO3]	Demonstrates precise and creative usage of the features, elements and techniques	Correctly applies the features and elements with minor gaps or missed opportunities.	Uses the features and elements, but with partial understanding or inconsistent usage.	Limited understanding of the features and elements; incorrect or weak usage.	No evidence of correct/relevant features and elements use.
Complete Solution & Comparison Of Results/ output for various cases. [CO2-4] [PO2, PO4,	Provides clear and correct solution/results with analysis for multiple cases; comparisons among cases highlight key	Provides correct solution/results with analysis for multiple cases, though slightly less detailed.	Provides correct solution/results with limited analysis; comparisons are present but shallow.	Provides correct solution/ results. Minimal analysis: comparisons are weak or incomplete.	Solution/results are partially correct. No meaningful analysis or comparison.

PO5]	strengths and weaknesses.				
Creativity, efficiency of Problem-Solving [CO2-4] [PO3, PO11]	Demonstrates outstanding creativity and innovation in developing solution, especially for design tasks.	Demonstrates creativity and some innovation; developed solution is practical.	Shows moderate creativity; developed solution is functional but not innovative.	Minimal creativity; developed solution is repetitive or unimaginative.	No creativity or Problem-solving/ adequate e solution is evident.
Documentation on & Analysis [CO1-5] [PO8/PO9/ PO11]	Documentation is complete, well organized, and includes deep reflection on improvements across iterations.	Documentation is complete with some reflection on program refinement.	Documentation is present but lacks detail or depth in reflection.	Incomplete documentation ; reflection is minimal.	No documentation or reflection provided as per schedule.

TW & SL Details (Duration & Rubrics for Evaluation)

Sl. No	Term Work Activity (TW)	Number of Hours
1.	Learning Activity : Practical Assignment	10

Self-Learning (SL):

Sl. No	Self- Learning	Number of Hours
1.	File Management, Word Processors, Introduction to Spreadsheets, Introduction to Presentation Applications. Refer Text book 2: Chapter-6, Chapter-8, Chapter-9, and Chapter-10.	15
2.	Build a Website with Google Sites https://sites.google.com/site/horstwebdesign/about-google-sites	10
3.	NPTEL Course in Information Technology https://onlinecourses.swayam2.ac.in/e-learning/preview/cec20_cs05	10

Syllabus of Programming Language Courses

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF AI & ML and CSE(Data Science)

Course Name: Introduction to Python Programming						**Semester:1st /2nd**	
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26IPPS105/205	60	0	30	90	30	120	4
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1.5 Hrs.	3 Hrs.	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Explain Python fundamentals and control structures.
CLO2: Apply Python sequence data types and data manipulation techniques.
CLO3: Utilize Python libraries and NumPy for computational problems.
CLO4: Implement file-handling operations using Python.
CLO5: Apply object-oriented programming concepts in Python applications.

Module 1	**Python Fundamentals and Control Structures**	Duration:9 Hours

The way of the program: The Python programming language, what is a program? What is debugging? Syntax errors, Runtime errors, Semantic errors, Experimental debugging.
Variables, Expressions and Statements: Values and data types, Variables, Variable names and keywords, Statements, Evaluating expressions, Operators and operands, Type converter functions, Order of operations, Operations on strings, Input, Composition, The modulus operator.
IF-ELSE AND FLOW CONTROL: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Flow Control Statements
Iteration: Assignment, Updating variables, the for loop, the while statement, The Collatz 3n + 1 sequence, tables, two-dimensional tables, break statement, continue statement, paired data, Nested Loops for Nested Data.
Functions: Functions with arguments and return values.
Chapters: 1.1-1.7, 2.1-2.12, 3.3, 4.4, 4.5

Module 2	**Python Sequence Data Types and Data Manipulation**	Duration:9 Hours

Strings: Working with strings as single things, working with the parts of a string, Length, Traversal and the for loop, Slices, String comparison, Strings are immutable, the in and not in operators, A find function, Looping and counting, Optional parameters, The built-in find method, The split method, Cleaning up your strings, The string format method.
Tuples: Tuples are used for grouping data, Tuple assignment, Tuples as return values, Composability of Data Structures.
Lists: List values, accessing elements, List length, List membership, List operations, List slices, Lists are mutable, List deletion, Objects and references, Aliasing, cloning lists, Lists and for loops, List parameters, List methods, Pure functions and modifiers, Functions that produce lists, Strings and lists, list and range, Nested lists, Matrices.
Chapter: 5.1, 5.2, 5.3

Module 3	**Python Data Structures, NumPy and File Handling**	Duration:9 Hours

Dictionaries: Dictionary operations, dictionary methods, aliasing and copying.
Numpy: About, Shape, Slicing, masking, Broadcasting, dtype.
Files: About files, writing our first file, reading a file line-at-a-time, turning a file into a list of lines, Reading the whole file at once, working with binary files, Directories, fetching something from the Web.
Self-study:Solving Linear Equations Using NumPy. Applications of Dictionaries in Student Record Management and Data Organization.
Chapter: 5.4, 6.1-6.5, 7.1-7.8

Module 4	**Python Modules and Object-Oriented Programming**	Duration:9 Hours

Modules: Random numbers, the time module, the math module, creating your own modules, Namespaces, Scope and lookup rules, Attributes and the dot Operator, Three import statement variants.Mutable versus immutable and aliasing

Object oriented programming: Classes and Objects — The Basics, Attributes, Adding methods to our class, Instances as arguments and parameters, Converting an instance to a string, Instances as return values.

Self-study:Scientific Calculator Using Python Modules (math, random, and time).

Chapter: 8.1-8.8, 9.1, 11.1

Module 5		Duration:9 Hours

Object oriented programming: Objects are mutable, Sameness, Copying.

Inheritance: Pure functions ,Modifiers, Generalization, Operator Overloading, Polymorphism.

Exceptions: Catching Exceptions, Raising your own exceptions.

Self-study:Real-World Modeling Using Python Classes and Objects

Chapter: 11.2.2-11.2.4, 11.3.2-11.3.9, 12.1, 12.2

PRACTICAL COMPONENTS OF IPCC

PART – A: FIXED SET OF EXPERIMENTS

1. a. Develop a python program to read 2 numbers from the keyboard and perform the basic arithmetic operations based on the choice. (1-Add, 2-Subtract, 3-Multiply, 4-Divide).
   b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
2. a. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.
   b. Write a python program to create a list and perform the following operations
   - Inserting an element
   - Removing an element
   - Appending an element
   - Displaying the length of the list
   - Popping an element
   - Clearing the list
3. a. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
   b. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with a suitable message.
4. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use a dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display the dictionary slice of the first 10 items.
5. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].
6. Develop a function named DivExp which takes TWO parameters a, b, and returns a value c (c=a/b). Write a suitable assertion for a>0 in the function DivExp and raise an exception for when b=0. Develop a suitable program that reads two console values and calls the function DivExp.
7. Define a function that takes TWO objects representing complex numbers and returns a new complex number with the sum of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N (N >=2) complex numbers and to compute the addition of N complex numbers.
8. Write a Python program to define a class Student with read() and disp() methods to accept three subject marks and display the total, average, and pass/fail result.
9. Develop Data Summary Generator: Read a CSV file (like COVID data or weather stats), convert to dictionary form, and allow the user to run summary queries: max, min, average by column.
10. Develop a Python program using NumPy to analyze the marks of 5 students in 3 subjects by performing shape, dtype, slicing, masking to identify marks above 80, and broadcasting to add 5 grace marks, subject to a maximum of 100 marks.

11. Develop Student Grade Tracker: Accept multiple students' names and marks. Store them in a list of tuples or dictionaries. Display summary reports (average, topper, etc.).
12. Develop a program to display contents of a folder recursively (Directory) having sub-folders and files (name and type).

Text books /References:

Text books:

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers- How to think like a computer scientist: learning with python 3. Green Tea Press, Wellesley, Massachusetts,2020 https://media.readthedocs.org/pdf/howtothink/latest/howtothink.pdf

Reference Books/Manual:

1. Al Sweigart," Automate the Boring Stuff with Python, 2nd Edition: Practical Programming for Total Beginners",2nd Edition, No Starch Press, 2022. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/)
2. 2. Kyla McMullen, Elizabeth Matthews and June Jamrich Parsons, Programming with Python, Cengage, 2023.

Web links and Video Lectures (e-Resources):

https://www.learnbyexample.org/python/
https://www.learnpython.org/
https://pythontutor.com/visualize.html#mode=edit

Expected Course Outcomes:

After successfully completing the course, the student will be able to;
CO1: Develop scripts using primitive language constructs of python.
CO2: Identify the methods to manipulate primitive python data structures.
CO3: Make use of Python standard libraries for programming.
CO4: Build scripts for performing file operations.
CO5: Illustrate the concepts of Object-Oriented Programming as used in Python.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation – Theory Component (25)				
2 Internal Assessments	50 Each	100	20	8
2 Improvement Tests	25 Each	50	5	2
Continuous Internal Evaluation - Lab Component (25)				
CIE Practical Component – Continuous Assessment through Rubrics	10	10	10	4
Lab Internal Assessment through Rubrics	10	10	10	4
Activity-Based Learning(TW & SL)	50	50	5	2
TOTAL CIE MARKS(TC+LC)			25+25	10+10
Semester End Evaluation				
Semester End Examination	100	100	50	18
TOTAL MARKS (CIE + SEE)			100	40

TW & SL Details (Duration & Rubrics for Evaluation)

Component	Activity & Student Submission	Performance Indicator and Marks Distribution	
ABL (TW & SL)	In groups of 3, develop a simple Python application such as SGPA Calculator, Bill Generator, Contact Book, Student Performance Analyzer,Student Attendance Tracker, Number Guessing Game, Quiz Game, or Rock-Paper-Scissors.	Content Coverage	10
		Understanding & Analysis	10
		Implementation & Functionality	15
		Presentation & Viva / Interaction	15
		TOTAL	**50**

Notional Hours of Allocation (Total: 15 Hours)

A. Batch / group creation – 1 Hour
B. Preliminary discussion among group members – 2 Hours
C. Selection of a simple Python application and planning – 2 Hours
D. Writing the Python program – 5 Hours
E. Testing, debugging, and making corrections – 3 Hours
F. Final demonstration and presentation for assessment – 2 Hours

Rubrics for Activity-Based Learning (Through TW & SL)

Performance Indicator	Excellent (9–10)	Good (7–8)	Satisfactory (5–6)	Needs Improvement (1–4)	Not Demonstrated (0)
Content Coverage	Covers all required features of the Python application.	Covers most required features.	Covers basic features.	Covers very few required features.	No relevant content presented.
Understanding & Analysis	Clearly explains the logic, concepts, and program flow.	Explains the logic with minor difficulties.	Demonstrates basic understanding.	Shows limited understanding of the logic.	Unable to explain the program.
Implementation & Functionality	Program executes correctly and produces expected results.	Program works with minor errors.	Basic functionality works with some errors.	Program has major errors and limited functionality.	No working implementation demonstrated.
Presentation & Organization	Presents the application clearly, systematically, and confidently.	Presents the application in an organized manner.	Presentation is understandable but lacks organization.	Presentation is unclear and poorly organized.	No presentation provided.
Viva / Interaction	Answers questions accurately and confidently.	Answers most questions correctly.	Answers basic questions.	Answers very few questions correctly.	Unable to answer questions.

Total: 50 marks — 10 marks for each performance indicator.

Rubrics for Continuous Assessment – Practical Component

Component & CO-PO Mapping	Outstanding (5)	Exceeds Expectations (4)	Meets Expectations (3)	Needs Improvement (2)	Unsatisfactory (1)
Identification of real-life problem and its relevance [CO1] [PO2]	Clearly defined and contextually relevant problem; innovative approach	Relevant and well-described problem	Partially relevant with limited context	Vague or not fully relevant problem	No identifiable or valid problem
Use of primitive constructs (variables, loops, functions, conditionals) [CO1] [PO1]	All constructs used correctly with proper logic and flow	Most constructs used properly	Basic constructs applied with some errors	Minimal construct usage with logical flaws	Incorrect or missing constructs
Manipulation of Python data structures (lists, tuples, dictionaries, sets) [CO2] [PO1]	Effective and optimized usage of Data Structures	Mostly appropriate usage	Some usage with basic understanding	Incorrect or limited use	Not used or misused entirely
Use of standard libraries and file operations (if applicable) [CO3, CO4] [PO5]	Libraries and file operations used correctly and meaningfully	Minor issues in usage	Limited or partially correct use	Attempted but faulty implementation	Not attempted or irrelevant

Code structure, modularity, and documentation [CO4] [PO9, PO11]	Modular, structured code with comments and output samples	Structured code with basic documentation	Limited comments or unclear structure	Poor documentation and readability	No documentation, disorganized code

Rubrics for Laboratory Experiment Assessment

Component & CO-PO Mapping	Outstanding (5)	Exceeds Expectations (4)	Meets Expectations (3)	Needs Improvement (2)	Unsatisfactory (1)
Fundamental Knowledge: Understanding the problem statement [CO1-5] [PO1, PO2]	The student has in depth knowledge of the topics related to the problem. Student is able to completely understand the problem definition.	Student has good knowledge of some of the topics related to problem. Student is able to understand the problem definition.	Student is capable of narrating the answer but not capable to show in depth knowledge and the problem definition.	Student has not understood the concepts partially. Student is able to partially understand the problem definition	Student has not understood the concepts and the problem definition clearly.
Design of algorithm/flow chart and program [CO1-5] [PO2, PO3]	Student is capable of discussing more than one design for his/her problem statement and capable of proving the best suitable design with proper reason.	Student is capable of discussing few designs for his/her problem statement but not capable of selecting best.	Student is capable of discussing single design with its merits and de-merits.	Student is capable of explaining the design.	Student is capable of explaining the design partially.
Implementation (Program coding) with suitable tools [CO1-5] [PO5, PO8]	Student is capable of implementing the design with best suitable language structure considering optimal solution/optimal efficiency.	Student is capable of implementing the design with best suitable language structure and should be capable of explaining it.	Student is capable of implementing the design with proper explanation.	Student is capable of implementing the design.	Student is capable of implementing the design with errors.
Program debugging and testing with suitable tools [CO1-5] [PO5, PO8]	Student is capable to compile and debug the program with no errors (syntax, semantic and logical).	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with full understanding of error descriptions.	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with partial understanding of error descriptions.	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with no understanding of error descriptions.	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with assistance.
Results & interpretation /analysis [CO1-5] [PO4]	Student is able to run the program on various cases and compare the result with proper analysis.	Student is able to run the program for all the cases.	Student is able to run the code for few cases and analyze the result.	Student is able to run the program but not able to analyze the result.	Student is able to run the program but not able to verify the correctness of

					the result.
Demonstration and documentation [CO1-4] [PO8, PO9, PO11]	Demonstration and lab record is well-organized, with clear sections.	Demonstration and lab record is organized, with clear sections, but some	Demonstration and lab record lacks clear organization or structure. Some sections are	Demonstration and lab record is poorly organized, with missing or unclear sections.	Demonstration and lab record is poorly organized, with missing sections. Record

Rubrics for Continuous Internal Evaluation (CIE) Test

Component & CO-PO Mapping	Excellent (5)	Good (4)	Fair (3)	Marginal (2)	Unsatisfactory (1)
Fundamental Knowledge (2) [CO1, CO2] [PO1]	The student has well depth knowledge of the topics related to the problem & course	Student has good knowledge of some of the topics related to problem & course	Student has average knowledge of some of the topics related to problem & course	Student is capable of narrating the answer but not capable to show in depth knowledge	Student has not understood the concepts clearly
Understanding of problem definition (1) [CO1, CO2] [PO2]	Student is able to completely understand the problem definition	Student is able to understand the problem definition but not clearly	Student has a basic understanding of the problem definition that is partial or superficial	Student is able to Shows minimal or unclear understanding of the problem definition	Student is not able to understand the problem definition
Design and Implementation (3) [CO1, CO2] [PO3]	Student is capable of design and implementing with best suitable construct for the given problem definition	Student is capable of design and implementing with some construct for the given problem definition	Student is capable of design and implementing the core part of the construct for the given problem definition	Student is partially capable of design and implementing with some algorithm for the given problem definition	Student is not capable of design and implementing
Result & Analysis (2) [CO1, CO2] [PO4]	Student is able to run the program on various data inputs and compare the result with proper inference.	Student will be able to run the program on various data inputs and fair knowledge in comparing the result with proper inference	Student will be able to run the code for few data/datasets and analyze the output.	Student will be able to run the code for few data inputs but not analyze the output.	Student will be not able to run the program and not able to analyze the result.
Communication (Viva voce) (2) [CO3] [PO8, PO9]	Good Verbal & nonverbal communication skills with precise and correct terminologies/ answers.	Good verbal Communication skills with precise and correct terminologies/ answers.	Average Communication but with precise and correct terminologies/ answers.	Average Communication but with imprecise and incorrect terminologies/ answers	Poor Communication (Minimal interaction/answers)

Self-Learning (SL) Details: Duration and Rubrics for Evaluation

Component	Activity	Marks	Duration	Rubrics for Evaluation
Self-Study Component in Each Module	Student presentations on prescribed self-study topics	As per IA scheme	15 Hours	Relevance of content, conceptual understanding, presentation skills, application of concepts, and responses to questions

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

Department of Computer Science and Engineering

COURSE NAME: INTRODUCTION TO C PROGRAMMING						Semester: 1st / 2nd	
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26ICPC105/205	45	0	30	75	45	120	4
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1.5 hours	3 hours	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to:

CLO1: Understand the fundamentals of algorithms, flowcharts, and problem-solving Techniques.
CLO2: Gain knowledge of C programming basics including structure, syntax, and Execution.
CLO3: Apply concepts of data types, variables, input/output operations, loops, control Statements to develop simple C programs.
CLO4: Apply the concept of Functions, Arrays, Strings and pointers to develop C Programs.

Module 1	Introduction	Duration:9 hrs

Flowchart and Algorithms: Art of Programming through Algorithms & Flowcharts, sample problems.
Overview of C: History of C, Importance of C, Basic Structure of C Programs, Programming Style, Compiling and Executing a 'C' Program.
Constants, Variables and Data Types: Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants, Declaring a Variables as Constants and Volatile, Formatted Input, Formatted Output Statements.
Textbook: Chapter 1: 1.6 Chapter 2: 2.1, 2.2, 2.8, 2.9, 2.10 Chapter 3: 3.2 to 3.14 Chapter 5: 5.4, 5.5

Module 2	Operators, Decision making and Looping	Duration:9 hrs

Operators: Introduction to Operators, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operator, Special Operators, Arithmetic Expression, Precedence of Arithmetic Operators.
Decision Making, Branching, Looping: Introduction, Decision Making with if Statement, Simple if Statement, The if..else Statement, Nesting of if..else Statements, The else if Ladder, The Switch Statement, The GOTO Statement, while, do, for, Jumps in Loops, Infinite Loop.
Textbook: Chapter 4: 4.1 to 4.10, 4.12 Chapter 6: 6.1 to 6.7, 6.9 Chapter 7: 7.1 to 7.5

Module 3	Arrays and Strings	Duration:9 hrs

Introduction, Declaration and Initialization of One-dimensional and Two-Dimensional Arrays, Example Programs using arrays, Reading and writing a Character, Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, Comparison of Two Strings, String-handling Functions, Simple programs on strings.
Textbook: Chapter 8: 8.1 to 8.6 Chapter 5: 5.2, 5.3 Chapter 9: 9.2 to 9.5, 9.7, 9.8

Module 4	**User Defined Functions**	**Duration:9 hrs**
Introduction, Need for User-defined Functions, A Multi-functional Program, Elements of User-defined Functions, Definition of Function, Return Values and their Types, Function Calls, Function Declaration, No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Arguments but returns a Value **Textbook**: Chapter 10: 10.1 to 10.8, 10.10, 10.11, 10.12, 10.13		
Module 5	**Structures and Pointers**	**Duration:9hrs**
Structures and Pointers: Introduction, Defining a Structure, Declaring and Accessing Structure Variables and Members, Structure Initialization, Copying and Comparing Structure Variables, Array of Structures, Arrays with in Structures. pointers: Introduction, Understanding pointers, Accessing the Address of Variable, Declaring pointer variables, initialization of pointers, accessing variables through its pointer, pointers and Arrays. **Textbook:** Chapter 11: 11.1 to 11.6, 11.8, 11.9 Chapter 12: 12.1 to 12.6, 12.10		

Practical Component of IPCC:

1. Develop a C program to convert temperature from degree Celsius to Fahrenheit.
2. Develop a program to find the roots of quadratic equations.
3. Given age and gender of a person, develop a program to categorise senior citizen (male & female).
4. Develop a program to find whether a given number is prime or not.
5. Develop a program to find key elements in an array using linear search.
6. Develop a program to find the transpose of a matrix.
7. Develop a program to find the sum of digits of a given number.
8. Develop a program to concatenate two strings, find length of a string and copy one string to other using string operations.
9. Develop a modular program to generate Fibonacci series up to N terms.
10. Develop a program to declare the structure of employees and display the employee records with higher salary among two employees.
11. Develop a program to create an array of structures to store book details and check whether a specific book, as requested by the user, is available or not."
12. Develop a program to add two numbers using the pointers to the variables.

References:

Textbook:

1. Programming in ANSI C, 9e, E Balaguruswamy, Tata McGraw Hill Education.

Reference books / Manuals:

1. Programming in C, ReemaThareja, Oxford University, Third Edition, 2023.
2. The 'C' Programming Language, Brian W. Kernighan and Dennis M. Ritchie, Second Edition, Prentice Hall of India, 2015

Web links and Video Lectures (e-Resources):

1. VTU Elearning Resources: Elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2. IntroductiontoProgramminginC[https://onlinecourses.nptel.ac.in/noc23_cs02/preview]
3. CforEveryone:ProgrammingFundamentals[https://www.coursera.org/learn/c-for-everyone]
4. ComputerProgrammingVirtualLab[https://cse02-iiith.vlabs.ac.in/exp/pointers/]
5. C Programming: The ultimate way to learn the fundamentals of the C language [https://www.pdfdrive.com/c-programming-the-ultimate-way-to-learn-the-fundamentals-of-the-c-language-e187584209.html]
6. C Programming: The Complete Reference

	[https://viden.io/knowledge/programming-in-c-language/attachment/28313/c-the-complete-reference-herbert-schildt-4th-edition-pdf/preview] 7. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384323703937433634517_shared/overview 8. CprogrammingTutorial:https://www.geeksforgeeks.org/c/c-programming-language/

Expected Course Outcomes:

After successfully completing the course, the student will be able to:

CO1: Explain the fundamental structure of a C program and primitive constructs.

CO2: Apply decision-making and iterative control structures to solve simple computational problems.

CO3: Develop programs using arrays and string operations to solve real-world problems.

CO4: Construct user-defined functions to modularize the solution to the given problems.

CO5: Build programs using structures and pointers for complex data representation and access.

Assessment Details (CIE & SEE)

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying 50% weightage (i.e., 50 marks each).

The CIE Theory component will be 25 marks and CIE Practical component will be 25 marks.

The CIE Theory component consists of IA tests for 25 marks. The CIE Practical component for continuous assessments will be for 15 marks through rubrics and for lab Internal Assessment will be conducted for 10 marks through rubrics.

- To qualify and become eligible to appear for SEE, in the CIE theory component, a student must score at least 40% of 25 marks, i.e., 10 marks.
- To qualify and become eligible to appear for SEE, in the CIE Practical component, a student must secure a minimum of 40% of 25marks, i.e., 10marks.
- To pass the SEE, a student must secure a minimum of 35% of 50 marks, i.e., 18 marks.

A student is deemed to have completed the course if the combined total of CIE and SEE is at least 40 out of 100 marks.

Rubrics for Learning Activity:

Component &CO-PO Mapping	Outstanding (5)	Exceeds Expectations (4)	Meets Expectations (3)	Needs Improvement (1-2)	Unsatisfactory (0)
Clarity & Simplicity of algorithm/program [CO1] [PO9]	Algorithm/Programs are self-explanatory, specific and well-structured for the intended activity; no ambiguity is present.	Programs are clear and mostly specific; minor ambiguity is present.	Programs are some what clear but could be more specific; moderate ambiguity.	Programs are vague and lack clarity; high ambiguity.	Programs are unclear, incomplete, or irrelevanttothe activity.
Appropriate Use of language constructs and design of algorithm/program [CO4,CO5] [PO1,PO3]	Demonstrates precise and creative usage of the language construct and structured programming	Correctly applies the language construct with minor gaps or missed opportunities.	Uses the language construct, but with partial understanding or inconsistent usage.	Limited understanding of the language construct; incorrect or weak usage.	No evidence of correct/relevant language construct use.

Compilation, Debugging, Analysis &Comparison of Results for variouscases. [CO2, C03] [PO2,PO4,PO5]	Providesclearand correctresults with analysis for multiple cases; comparisons among cases highlight key strengths and Weaknesses.	Providescorrect results with analysis for multiple cases, though slightly less detailed.	Providescorrect results with limitedanalysis; comparisonsare present but shallow.	Providescorrect results. Minimalanalysis: comparisonsare weak or incomplete.	Results are partiallycorrect. No meaningful analysis or comparison.
Creativity, efficiency of Problem-Solving/program [CO2, CO3] [PO3,PO11]	Demonstrates outstanding creativity and innovation in writingprograms, especially for problem-solving or Designtasks.	Demonstrates creativity and someinnovation; Program solutions are practical.	Showsmoderate creativity; programs are functional but notinnovative.	Minimal creativity; programs are repetitive or unimaginative.	No creativity or problem-solving/Programming is evident.
Documentation&Reflection [CO1, CO4, CO5] [PO8/PO9/PO11]	Documentationis complete, well-organized,and includes deep reflectionon improvements acrossiterations.	Documentation iscompletewith some reflection onprogram refinement.	Documentation is present but lacks detail or depth in reflection.	Incomplete documentation; reflectionis minimal.	No documentation or reflection providedasper schedule.

TW & SL Details

Sl. No	Term Work Activity (TW)	Number of Hours/Semester
1	Learn and design some C Programs other than listed in the syllabus	15

Self-Learning (SL):

Sl. No	Self- Learning	Number of Hours/Semester
1	NPTEL Certification Course on "Introduction to Programming in C" by IIT, Khanpur-Prepartion: https://nptel.ac.in/courses/106104128	12
2	C Programming Tutorials by Geeks for Geeks: https://www.geeksforgeeks.org/c/c-programming-language/	10
3	C Coding Practice by Hacker Rank: https://www.hackerrank.com/domains/c	8

Syllabus of Program Specific Courses

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Course Name: PROGRAMMING IN C LANGUAGE						Semester: 1st / 2nd	
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26PCLS105/205	45	0	0	45	45	90	3
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1.5 hours	3 hours	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

- **CLO1:** Study the basic architecture and functionalities of a Computer
- **CLO2:** Apply programming constructs of C language to solve the real-world problems
- **CLO3:** Explore user defined data structures like arrays, structures and pointers in implementing solutions to problems
- **CLO4:** Design and Develop Solutions to problems using structured programming constructs such as functions.

Module 1	**Introduction**	**Duration:9 hrs**

Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, Using comments, C tokens, Character set in C, variables, constants, Input/output statements in C, Operators in C, Type conversion and typecasting

Textbook: Chapter 9 (9.1-9.16)

Module 2	**Decision Control and Looping**	**Duration:9 hrs**

Introduction to decision control, Conditional branching statements, Iterative statements (for, while and do while loops), Nested loops, break and continue statements, goto statement.

Textbook: Chapter 10 (10.1-10.6)

Module 3	**Functions and Arrays**	**Duration:9 hrs**

Functions: Introduction to functions, Function definition, function declaration, function call ,return statement, passing parameters to functions, scope of variables, storage classes, recursive functions.

Arrays: Declaration of arrays, Accessing the elements of an array, Storing values in arrays, Operations on arrays, Passing arrays to functions, Two dimensional arrays, Operations on two-dimensional arrays, Two-dimensional arrays to functions.

Textbook :Chapter 11 (11.1-11.10) Chapter 12 (12.1-12.8 and 12.12)

Module 4	**Strings and Pointers**	**Duration:9 hrs**

Strings : Introduction about Strings, String taxonomy, Operations on strings, Miscellaneous string and character functions

Pointers: Introduction to pointers, Declaring pointer variables, Types of pointers, Passing arguments to functions using pointers

Textbook: Chapter 13 (13.1-13.5), Chapter 14 (14.2-14.7)

Module 5	**Structures, Union and Files**	**Duration:9 hrs**

Structure, Union, and Enumerated Data Type: Introduction, Nested structures, Array of structures, Structures and functions, Unions, Enumerated data type.

Files: Introduction to files, Using files in C, Reading and writing data files, Detecting end of file

Text book: Chapter 15 (15.1-15.4, 15.6, 15.10), Chapter 16 (16.1-16.5)

References

Textbook:

1. Reema Thereja "Computer Fundamentals and Programming in C", Oxford University, Second Edition, 2017.

Reference Books:

1. E. Balaguruswamy, Programming in ANSIC, 7thEdition, Tata McGraw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie "C' Programming Language", Prentice Hall of India.

	Web links and Video Lectures (e-Resources): 9. VTU ellearning Resources: elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html 10. Introduction to Programming in C [https://onlinecourses.nptel.ac.in/noc23_cs02/preview] 11. C for Everyone: Programming Fundamentals [https://www.coursera.org/learn/c-for-everyone] 12. Computer Programming Virtual Lab[https://cse02-iiith.vlabs.ac.in/exp/pointers/] 13. C Programming: The ultimate way to learn the fundamentals of the C language [https://www.pdfdrive.com/c-programming-the-ultimate-way-to-learn-the-fundamentals-of-the-c-language-e187584209.html] 14. C Programming: The Complete Reference [https://viden.io/knowledge/programming-in-c-language/attachment/28313/c-the-complete-reference-herbert-schildt-4th-edition-pdf/preview] 15. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384323703937433634517_shared/overview 16. C programming Tutorial: https://www.geeksforgeeks.org/c/c-programming-language/

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1: Explain the fundamental concepts of basic language constructs in C Programming.

CO2: Make use of decision control and looping statements to solve basic computational Problems.

CO3: Develop modular programs using user-defined functions and arrays for complex Computational problems.

CO4: Apply the concepts of strings and pointers in problem solving

CO5: Construct user defined data types using structures, unions, enumerations to model Simple real-world scenarios.

Assessment Details (CIE & SEE)

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40%of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50marks**, i.e., **18 marks**.
- Not withstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE is at least 40 out of 100 marks**.

Continuous Comprehensive Assessments(CCA):

CCA will be conducted for a total of 25 marks. These activities should align with course outcomes and promote higher-order thinking and application-based learning.

Learning Activity : Programming Assignment (25 marks)

Instructions:

1. Course instructor will refer to Hacker Rank/Hacker Earth/LeetCode or any other platform to derive the questions for problem-solving.
2. Course Instructor must identify programming problems from these sections: Statements (control), Arrays, Strings, Structures & Unions and Functions.
3. Courser instructor will assign THREE questions from each section to the students for design of algorithm, program and coding/execution.
4. Students must demonstrate the solutions to the course instructor and submit the record containing algorithm, program, debugging/execution and results with observations.
5. Course instructor must evaluate the student performance as per the rubrics.

Rubrics for Learning Activity (Programming assignment)

Component &CO-PO Mapping	Outstanding(5)	Exceeds Expectations(4)	Meets Expectations(3)	Needs Improvement (1-2)	Unsatisfactory (0)
Clarity & Simplicity of algorithm/program [CO1] [PO9]	Algorithm/Programs are self-explanatory, specific,andwell-structuredforthe intended activity; no ambiguity is present.	Programs are clear and mostly specific; minor ambiguity is present.	Programs are some what clear but could be more specific; moderate ambiguity.	Programs are vague and lack clarity; high ambiguity.	Programs are unclear, incomplete, or irrelevant to the activity.
Appropriate Use of language constructs and design of algorithm/program [CO4,CO5] [PO1,PO3]	Demonstrates precise and creative usage of the language construct and structured programming	Correctly applies the language construct with minor gaps or missed opportunities.	Uses the language construct, but with partial understandin g or in consistent usage.	Limited understanding of the language construct; incorrect or weak usage.	No evidence of correct/relevant language construct use.
Compilation, Debugging, Analysis &Comparison of Results for various cases. [CO2, C03] [PO2,PO4,PO5]	Provides clear and correct results with analysis for multiple cases; comparisons among cases highlight key strengths and Weaknesses.	Provides correct results with analysis for multiple cases, though slightly less detailed.	Provides correct results with limited analysis; comparisons are present but shallow.	Provides correct results. Minimal analysis: comparisons are weak or incomplete.	Results are partially correct. No meaningful analysis or comparison.
Creativity, efficiency of Problem-Solving/program [CO2, CO3] [PO3,PO11]	Demonstrates outstanding creativity and innovation in writing programs, especially for problem-solving or Design tasks.	Demonstrates creativity and some innovation; Program solutions are practical.	Showsmoder ate creativity; programs are functional but not innovative.	Minimal creativity; programs are repetitive or unimaginative.	No creativity or problem-solving/Program ming is evident.
Documentation& Reflection[CO1, CO4, CO5] [PO8/PO9/PO11]	Documentation is complete, well-organized, and includes deep reflection on improvements Across iterations.	Documentation is complete with some reflection on program refinement.	Documentati on is present but lacks detail or depth in reflection.	Incomplete documentation; reflection is minimal.	No documentation or reflection provided as per schedule.

TW & SL Details

Sl. No.	Term Work Activity (TW)	Number of Hours/Semester
1	Practicing Programming Assignment by referring relevant materials	10

Self-Learning (SL):

Sl. No.	Self- Learning	Number of Hours/Semester
1	NPTEL Certification Course on "Introduction to Programming in C" by IIT, Khanpur-Prepartion: https://nptel.ac.in/courses/106104128	15
2	C Programming Tutorials by Geeks for Geeks: https://www.geeksforgeeks.org/c/c-programming-language/	10
3	C Coding Practice by Hacker Rank: https://www.hackerrank.com/domains/c	10

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF CIVIL ENGINEERING

Course Name: ENGINEERING MECHANICS						**Semester: 1st /2nd**	
Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26ENMC105/205	45	0	0	45	45	90	3
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		1.5 Hrs.	3 Hrs.	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Realize and relate importance of system of forces in civil engineering.

CLO2: Understand the concept of equilibrium of components and systems acted upon by force

CLO3: Get familiarized with effect of loading based on the type of support and restrain

CLO4: Treat friction as a force and its influence in structural components

CLO5: Realize the significance of shape of objects& its resistance against rotational motion

Module 1	**Introduction & Coplanar Force System**	Duration:9 Hours

Basic terminologies: Time, Mass, Space, length, force, momentum, rigid body, particle; Fundamental laws of mechanics

Force System: Characteristics of a force, Classification of force system,principle of transmissibility of a force, principle of superposition of force,Composition and resolution of forces, Resultant of coplanar concurrent and nonconcurrentforce system, Moment, Couple and Characteristics of couple,Varignon's theorem: Numerical Examples

Module 2	**Equilibrium of Forces**	Duration:9 Hours

Equilibrium: Conditions of static equilibrium, Equilibrium of coplanar concurrentforce systems, Lami's theorem, Free body diagrams, Equilibrium of coplanarnon-concurrent force system, Numerical examples.

Supports & Reactions: Types of supports, loadings and beams, Supportreactions for statically determinate beams subjected to various loadings,Numerical examples.

Module 3	**Friction**	Duration:9 Hours

Introduction, Types of friction, Concept of static friction, Kinetic (Dynamic)friction, Laws of friction, Angle of repose, Cone of friction, Equilibrium of blockson horizontal and inclined plane, Ladder friction: Numerical examples.

Module 4	**Centroid of Plane Figures**	Duration:9 Hours

Introduction, definitions of centroid and centre of gravity. Axes of symmetry,Locating the centroid of square, rectangle, triangle, circle, semicircle, quadrantand sector of a circle using method of integration, Centroid of composite areasand simple built-up sections: Numerical examples.

Module 5	**Second moment of Areas**	Duration:9 Hours

Introduction, Moment of inertia about an axis, Parallel axes theorem,Perpendicular axes theorem, Polar moment of inertia, Radius of gyration,Moment of inertia of square, rectangular, triangular and circular areas from themethod of Integration, Moment of inertia of composite areas and simple built-upsections: Numerical Examples.

Text books /References:

Text books:

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering andEngineering Mechanics, third edition, 2015, Laxmi Publications, ISBN: 9789380856674
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, Eleventh edition, 2018, Eastern Book Promoters Belgaum [EBPB], ISBN: 5551234003896.

Reference Books:

1. Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–sixth Edition,2008, Wiley publication.
2. Irving H. Shames, Engineering Mechanics-Statics and Dynamics, fourth edition, 2002, Prentice-Hall of India(PHI).
3. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, fourteenth edition, 2017, Pearson Press, New Delhi.ISBN:9789332584747
4. Timoshenko S, Young D. H., Rao J. V., Sukumar Patil, Engineering Mechanics, fifth Edition, 2017,McGraw Hill Publisher, ISBN: 9781259062667
5. Bhavikatti S S, Engineering Mechanics, fourth edition, 2018, New Age International Publications
6. J K Gupta and S K Gupta, Engineering Mechanics and Applied Mechanics, first edition, 2021, Cengage learning. ISBN: 9789353505851.

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1:Understand conceptually and computationally the types, behaviour and impact of force and combination of forces on bodies

CO2:Realize and resolve forces under the conditions of equilibrium

CO3: Determine the reactions by understand the relevance of types of supports & loading

CO4:Consider friction as a force to understand types and laws of friction

CO5:Locate the centroid of simple and composite plane areas using first principles

CO6: Compute the second moment of area of two-dimensional surfaces

Assessment Details (CIE & SEE)

Nature of Assessment		Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation					
2 Internal Assessment		50 Each	100	25	10
CCE	Two Module Test / Two Remedial Test/ Two Improvement Test	25 Each	50	15	06
	ABL	50	50	10	04
TOTAL CIE MARKS				**50**	**20**
Semester End Evaluation					
Semester End Examination			100	50	18
TOTAL MARKS (CIE + SEE)				**100**	**40**

TW & SL Details (Duration & Rubrics for Evaluation)

Component	Activity & Student Submission	Performance Indicator and Marks Distribution	
ABL (TW & SL)	Prepare physical models to represent various types of supports and loading, with provision to demonstrate how a body is restrained	Choice of materials for preparing models	10
		Types of supports and loading considered	10
		Effectiveness of models to convey the essence	10
		Demonstration of how a body is restrained	10
		Overall presentation and communication	10
		TOTAL	**50**

Notional Hours of Allocation

I. Batch / group creation – 3 Hours
J. Preliminary discussion among the group members –7 Hours
K. Deciding on materials and representation –10 Hours
L. Purchase of all necessary materials – 10 Materials
M. Preparation and discussions before the actual model making – 10 Hours
N. Preparation and presentation of model for assessment – 5 Hours

Rubrics for - Activity-Based Learning (Through TW & SL)

Performance Indicator	Excellent (9–10)	Good (7–8)	Satisfactory (5–6)	Needs Improvement (1–4)	Not Demonstrated (0)
Choice of materials for preparing models	Very appropriate choices for the purpose	Appropriate choices for the purpose	Decent choices for the purpose	Not relevant choices for the purpose	No Choice Made
Types of supports and loading considered	All types of support and loading considered	Majority of the types of support and loading considered	Decent types of support and loading considered	Bare minimum types of support and loading considered	None of the types considered
Effectiveness of models to convey the essence	Extremelyrelevant and relatable	Appropriately relevant and relatable	Moderately relevant and relatable	Just relevant and relatable	No relevance and relatability
Demonstration of how a body is restrained	Complete demonstration of how a body is restrained	Appropriate demonstration of how a body is restrained	Partial demonstration of how a body is restrained	Bare minimum demonstration of how a body is restrained	No demonstration of how a body is restrained
Overall presentation and communication	Effective Technical &Professional explanation indicatingeffective learning	Appropriate Technical & Professional explanation indicating Good learning	Decent Technical & Professional explanation indicating Satisfactory learning	Mere Technical & Professional explanation indicating non-effective learning	No explanation indicating no learning

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MECHANICAL ENGINEERING

Course Name: **ELEMENTS OF MECHANICAL ENGINEERING** | Semester: 1st /2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26EMEM105/205	45	0	0	45	45	90	3

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1.5 hrs	3 hrs	Descriptive

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Describe the classification, properties and engineering applications of conventional, composite, smart and nanomaterials.

CLO2: Explain the basic principles of thermodynamics, steam, heat engines, IC engines, electric vehicles and hybrid vehicles.

CLO3: Discuss the working principles, operations and applications of machine tools and joining processes.

CLO4: Illustrate the principles and applications of mechanical drives and basic robotic systems.

CLO5: Summarize the fundamentals and applications of CNC, automation, additive manufacturing and AI in mechanical engineering.

Module 1	**Engineering Materials**	**Duration: 09**

Engineering Materials: Introduction, Classification, Ferrous and Non-Ferrous metals: Types, Properties, Heat treatment basics, Corrosion resistance and their modern engineering applications.

Composite Materials: Introduction, Constituents of a Composite, Classification, Types of Matrix and Reinforcement materials, Manufacturing methods of composites, Advantages, Disadvantages and Applications of composite materials in Aerospace, Automobile and Renewable energy industries.

Smart Materials: Introduction, Types - Piezoelectric materials, MR fluids, Shape memory alloys, Electrochromic materials and Advantages, Disadvantages, Sensors/Actuator applications in automation, biomedical and robotics fields.

Nano Materials: Introduction, Types of Nano materials, Advantages, Disadvantages and Applications.

Module 2	**Concepts of Thermodynamics, Steam, IC Engines and EV-HEV**	**Duration: 09**

Concepts of Thermodynamics: Work, Energy, Heat, Laws of Thermodynamics, Modes of Heat transfer: Conduction, Convection and Radiation.

Steam: Formation of steam, Properties of Steam, Use of steam tables, Numerical related to the properties of steam.

Introduction to Heat Engines and Heat Pumps: Introduction to Heat engines and Heat pumps, Basic efficiency concepts and modern HVAC applications.

Introduction to Internal Combustion Engines: Working principle of Two stroke and Four stroke engines (SI & CI Engines), Emission control concepts, Simple Numerical on IP, BP and FP.

Electric Vehicles and Hybrid Vehicles: Working principles, Electric and Hybrid vehicle components, and Brief introduction to energy storage in Electric vehicles, Regenerative braking concept and battery management system (BMS).

Module 3	**Machine Tools**	**Duration: 09**

Machine Tools:

Lathe: Working principle, Specifications, Operations performed – Turning, Facing, Taper turning by swivelling the compound rest, Thread cutting and Knurling.

Drilling Machine: Working principle, Specifications, Operations performed – Drilling, Reaming, Boring, Counter boring, Countersinking, and Tapping.

Milling machine: Working principle, Specifications, Operations performed – Plane milling, End milling, Slot milling, Angular milling.

(Sketches of machine tools not required. Sketches to be used only for explaining the operations).

Joining Processes: Introduction, Temporary and Permanent joining methods: Working principle of Soldering, Brazing and Electric Arc welding, TIG, MIG Advantages, Limitations and Applications.

Module 4	**Mechanical Drives and Robotics**	**Duration: 09**

Belt drives: Introduction, Open and Cross belt drives. (No derivations and simple numerical on open belt drive and crossed belt drive), Flat belts and V belts.

Gear Drives: Types of Gears, Velocity ratio, Gear Trains - Simple and Compound gear trains and Numerical.

Robotics: Introduction, Generation of Robots, Robot anatomy - Links and Joints, Types of Robots, Configurations of Robots, Robot motion - Degrees of Freedom, Robot sensors: Tactile, Force, Proximity and Vision sensors

Module 5	**CNC and Additive Manufacturing**	**Duration: 09**

Computer Numerical Control (CNC): Introduction, Definition of NC and CNC Components of CNC. Definition of CAD, CAM, CAE and CIM.

Automation: Definition, Types of Automation, Reasons for Automation.

Additive manufacturing: Introduction, Basic principles (Steps in additive manufacturing), Additive manufacturing processes – Photo polymerization technique, Material extrusion technique and Powder based fusion technique, Automotive and Aerospace applications.

Applications of AI in Mechanical Engineering: Automobile industry, manufacturing industry and Mechanical design.

Text Books and References:	**Text Books:** 5. K R Gopala Krishna, Elements of Mechanical Engineering, Subhash Publications, 2018. 6. Textbook of Elements of Mechanical Engineering, S. Trymbaka Murthy, Medtech, 2019. **Reference:** 11. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003. 12. William D. Callister, Materials Science & Engineering, An Introduction, John Wiley & Sons Inc, 2010. 13. Elements of Mechanical Engineering, Kestoor Praveen, Suggi Publishing, 2019 14. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1 15. Groover M. P.(2008). Automation, production systems, and computer integrated manufacturing, 3rd ed. Prentice Hall.
Web links and Video Lectures (e-Resources):	• https://nptel.ac.in/courses/112104526 • https://nptel.ac.in/courses/112104616 • https://nptel.ac.in/courses/112104769 • https://venturebeat.com/ai/how-ai-is-impacting-the-automotive-world/ • https://www.vlcsolutions.com/blog/artificial-intelligence-in-manufacturing/ • https://skill-lync.com/blogs/technical-blogs/design-applications-of-machine-learning-and-ai-in mechanical-engineering • https://caeassistant.com/blog/ai-in-mechanical-engineering-video/ • https://www.neuralconcept.com/post/how-is-ai-used-in-mechanical-engineering • https://www.youtube.com/watch?v=MKiiXubKaGM • https://www.youtube.com/watch?v=_canCYWZPsc • https://www.youtube.com/watch?v=lQ-MYnyxh7M
Teaching-Learning Process (Innovative Delivery Methods):	The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes. • Simulation and Virtual Labs • Partial Delivery of course by Industry experts • ICT-Enabled Teaching • Video demonstration

Expected Course Outcomes:
After successfully completing the course, the student will be able to;
CO1: Identify and classify engineering, composite, smart and nanomaterials based on their properties and applications.
CO2: Describe the basic principles and working of thermodynamic systems, steam, heat engines, IC engines, electric vehicles and hybrid vehicles.
CO3: Describe the working principles, operations and applications of machine tools and common joining processes.
CO4: Illustrate the working principles of belt and gear drives and identify basic robotic configurations, degrees of freedom and sensors.
CO5: Summarize the fundamentals and applications of CNC, automation, additive manufacturing and AI in mechanical engineering.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	50 Each	100	25	10
Activity Based Learning – 1	30	30	15	6
Activity Based Learning - 2	20	20	10	4
TOTAL CIE MARKS			50	20
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Activity-Based Learning (ABL) Component
Integrating Team Work (TW) and Self-Learning (SL)

ABL will be conducted for a total of 25 marks. It is evaluated through the learning activities which are aimed at enhancing the holistic development of students. These activities should align with course objectives and promote higher-order thinking and application-based learning.

ABL 1: Case Study Presentation				
Component	**Activity**	**Student Submission**	**Performance Indicator and Marks Distribution**	
ABL 1 (TW & SL)	Students shall work in teams to select and study a real-world engineering case related to Elements of Mechanical Engineering. The case may involve an automobile braking system, IC engine, centrifugal pump, refrigeration system, wind turbine, CNC machining, hydraulic system, or another relevant mechanical engineering application. Students shall investigate the working principle, components, design features, relevant engineering concepts, applications, advantages, limitations, and possible improvements. The activity shall integrate Team Work (TW) and Self-Learning (SL).	1. Case study report with introduction, objectives, and problem description. 2. Technical study of the selected engineering system. 3. Analysis of working principles and relevant EME concepts. 4. Supporting drawings, diagrams, calculations, or technical data, wherever applicable. 5. Group presentation. 6. Individual self-learning record and evidence of contribution.	Understanding of Case	**5 marks**
			Analysis and Critical Thinking	**10 marks**
			Documentation and Presentation Skills	**10 marks**
			Question-and-Answer Handling	**5 marks**
			TOTAL	**30 marks**
30 Marks is to be scale down to 15 Marks				

ABL 2: Material Selection and Justification for a Real-World Engineering Product				
Component	**Activity**	**Student Submission**	**Performance Indicator and Marks Distribution**	
ABL 2 (TW & SL)	Students shall work in teams to select a real-world engineering product, such as an aircraft wing, car chassis, biomedical implant, wind turbine blade, tennis racket, or other suitable engineering product. The team shall study the materials used, their properties, advantages, disadvantages, and suitability for the selected application. Students shall compare alternative materials and justify the selection based on relevant EME concepts and application requirements. The activity shall integrate Team Work (TW) and Self-Learning (SL).	1. Material selection and justification sheet. 2. Group report containing product details, materials, properties, and applications. 3. Individual self-learning record and evidence. 4. Material comparison and selection analysis. 5. Group presentation. 6. Individual contribution and learning evidence.	Material Selection and Relevance	**10 marks**
			Technical Content Accuracy	**5 marks**
			Organization and Presentation	**5 marks**
			TOTAL	**20 marks**

TW & SL Hour Allocation

Sl. No.	Activity	TW (Hours)	SL (Hours)	Total Hours
1	ABL 1: Case Study Presentation	15	11	26
2	ABL 2: Material Selection and Justification	11	8	19
	Total	**26**	**19**	**45**

ABL 1: Case Study Presentation – 26 Hours: Preliminary Discussion – 1 Hour, Self-Learning Resources – 5 Hours, Case Selection and Planning – 2 Hours, Technical Analysis – 7 Hours, Individual Self-Learning – 3 Hours, Report and Presentation Preparation – 4 Hours, Presentation and Discussion – 2 Hours, Feedback and Corrections – 2 Hours.

ABL 2: Material Selection and Justification – 19 Hours: Preliminary Discussion – 1 Hour, Self-Learning Resources – 4 Hours, Product Selection – 1 Hour, Material Study and Comparison – 4 Hours, Individual Self-Learning – 3 Hours, Report and Presentation Preparation – 3 Hours, Presentation and Discussion – 2 Hours, Feedback and Corrections – 1 Hour.

Suggested ABL-1: Case Study Topics

1. Study of Ferrous and Non-Ferrous Materials and Their Engineering Applications.
2. Working Principle and Applications of Two-Stroke and Four-Stroke Engines.
3. Study of Electric and Hybrid Vehicles and Regenerative Braking.
4. Working Principle and Applications of Heat Engines and Heat Pumps.
5. Study of Lathe, Drilling, and Milling Operations in Manufacturing.
6. Comparison of Soldering, Brazing, and Arc Welding Processes.
7. Study of Belt Drives and Gear Drives in Mechanical Systems.
8. Study of Robot Configurations, Degrees of Freedom, and Applications.
9. Applications of CNC Machines in Modern Manufacturing.
10. Study of Additive Manufacturing Processes and Their Aerospace and Automotive Applications.

Suggested ABL-2: Material Selection and Justification Topics

1. Material Selection for an Automobile Component Using Ferrous and Non-Ferrous Materials.
2. Material Selection for an Electric Vehicle Battery Enclosure.
3. Material Selection for an Aerospace Component Using Composite Materials.
4. Material Selection for a Wind Turbine Blade Using Composite Materials.
5. Material Selection for an IC Engine Component Considering Strength and Heat Resistance.
6. Material Selection for a Heat Exchanger Component Considering Thermal Conductivity and Corrosion Resistance.
7. Material Selection for a Robot Link Considering Strength and Weight.
8. Material Selection for a CNC Machine Component Considering Stiffness and Wear Resistance.
9. Material Selection for an Additively Manufactured Automotive Component.
10. Material Selection for a Smart Sensor or Actuator Using Piezoelectric Materials or Shape Memory Alloys.

Note: The above topics are suggestive and not exhaustive. Students may select other relevant topics in consultation with the course faculty, provided they align with the prescribed EME syllabus and the objectives of the respective ABL activity.

Rubrics for - Activity-Based Learning - 1 (Through TW & SL): 30 Marks

Performance Indicator	Excellent (9–10)	Good (7–8)	Satisfactory (5–6)	Needs Improvement (1–4)	Not Demonstrated (0)
Understanding of Case (5)	**5:** Demonstrates comprehensive understanding of the case, objectives, components, and engineering significance.	**4:** Demonstrates good understanding with minor gaps.	**3:** Demonstrates basic understanding of the case.	**1–2:** Demonstrates limited understanding with significant gaps.	**0:** No evidence of understanding.
Analysis and Critical Thinking (10)	**9–10:** Provides in-depth technical analysis, identifies engineering challenges, evaluates alternatives, and develops logical conclusions.	**7–8:** Provides sound analysis and identifies important engineering issues with minor gaps.	**5–6:** Provides basic analysis with limited critical evaluation.	**1–4:** Provides superficial or partially incorrect analysis.	**0:** No meaningful analysis.
Documentation and Presentation Skills (10)	**9–10:** Report is comprehensive, well organized, technically accurate, and supported by appropriate diagrams or evidence; presentation is clear and professional.	**7–8:** Report and presentation are well organized with minor shortcomings.	**5–6:** Report and presentation cover the basic requirements but lack depth or clarity.	**1–4:** Report is incomplete or poorly organized; presentation lacks clarity.	**0:** No meaningful report or presentation.
Question-and-Answer Handling (5)	**5:** Answers questions accurately, confidently, and with sound technical reasoning.	**4:** Answers most questions correctly with good understanding.	**3:** Answers basic questions but requires some guidance.	**1–2:** Gives incomplete or incorrect answers.	**0:** Unable to respond to questions or demonstrate understanding.

Rubrics for - Activity-Based Learning - 2 (Through TW & SL): 20 Marks

Performance Indicator	Excellent (9–10)	Good (7–8)	Satisfactory (5–6)	Needs Improvement (1–4)	Not Demonstrated (0)
Material Selection and Relevance (10)	**9–10:** Selects an appropriate material and provides a strong, logical justification based on properties, advantages, limitations, and application requirements.	**7–8:** Selects a suitable material with good justification and minor gaps in comparison.	**5–6:** Provides a reasonable material selection with basic justification.	**1–4:** Selection is weak or partially justified, with limited comparison of alternatives.	**0:** No meaningful material selection or justification.
Technical Content Accuracy (5)	**5:** Presents accurate material properties, applications, and comparisons supported by appropriate technical information.	**4:** Presents mostly accurate information with minor errors or omissions.	**3:** Presents basic information with some technical gaps.	**1–2:** Contains significant technical errors or incomplete information.	**0:** No meaningful or technically relevant information.
Organization and Presentation (5)	**5:** Report and presentation are clear, logically organized, technically sound, and supported by appropriate evidence.	**4:** Report and presentation are well organized with minor shortcomings.	**3:** Presentation is understandable but lacks depth or organization in some areas.	**1–2:** Report or presentation is poorly organized and difficult to follow.	**0:** No meaningful report or presentation.

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Name: Fundamentals of Electronics & Communication Engineering						Semester: 1st / 2nd	
Course Code	L (H/W)	T (H/W)	P (H/W)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26ECEE105/205	3	0	0	45	45	90	3
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		3	3	Written

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Introduce digital number systems, Boolean algebra, logic gates, and the principles of combinational logic circuit design.

CLO2: Explain the operational characteristics of semiconductor diodes and their theoretical application in rectification, filtering, and voltage regulation.

CLO3: Provide a fundamental understanding of BJT, JFET, and MOSFET operating principles, DC biasing techniques, small-signal amplification, and switching modes.

CLO4: Familiarize with operational amplifier architecture, negative feedback principles, and linear/non-linear circuit configurations.

CLO5: Understand the communication-system fundamentals, transmission media, modulation techniques, mobile communication, and PCM to practical communication applications.

Module 1	**Digital Systems and Binary Numbers**	**Duration:9**

Digital Systems, Numbering System (Binary, Octal, Decimal and, Hexadecimal), Number Base Conversion-(Binary to Decimal, Hexadecimal and Vice Versa), 1's and 2'scomplement operation, Signed Binary Numbers-Arithmetic Addition and Subtraction, Binary Logic. Boolean Algebra: Basic Definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates (Excluding extension to multiple inputs, positive and negative edge) NAND and NOR as Universal gates (Excluding Multilevel Presentation), Binary Adders. (Half Adder and Full Adder).
Case study: 4-bit adder simulation.

Module 2	**Diodes and their Application**	**Duration:9**

Introduction, Characteristics and Parameters, Diode Approximation, DC Load Line Analysis, Half Wave Rectifier, Full Wave Bridge Rectifier, Capacitor Filter Circuit (Only Qualitative Approach). Zener Diode and its Use in Voltage Regulation, Diode Logic Circuits.
Case study: Mobile Phone Charging adapter

Module 3	**Bipolar Junction Transistors**	**Duration:9**

Bipolar Junction Transistors Bipolar Junction Transistors: Introduction, BJT Voltages & Currents, BJT Amplification, BJT Switching, Common Base Characteristics, Common Emitter Characteristics, BJT Biasing, Fixed Biasing and Voltage Divider, DC Load Line and Bias Point.
Field Effect Transistor: Junction Field Effect Transistor (N- Channel), JFET Characteristics, MOSFETs: Enhancement MOSFETs.
Case Study of MOSFET as a Switch

Module 4	**Operational Amplifiers:**	**Duration:9**
Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol. Op-Amp Parameters: Gain, Input Resistance, Output Resistance, CMRR, Slew Rate, Bandwidth, Input Offset Voltage, Input Bias Current and Input Offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting & Non-Inverting Amplifier. Amplifier Op-Amp Applications: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator. Feedback: Types of feedback. Case Study: Audio Preamplifier Using an Operational Amplifier (LM741)		
Module 5	**Fundamentals of Communication Systems**	**Duration:9**
Elements of an Electrical Communication System, Communication Channels and their Characteristics: Wire line, Fiber Optic, Wireless Electromagnetic Channels. Introduction to Analog Modulation Types: Amplitude Modulation, Frequency and Phase Modulation, Waveforms. (Excluding Derivation and Spectral Diagrams). Applications: AM radio Broadcasting, Super heterodyne FM Receiver, Mobile Wireless Telephone Systems, Analog Signal to Digital Signal Using PCM. Case Study: Smartphone Voice Call Process.		
References:	**Text Books :** 1. M. Morris Mano and Michael D. Ciletti, Digital Design - With an Introduction to the Verilog HDL, VHDL and System Verilog 6th Edition, Pearson Education Inc, 2024. 2. David A Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 30th Impression, 2025. 3. D.P Kothari and I J Nagrath, Basic electronics, Second Edition, McGraw Hill Education Pvt ltd, 2018. 4. Ramakanth A Gayakwad, Op-amps and Linear Integrated Circuits, 4th Edition, Pearson Education, 2015. 5. John G. Proakis, Masoud Saleh, Fundamentals of Communication Systems, Second Edition, Pearson Educations, Inc., 2014. **Reference Books:** 1. Mike Tooley, Electronic Circuits, Fundamentals & Applications, 5th Edition, Elsevier, 2020. 2. Albert Malvino, Electronic Principles, 9th Edition, McGraw Hill Publications, 2021. 3. Electronic Devices and Circuit Theory, R Nashelsky and L Nashelsky, 11th Edition, Pearson, 2012.	
Expected Course Outcomes: After successfully completing the course, the student will be able to: CO1: **Apply** number-system concepts and Boolean algebra to simplify and implement basic digital logic circuits. CO2: **Analyze** diode characteristics to evaluate the performance parameters of rectifiers, Zener voltage regulators. CO3: **Apply** transistor operating principles and DC biasing methods to configure BJT, JFET, and enhancement MOSFET circuits. CO4: **Analyze** basic op-amp circuits for signal-processing applications. CO5: **Explain** the fundamental principles of communication channels, analog modulation schemes, and PCM-based digital communication systems.		

Assessment Details (CIE & SEE)
The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

• To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks.
• To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks.
Notwithstanding the above, a student is considered to have passed the course, provided the combined total of CIE and SEE is at least 40 out of 100 marks

Note: The Case Studies provided in Modules 1, 2, 3, 4 and 5 are only meant to motivate the application of concepts to students and will not appear in the SEE.

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessments	50 Each	100	25	10
1 Improvement Test / 1 Activity Based Learning for Team Work (TW) and Self-Learning (SL) Activity (Mini-Project)	50 Each	50	25	10
TOTAL CIE MARKS			**50**	**20**
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

TW & SL Details (Duration & Rubrics for Evaluation)
The activities for TW & SL should align with course objectives and promote higher-order thinking and application-based learning.

Application-Based Electronic Circuit Mini-Project (45 hours)
(Batch of 4 students , One out of 5 broad areas listed below)

1. Design and Hardware Realization of Combinational Digital Logic Circuits.
2. Design, Implementation, and Parameter Evaluation of Diode Rectifier and Voltage Regulator Circuits.
3. Design, Biasing, and Characterization of Transistor Switching and Amplification Circuits.
4. Implementation and Testing of Operational Amplifier Signal-Processing Configurations.
5. Design and Hardware Testing of Basic Signal Transmission Links.

Activity	Nature of Work	Hours
1. Problem Identification and Selection	Identification of an application/problem and finalization of the project topic	5
2. Background Study and Self-Learning	Study of relevant electronic concepts, components, circuits and applications	8
3. Circuit Design and Implementation	Circuit development, component selection, basic calculations, schematic preparation, wiring and implementation	15
4. Testing and Troubleshooting	Testing the circuit, identifying errors, making corrections and verifying operation	7
5. Performance Verification and Demonstration	Verification of working/performance and demonstration of the completed project	5
6. Documentation and Project Report	Preparation of technical report, observations, results and conclusion	5
Total		**45 Hours**

Rubrics for Mini-Project – 50 Marks

Assessment Criteria 10 Marks 20 Marks	**Superior (9-10) 17-20**	**Good (7-8) (13-16)**	**Fair (5-6) (9-12)**	**Needs Improvement (3-4) (5-8)**	**Unacceptable (0-2) (0-4)**
Student has a well-defined problem statement and a basic technical report – **10 Marks**	Problem statement and mini-project report are clear, specific, and well explained with objective, circuit diagram and basic working principle.	Problem statement and report are clear and specific, but some explanation is limited.	Problem statement and report are understandable but somewhat incomplete.	Problem statement and report are unclear or lack important details.	No clear problem statement and poor/incomplete report.
The design provided by the student meets the basic requirements - **20 Marks**	Design fully meets the requirements, circuit is properly implemented, and the student demonstrates good understanding of the design.	Design meets most requirements with minor limitations; student can explain the basic design.	Design meets basic requirements but has noticeable limitations or requires assistance.	Design meets few requirements and has significant shortcomings.	Design does not meet the requirements or is non-functional.
Hardware / Simulation circuit setup **10 Marks**	Hardware/ Simulation setup is correct, and neat.	Setup is correct with minor issues.	Setup is partially correct.	Setup has major errors.	Setup is incorrect /missing.
Demonstration **10 Marks**	Demonstrates successful circuit working and answers viva-voce questions clearly	Demonstration meets most requirements.	Demonstration meets basic requirements with some assistance.	Demonstration is incomplete or unclear.	No meaningful demonstration is provided.

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Name: Basics of Electrical Engineering | Semester: 1st / 2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26BEEE105/205	45	0	0	45	45	90	3

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1:30 Hr	3 Hr	Theory

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Apply the basic laws used in the analysis of DC circuits and AC circuits

CLO2: Explain the behaviour of circuit elements in different phases

CLO3: Understand the construction and working principles of electrical measuring Instruments.

CLO4: Explain domestic wiring, electrical safety, and energy consumption calculation.

Module 1	DC Circuits and Electromagnetism	Duration: 09 Hours

DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. Problems.

Electromagnetism: Faraday's law of electromagnetic induction, Lenz's law, dynamically and statically induced emf, Fleming's right-hand rule. Simple problems. Overview of magnetic circuit, mmf, magnetic field strength, permeability, reluctance. Inductance and mutual inductance, coefficient of coupling, energy stored in an inductor.

Self learning:

Overview of Coulombs law, absolute and relative permittivity, electric field, electric flux, electric field strength, flux density solving simple numerical.

Module 2	Single phase AC circuits	Duration: 09 Hours

Single-phase Circuits: Generation of sinusoidal voltage, frequency. Over view of average value, RMS value, form factor and peak factor of sinusoidal voltage and current. Phasor representation of alternating quantities. Analysis of R, L and C circuits. Series and parallel R-L, R-C and R-L-C circuits with phasor diagrams, calculation of real power, reactive power, apparent power, Simple Problems.

Self learning:

Sinusoidal Waveform Analysis: Mathematically derive and visually plot RMS, average, peak factor, and form factor for standard AC waveforms, simple numerical.

Module 3	Three- phase Circuits	Duration: 09 Hours

Three- phase Circuits: Generation of three-phase system, definition of phase sequence, star and delta (mesh) connections, relation between phase and line voltages and currents of star and delta connections. Overview of balanced and unbalanced source and load, power factor. Problems on balanced loads. Measurement of 3-phase power by 2-wattmeter method. Expression of power factor in terms wattmeter readings.

Self learning:

Comparison between single phase and three-phase systems, Calculation of power, power factor in three phase AC circuits.

Module 4	Measuring Instruments	Duration: 09 Hours

Measuring Instruments: Construction and working principle with balancing equation for Wheatstone's bridge, Kelvin's double bridge, Megger, Maxwell's bridge for inductance, Schering bridge for capacitance, concepts of current transformer and potential transformer.

Self learning:

Detail study on Moving Coil and Moving Iron :Induction type meters, Study on Energy meter

Module 5	**Domestic Wiring, Electricity Bill & Electrical Safety Measures**	**Duration: 09 Hours**

Domestic Wiring: Wiring Characteristics, Two way and three way control of lamp load.
Domestic Electricity Bill: Definition of "unit" used for consumption of electrical energy, power rating of common household appliances. Sanctioned Load, Two-part electricity tariff.
Equipment Safety Measures: Working principles of fuse and miniature circuit breaker (MCB), the merits and demerits of fuse and MCB.
Personal safety measures: Electric shock, possible effects of shocks. Safety precautions to avoid personal shock while dealing with electricity. Permanent measure: Earthing: Pipe and plate.
Self learning: Calculation of connected load and maximum demand. Calculation of electricity bill for domestic consumers.

Text Books:	1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, McGraw Hill 2nd edition, 3rd Reprint 2024. 2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015. 3. Electrical and electronic measurements and instrumentation by A K Sawhney, DhanapatRai and Co. edition, January 2015
References:	1. Basic Electrical and Electronics Engineering, S.K Bhattacharya, et al, Pearson. 2nd edition, 2017. 2 .Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.0

Expected Course Outcomes:
After successfully completing the course, the student will be able to;
CO1:Apply the basic laws used for the analysis of DC circuits, Electromagnetism
CO2:Analyse the different phases of circuits with parameters in it.
CO3:Demonstrate the Measuring Instruments used in electrical system
CO4:Explain the personal Safety measures and energy consumption in domestic loads

Assessment Details (CIE & SEE)
The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.
Out of 50 marks earmarked for CIE, 25 marks shall be assigned for internal tests.A minimum of two Internal Assessment Tests (IA) shall be conducted, carrying a total of 25 marks.
Continuous Comprehensive Assessments (CCA):
CCA will be conducted for a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students. These activities should align with course objectives and promote higher-order thinking and application-based learning.
Learning Activity -1: (Marks- 15)-Self learning assessment at end of the semester.
Learning Activity-2: (Marks-10)-Term work assessment for Industrial Visit & Report Writing/ Case study / Poster Creation & Presentation
To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks.
To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks.
Not- withstanding the above, a student is considered to have passed the course, provided the combined total of CIE and SEE is at least 40 out of 100 marks.

TW & SL Details (Duration & Rubrics for Evaluation):

Sl. No	**Self Learning Activity (SL) &Term Work (TW) &**	**Number of Hours / Semester**
1.	Self-learning is incorporated into each of the five modules, with 5 hours allocated per module (5 Module * 5 Hour)	25
2.	Industrial Visit & Report Writing/ Case study / Poster Creation & Presentation	20
Total		45

Rubric for Term Work (TW) and Self-Learning (SL)

Activity type	Performance Indicator	Excellent (9-10)	Very Good (7-8)	Good (5-6)	Fair (3-4)	Needs Improvement (1-2)	Unacceptable (0)
Industrial Visit Report & Writing	**Submit a comprehensive report.**	Submits a Clear, concise, well - structured, report with relevant attachments.	Submits a clear and structured report with sufficient attachments.	Submits a moderate report without many attachments .	Submits a moderate report devoid of attachments.	Submits a report not following a sequence of events that a report generally demands.	Unattempted or completely inaccurate Work.
Case Study	**Analyse problems using first principles.**	Applies first principles thoroughly to produce logical, and innovative solution.	Applies first principles effectively with minor mistakes.	Applies first principles adequately for regular problems.	Applies first principles to only simple problems.	Applies first principles in an inappropriate way.	No analysis provided.

Activity type	Performance Indicator	Excellent (4-5)	Good (1-3)	Unacceptable (0)
Poster Creation & Presentation on personal safety measures, electric shock causes, emergency first-aid protocols. Plate/pipe earthing mechanics	**Technical Accuracy & Content Depth (5)**	Accurately and comprehensively covers all 4 topics (safety, shock causes, first aid, earthing mechanics) with precise technical detail**.**	Covers most topics accurately but lacks depth in earthing mechanics or first aid.	Unattempted or completely inaccurate work.
	Visual Design & Oral Delivery (5)	Poster is visually appealing with clear diagrams; presentation is confident, well-structured, and engaging.	Poster and delivery are satisfactory but lack visual appeal or confident audience interaction.	Unattempted or completely inaccurate work.

Syllabus of Program Specific Laboratory Courses

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF COMPUTER SCIENCE AND ENGINERING

Course Name: C PROGRAMMING LABORATORY | **Sem: 1st / 2nd**

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26CPLS106/206	0	0	30	30	-	30	1

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	2 hours	3 hours	Practical

Note / Instructions:

1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 8 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100.
2. Both PART-A and PART-B are considered for CIE and SEE.
3. Students have to answer 1(one) question from PART-A and 1(one) question from PART-B.
   a. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for 70 marks out of the maximum 100 marks.
   b. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-B. It shall be evaluated for 30 marks.
4. For continuous internal evaluation, during the semester, the typical open-ended questions shall be from PART-B, and any other similar questions to enhance the skill of the students

PART A (Conventional Experiments / Programs)

Note: Students must write the Algorithm and flowchart for PART-A Questions in the Record book.

1. A robot needs to find how far it must travel between two points on a 2D plane. Develop a C program to calculate the straight-line distance between the given coordinates.
2. Develop a C program that takes a student's marks as input and displays their grade based on the following criteria:

   75 and above: Grade A
   75 to 89: Grade B
   50 to 74: Grade C
   50 to 59: Grade D
   Below 50: Grade F

   Choose a suitable control structure to implement this logic efficiently.
3. Develop a C program that takes a unique identification input like PAN Number, AADHAR_Number, APAAR_Id, Driving License, Passport and checks it against a set of stored KYC records. Based on the input, display whether the individual is verified or not. Use an appropriate control structure to handle multiple possible ID matches. Assume all unique identification is of integer type.
4. A math app needs to determine the type of roots for a quadratic equation based on user input. Develop a C program to calculate and display the roots based on the given coefficients.
5. A sensor in a robotic arm needs to calculate the angle of rotation in real-time, but the hardware doesn't support built-in trigonometric functions. Develop a C program to approximate the value of sin(x) using a series expansion method for improved performance.
6. Develop a C program that accepts a course description string and a keyword from the user. Search whether the keyword exists within the course description using appropriate string functions. If found, display: "Keyword '<keyword>' found in the course description." Otherwise, display: "Keyword '<keyword>' not found in the course description."
7. Develop a C program that takes marks for three subjects as input. Use a function to check if the student has passed (minimum 40 marks in each subject). Display the average and whether the student passed or failed.

8. In an ATM system, two account balances need to be swapped temporarily for validation. Develop a C program that accepts two balances and uses a function with pointers to swap them. Display the balances before and after swapping.

PART B (Open Ended Experiments / Programs)

Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.

1. A college library has a digital book shelf system where each book is assigned a unique Book ID. The book shelf is organized in ascending order of Book IDs. Develop a C Program to quickly find whether a book with a specific Book ID is available in the shelf.
2. A sports teacher has recorded the scores of students in a 100-meter race. To prepare the result sheet, the teacher wants the scores arranged in descending order (from highest to lowest). Develop a C program to sort the scores.
3. A small warehouse tracks how many units of different products are shipped from multiple branches. Another dataset shows how much revenue each product generates per unit. Develop a C program which combines these datasets to calculate the total revenue generated by each branch.
4. A basic mobile contact manager stores first and last names separately. For displaying full names in the contact list, you need to join them manually. Additionally, the system must check the length of each full name to ensure it fits the screen. Perform these operations by developing a C program without using built-in string functions.
5. A currency exchange booth allows users to convert between two currencies. Before confirming the exchange, the system simulates a swap of the values to preview the result without actually changing the original data. In other cases, it updates the actual values. Develop a C program that implements both behaviors using Call by Value and Call by reference.
6. A local library needs to store and display details of its books, including title, author, and year of publication. Design a structure that can hold these details and develop a C program to display a list of all books entered.

System Requirements / Platform

Operating System: Linux / Windows
Compiler: GCC 9.0+ / VS Code IDE

Text books References:	**Suggested Learning Resources:(Textbook/Reference Book/Manuals):** **Textbook:** Hassan Afyouni, Behrouz A. Forouzan. "A Structured Programming Approach in C", 4th Edition, Cengage. **Reference books:** Schildt, Herbert."C the complete reference", 4th Edition, McGraw Hill. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, 2nd edition, Prentice Hall of India. **Weblinks and Video Lectures(e-Resources):** 1. Introduction to Programming in C [https://onlinecourses.nptel.ac.in/noc23_cs02/preview] 2. C for Everyone: Programming Fundamentals[https://www.coursera.org/learn/c-for-everyone] 3. Computer Programming Virtual Lab[https://cse02-iiith.vlabs.ac.in/exp/pointers/]

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1: Develop programs in C to solve simple computational problems.
CO2: Make use of C language derived data types to solve simple real-world problems.
CO3: Build a document consisting of experiment setup, design, implementation and results.

Assessment Details (CIE & SEE)

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).

The CIE marks awarded shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for 30 marks. The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 20 marks. For both CIE and SEE, the student is required to conduct one experiment each from both Part A and Part B.

- To qualify and become eligible to appear for SEE, in the **CIE component**, a student must secure **a minimum of 40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE component**, a student must secure **a minimum of 35% of 50 marks**, i.e., **18 marks**.

A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks**.

Rubrics for Evaluation

Rubrics for CIE–Continuous assessment (30 marks)

Component & CO-PO Mapping	Outstanding (5)	Exceeds Expectations (4)	Meets Expectations (3)	Needs Improvement (1-2)	Unsatisfactory(0)
Fundamental Knowledge: Understanding the problem statement [CO1,CO2] [PO1,PO2]	The student has in depth knowledge of the topics related to the problem. Student is able to completely understand the problem definition.	Student has good knowledge of some of the topics related to problem. Student is able to understand the problem definition.	Student is capable of narrating the answer but not capable to show in depth knowledge and the problem definition.	Student has not understood the concepts partially. Student is able to partially understand the problem definition	Student has not understood the concepts and the problem definition clearly.
Design of algorithm/flowchart and program [CO1,CO2] [PO2,PO3]	Student is capable of discussing more than one design for his/her problem statement and capable of proving the best suitable design with Proper reason.	Student is capable of discussing few designs for his/her problem statement but not capable of selecting best.	Student is capable of discussing design with its merits and de-merits.	Student is capable of explaining the design.	Student is capable of explaining the design partially.
Implementation (Program coding) with suitable tools [CO-1,CO2] [PO5,PO8]	Student is capable of implementing the design with best suitable language structure considering optimal solution/optimal efficiency	Student is capable of implementing the design with best suitable language structure and should be capable of Explaining it.	Student is capable of implementing the design with proper explanation.	Student is capable of implementing the design.	Student is capable of implementing the design with errors.
Program debugging and testing with suitable tools [CO1,CO2] [PO5,PO8]	Student is capable to compile and debug the program with no errors (syntax, semantic and logical).	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with full understanding of error descriptions.	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with partial understanding of error descriptions.	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with no understanding of error descriptions.	Student is able to compile and debug the program with errors (syntax, semantic and logical) and rectified errors with assistance.
Results &	Student is able	Student is able	Student is able to	Student is able to	Student is able to

interpretation /analysis [CO1,CO2][PO4]	to run the program on various cases and compare the result with proper analysis.	to run the program for all the cases.	run the code for few cases and analyze the result.	run the program but not able to analyze the result.	run the program but not able to verify the correctness of the result.
Demonstration and documentation [CO3] [PO8,PO9,PO11]	Demonstration and lab record is well-organized, with clear sections. The record is well structured with suitable formatting (e.g: font, spacing, labelling of figures and tables, equations numbered and etc).	Demonstration and lab record is organized, with clear sections, but some sections are not well-defined. The record is structured with formatting (e.g: font, spacing, labelling of figures and tables, equations numbered and etc).	Demonstration and lab record lacks clear organization or structure. Some Sections are unclear or incomplete. The record is partially structured with formatting (e.g: font, spacing, labelling of figures and tables, equations numbered and etc)	Demonstration and lab record is poorly organized, with missing or Unclear sections. The record is not properly structured with suitable formatting (e.g: font, spacing, labelling of figures and tables, equations numbered and etc).	Demonstration and lab record is poorly organized, with missing sections. Record not submitted on time. The record is not structured with minimum formatting (e.g: font, spacing, labelling of figures and tables, equations numbered and etc).

Rubrics for CIE Test (For 50 marks and reduced into 20 marks)

Component & CO-PO Mapping	Excellent (5)	Good(4)	Fair(3)	Marginal (1-2)	Unsatisfactory (0)
Fundamental Knowledge (2) [CO1,CO2] [PO1]	The student has well depth knowledge of the topics related to the problem & course	Student has good knowledgeof some of the topics related to problem & course	Student has average knowledge of some of the topics related to problem & course	Student is capable of narrating the answer but not capable to show in depth knowledge	Student has not understood the concepts clearly
Understanding of problem definition(1) [CO1,CO2] [PO2]	Student is able to completely understand the problem definition	Student is able to understand the problem definition but not clearly	Student has a basic understanding of the problem definition that is partial or superficial	Student is able to show minimal or unclear understanding of the problem definition	Student is not able to understand the problem definition
Design and Implementation(3) [CO1,CO2] [PO3]	Student is capable of design and implementing with best suitable construct for the given problem definition	Student is capable of design and implementing with some construct for the given problem definition	Student is capable of design and implementing the core part of the construct for the given problem definition	Student is partially capable of design and implementing with some algorithm for the given problem definition	Student is not capable of design and implementing
Result & Analysis(2) [CO1,CO2] [PO4]	Student is able to run the program on various data inputs and compare the result with proper inference.	Student will be able to run the program on various data inputs and fair knowledge in comparing the result with proper inference	Student will be able to run the code for few data/datasets and analyze the output.	Student will be able to run the code for few data inputs but not analyze the output.	Student will be not able to run the program and not able to analyze the result.
Communication (Viva voce) (2) [CO3] [PO8,PO9]	Good verbal & non verbal communication skills with precise and correct terminologies/answers.	Good verbal Communication skills with precise and correct terminologies/ answers.	Average Communication but with precise and correct terminologies/ answers.	Average Communication but with imprecise and incorrect terminologies/answers	Poor Communication (Minimal interaction/answers)

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF CIVIL ENGINEERING

Course Name: MECHANICS AND MATERIALS LABORATORY | **Semester: 1st / 2nd**

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26MMLC106/206	-	-	30	30	-	30	1

CIE Marks	SEE Marks	Total Marks	CIE:SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1.5 hours	3 hours	PRACTICAL

Note / Instructions:

1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100.
2. Both PART-A and PART-B are considered for CIE and SEE.
3. Students have answer 1(one) question from PART-A and 1(one) question from PART-B.
   a. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for 70 marks out of the maximum 100 marks.
   b. b. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for 30 marks.
4. For continuous internal evaluation, during the semester, classwork, the typical open-ended questions shall be from PART-B, and any other similar questions to enhance the skill of the students

PART A (Conventional Experiments / Programs)

1. Verification of Lami's Theorem.
2. Equilibrium of concurrent forces.
3. Parallel force system- Simply supported beam.
4. Verification of Varignon's theorem.
5. Specific Gravity of
   a) Fine aggregates.
   b) b) Coarse aggregates.
   c) c) Cement.
   d) d) Soil.
6. Sieve analysis of soil-Graphical representation of the gradation curve and

Visual identification of building materials: Bricks, Stones, Tiles, M-Sand, Bitumen, Fly-Ash, GGBS, Steel Bars of Various Sizes.

PART B (Open Ended Experiments / Programs)

Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.

1. Reactions.
2. Field tests on cement.
3. Particle size distribution.
4. Gap graded.
5. Uniformly graded.
6. Well graded

References:

Text books:

1. M. L. Gambhir: Concrete Manual:DhanpatRai& sons New – Delhi, ISBN-135551234001965.
2. Bansal R. K., RakeshRanjanBeohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering
Mechanics, third edition, 2015, Laxmi Publications, ISBN: 9789380856674
3. Ramamrutham.S, Engineering Mechanics, DhanpatRai Books, 2013,ISBN: 9789352164271.
4. Soil Mechanics and foundation Engineering by B C Punmia, Ashok kumarjain, Arunkumarjain, 18th
edition, 2023, Laxmi Publications New Delhi.

Manuals:

1. Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–sixth Edition,2008, Wiley publication. 2. Rattan S.S., Strength of Materials, Third edition, 2017, McGraw Hill Education; New Delhi. ISBN 13978-9385965517. 3. Bansal R K, Strength of Materials, Laxmi Publications. 2023, 4th Edition, ISBN:978-8131808146. 4. IS 4031 (Part 11):1988 – Specific gravity test for hydraulic cement. 5. IS 383:1970 – Specification for coarse and fine aggregates from natural sources for concrete. 6. IS 2386(Part 3):1963 Methods of test for aggregates for concrete: Part 3 Specific gravity, density, voids, absorption and bulking. 7. IS 2720 (Part 3/Sec 1):1980 – Determination of specific gravity of soil.

Web links and Video Lectures (e-Resources):

1. https://www.nptel.ac.in/courses/122104015/
2. https://nptel.ac.in/courses/112103109/
3. http://vlab.co.in/

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1:Analyse coplanar force systems by analytical and graphical methods and verifying Lami's theorem.

CO2:Compute support reactions in simply supported beams experimentally and analytically.

CO3:Identify and understand the properties of various construction materials.

Assessment Details (CIE & SEE)

1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100.
2. Both PART-A and PART-B are considered for CIE and SEE.
3. Students have answer 1(one) question from PART-A and 1(one) question from PART-B.

a. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for 70 marks out of the maximum 100 marks.

b. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for 30 marks.

4. For continuous internal evaluation, during the semester, classwork, the typical open-ended questions shall be from PART-B, and any other similar questions to enhance the skill of the students

Rubrics for Evaluation

Nature of Assessment		Conducted	Total	Reduced	Minimum
Continuous Internal Evaluation					
Weekly Evaluation		30 Each	100	30	12
CCE	1 Mid Semester Test	50	100	20	08
	1 Semester End Test	50			
TOTAL CIE MARKS				**50**	**20**
Semester End Evaluation					
Semester End Examination			100	50	18
TOTAL MARKS (CIE + SEE)				**100**	**40**

PART A

Marks Matrix for Mechanics and Material Laboratory

Parameters		***Marks***
Day – to – Day Work	Conduction (A1)	10 Marks
	Record Writing (A2)	10 Marks
	Viva Voce (A3)	10 Marks
	Total A= (A1+A2+A3)	**30 Marks**

Rubrics Showing Day to Day Evaluation of Laboratory

Assessment component	***High (9-10M)***	***Medium (6-8M)***	***Average (0-5M)***
Experimentation/ Conduction (10 M)	Can select appropriate instruments and required appurtenances to perform the experiment. Conduction of experiment with excellent skills	Can select appropriate instruments and required appurtenances to perform the experiment. Conduction of experiment with good skills	Needs some guidance in selecting appropriate equipment and appurtenances Conduction of experiment with moderate skills
Record Writing (10M)	All section well formatted, very well written and readable. Excellent recording of data obtained and accurate calculation.	Sections in order, improper formatting but readable. Neat /moderate recording of data but average accuracy obtained in the calculations.	Section out of order, sloppy formatting. Neat/Moderate recording of data with errors in calculations.
Viva-Voce (10M)	Student is highly knowledgeable,communicative and has analytical attitude	Student is knowledgeable and communicative	Student knowledge levels need to be improved

PART B

Marks Matrix for Mechanics and Material Laboratory

Parameters		***Marks***
1 Mid Semester and 1 Semester End Lab Internal Examination	Procedure Writing (B1)	20 Marks
	Conduction (B2)	20 Marks
	Viva Voce (B3)	10 Marks
	Total B = (B1+B2+B3)	50 Marks Each
2 Lab Internal *Examination*100 marks is reduced to 20 marks		
Grand Total (A+B) (30+20)		**50 Marks**

Rubrics Showing Internal Evaluation of Laboratory

Assessment component	***Excellent (18-20 M) for 20M (8-10M)for 10M***	***Good (14-16M)for 20M (7-8 M)for 10M***	***Average (10-12M)for 20M (5-6 M)for 10M***
Procedure (20M)	Neatly written without any deviations	Neatly/Moderately written with low deviations	Neatly/Moderately written with missing major steps.
Conduction (20M)	Can select appropriate instruments and required appurtenances to perform the experiment. Conduction of experiment with excellent skills	Can select appropriate instruments/equipment to perform the experiment. Conduction of experiment with good skills	Needs some guidance in selecting appropriate equipment and appurtenances Conduction of experiment with moderate skills
Viva-Voce (10M)	Student is highly knowledgeable, communicative and has analytical attitude	Student is knowledgeable and communicative	Student knowledge levels need to be improved

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF MECHANICAL ENGINEERING

Course Name: **ELEMENTS OF MECHANICAL ENGINEERING Lab** | Semester: 1st /2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26MELM106/206	0	0	30	30	-	30	1

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	3 hrs	3 hrs	Practical

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Perform basic machining operations such as facing, turning, step turning and knurling using a lathe machine following standard workshop practices.

CLO2: Prepare welded joints and fabricate simple components using suitable joining techniques such as arc welding and soldering.

CLO3: Use and calibrate measuring instruments such as vernier caliper, micrometer, slip gauges and sine bar for dimensional and angular measurements.

CLO4: Determine material and fuel properties such as hardness, flash point, fire point and viscosity using appropriate experimental methods.

CLO5: Analyze experimental results and select suitable materials, fuels, lubricants and joining processes for given engineering applications.

PART – A CONVENTIONAL EXPERIMENTS — **Duration: 15 hrs**

1. Performing facing, plain turning and step turning, knurling operations by using a lathe.
2. Preparation of welded joints using the arc welding process.
3. Calibration of Vernier calliper and micrometer using slip gauges.
4. Determination of the angle of a specimen using a sine bar.
5. Determination of the hardness of materials using hardness testing machine.

PART – B TYPICAL OPEN-ENDED EXPERIMENTS — **Duration: 15 hrs**

1. Comparative study of flash point and fire point of various fuels / oils using the closed cup method
2. Comparative study on viscosity of different base fuels.
3. Investigation of the effect of additives on the viscosity of base fuels.
4. Selection and justification of appropriate joining techniques for given applications
5. Fabrication of a sheet metal part with simple geometry and soldering.

Text Books and References:

Text Books:

7. K R Gopala Krishna, Elements of Mechanical Engineering, Subhash Publications, 2018.
8. Textbook of Elements of Mechanical Engineering, S. Trymbaka Murthy, Medtech, 2019.

Reference:

16. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.
17. William D. Callister, Materials Science & Engineering, An Introduction, John Wiley & Sons Inc, 2010.
18. Elements of Mechanical Engineering, Kestoor Praveen, Suggi Publishing, 2019
19. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1
20. Groover M. P.(2008). Automation, production systems, and computer integrated manufacturing, 3rd ed. Prentice Hall.

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1: Perform basic machining and welding operations using appropriate workshop equipment and standard procedures.

CO2: Calibrate and use measuring instruments such as vernier caliper, micrometer and slip gauges for accurate dimensional measurement.

CO3: Determine the angle of a given specimen using a sine bar and appropriate measurement procedure.

CO4: Compare the properties of fuels and oils such as flash point, fire point and viscosity using suitable experimental methods.

CO5: Interpret the hardness of materials using an appropriate hardness testing machine.

Assessment Details - CIE & SEE

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
Weekly Evaluation	15 Marks Each	15 x Number of Experiments	30	12
1 Mid Semester Test	50	50	20	08
1 Semester End Test	50	50		
TOTAL CIE MARKS			50	20
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Rubrics for Weekly Experiment Assessment

Performance Indicator	Excellent	Good	Satisfactory	Needs Improvement	Not Demonstrated
Preparation / Awareness (5)	**5** – Thorough understanding of principle, procedure, equipment and safety	**4** – Good understanding with minor gaps	**3** – Basic understanding of experiment	**1–2** – Limited understanding	**0** – Not prepared
Execution of Experiment (5)	**5** – Performs independently and correctly with proper equipment handling	**4** – Performs correctly with minimal guidance	**3** – Performs with some guidance	**1–2** – Requires considerable guidance	**0** – Unable to perform
Viva-Voce (5)	**5** – Answers accurately with clear understanding	**4** – Answers most questions correctly	**3** – Answers basic questions	**1–2** – Limited understanding	**0** – Unable to respond

Weekly Experiment Assessment– CO, PO Mapping and Justification

Performance Indicator	CO Mapping	PO Mapping	Justification
Preparation / Awareness (5)	CO1, CO2, CO3, CO4, CO5	PO1, PO2, PO5	Preparation requires understanding engineering principles and experimental procedures (**PO1**), interpreting the requirements and principles of the experiment (**PO2**), and understanding the use of laboratory equipment and measuring/testing instruments (**PO5**).
Execution of Experiment (5)	CO1, CO2, CO3, CO4, CO5	PO1, PO2, PO5	Students apply engineering knowledge to perform experiments (**PO1**), follow procedures and interpret experimental requirements (**PO2**), and correctly operate machines, measuring instruments and testing equipment (**PO5**).
Viva-Voce (5)	CO1, CO2, CO3, CO4, CO5	PO1, PO2, PO10	Viva assesses understanding of engineering fundamentals (**PO1**), interpretation and reasoning related to experimental procedures/results (**PO2**), and the ability to clearly communicate technical understanding (**PO10**).

Common Rubric for Mid-Semester and Semester-End Tests

Sl. No.	Performance Indicator	Maximum Marks	Excellent	Good	Satisfactory	Needs Improvement
1	**Understanding and Application of Working Principles**	10	**9–10:** Demonstrates comprehensive understanding of the experiment's principles and accurately applies relevant concepts.	**7–8:** Demonstrates good understanding and applies the principles with minor errors.	**5–6:** Demonstrates basic understanding but requires some guidance in applying the principles.	**1–4:** Demonstrates limited understanding and requires substantial guidance.
2	**Independent Experimental Execution**	20	**18–20:** Independently performs the experiment systematically, follows the correct procedure, handles apparatus appropriately, and observes safety practices.	**14–17:** Performs the experiment with minimal guidance and follows the procedure with minor errors.	**10–13:** Performs the basic steps but requires occasional guidance and correction.	**1–9:** Requires frequent assistance and demonstrates difficulty following the procedure correctly.
3	**Observation, Calculation and Result Analysis**	10	**9–10:** Records accurate observations, performs calculations correctly, analyses results critically, and draws valid conclusions.	**7–8:** Records observations and performs calculations with minor errors; conclusions are generally appropriate.	**5–6:** Records basic observations but requires guidance in calculations, analysis, or drawing conclusions.	**1–4:** Records incomplete or inaccurate observations and demonstrates limited analytical ability.
4	**Viva Voce and Technical Communication**	10	**9–10:** Answers technical questions accurately and confidently, uses appropriate terminology, and communicates concepts clearly.	**7–8:** Answers most questions correctly and communicates technical concepts effectively, with minor gaps.	**5–6:** Answers basic questions but demonstrates limited clarity or technical understanding.	**1–4:** Answers very few questions correctly and struggles to communicate technical concepts.

CO, PO Mapping and Justification – Mid-Semester and Semester-End Tests

Performance Indicator	CO Mapping	PO Mapping	Justification
1. Understanding and Application of Working Principles (10 Marks)	CO1, CO2	PO1, PO2	Understanding and application of working principles require engineering knowledge of mechanical components, machines and systems (**PO1**), along with the ability to interpret experimental requirements and apply relevant principles to the given experiment (**PO2**).
2. Independent Experimental Execution (20 Marks)	CO1, CO2, CO4	PO1, PO2, PO5	Students apply engineering knowledge to perform experiments (**PO1**), follow prescribed procedures and address practical requirements during experimental execution (**PO2**), and correctly operate laboratory apparatus, measuring instruments and testing equipment (**PO5**).
3. Observation, Calculation and Result Analysis (10 Marks)	CO2, CO3	PO1, PO2, PO4	Students apply engineering fundamentals to record and calculate experimental values (**PO1**), interpret observations and analyse experimental results (**PO2**), and conduct systematic investigations through observation, data analysis and drawing conclusions (**PO4**).
4. Viva Voce and Technical Communication (10 Marks)	CO1, CO3, CO4	PO1, PO2, PO10	Viva voce assesses understanding of engineering fundamentals (**PO1**), the ability to explain experimental procedures and interpret observations and results (**PO2**), and the ability to communicate technical knowledge clearly and effectively (**PO10**).

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Name: **Fundamentals of Electronics and Communication Laboratory** | Semester: 1st /2nd

Course Code	L (H/W)	T (H/W)	P (H/W)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26FELE106/206	**00**	**00**	**02**	**30**	**00**	**30**	**01**

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	**50**	**100**	**50:50**	**3**	**3**	**Practical**

Note / Instructions:

1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 06 conventional experiments, PART-B has 06 typical open-ended experiments. The maximum marks for the laboratory course are 100.
2. Both PART-A and PART-B are considered for CIE and SEE.
3. Students have answer 1(one) question from PART-A and 1(one) question from PART-B.
   a. The questions set for SEE shall be from among the experiments under PART-A. It shall be evaluated for 50 marks.
   b. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for 50 marks.

For continuous internal evaluation, during the semester, the typical open-ended questions shall be from PART-B, and any other similar questions to enhance the skill of the students.

Course Learning Objectives (CLOs)

CLO	Course Learning Objectives	Experiments
CLO1	**Implement and analyze fundamental digital and electronic circuits** using logic gates, adders, rectifiers, BJT and MOSFET characteristics.	Part A – 1 to 6
CLO2	**Design, test and evaluate analog electronic circuits** using Op-Amps and Zener diodes based on gain, waveform, regulation and other performance parameters.	Part B – 1 to 4
CLO3	**Generate and analyze analog and digital modulation waveforms** and evaluate their time-domain and frequency-domain characteristics using appropriate parameters.	Part B – 5, 6

PART A (Conventional Experiments / Programs)

1. Study of Truth Tables for OR, AND, NOT, NAND, and NOR Gates. Implement basics gate using universal Gates.
2. Realization of Half and Full Adder using Logic Gates.
3. Design and Testing of Half-Wave and Full-Wave Rectifiers With and Without Filter for Determining Ripple Factor, Voltage Regulation, and Efficiency.
4. Design and Testing of Bridge Rectifier With and Without Filter for determining Ripple Factor, Voltage Regulation, and Efficiency.
5. Analysis of Input and Output Characteristics of a Bipolar Junction Transistor in Common Emitter Configuration.
6. Study CMOS inverter characteristics: Voltage transfer behaviour and noise margins.

PART B (Open Ended Experiments / Programs)

1. Design and Testing of Op-Amp as voltage follower and a weighted summer with waveform analysis.
2. Design and Testing of a Zener Diode Voltage Regulator for Determination of Line Regulation and Load Regulation
3. Investigation of Op-Amp in Inverting and Non-Inverting Modes with Gain Measurement.
4. Design and Testing of Integrator and Differentiator Circuits using Op-Amp with Waveform Analysis.
5. Simulation of AM, FM, and PM Waveforms (Demonstration only).
6. Simulation of ASK, FSK, and PSK Waveforms (Demonstration only).

References:

Text Books:

1. M. Morris Mano and Michael D.Ciletti, Digital Design - With an Introduction to the Verilog HDL, VHDL and System Verilog 6th Edition, Pearson Education Inc, 2024.
2. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", 11th Edition, PHI, 2016.
3. D.P Kothari and I J Nagrath, Basic electronics, Second Edition, McGraw Hill Education Pvt ltd, 2018.
4. David A Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 30th Impression, 2025.
5. Ramakanth A Gayakwad, Op-amps and Linear Integrated Circuits, 4th Edition, Pearson Education, 2015.
6. John G. Proakis, Masoud Saleh, Fundamentals of Communication Systems, Second Edition, Pearson Educations, Inc., 2014.

Manuals:

1. Fundamental of Electronics and Communication Systems prepared by Dr. Rajashekar Kunabeva and Dr. OM Prakash Yadav, 2026-27.
2. Fundamental of Electronics and Communication Systems by Dr. NarayanaSwamy G, 2025-26.

Weblink / E-Resources:

1. Digital Electronic Circuits: https://nptel.ac.in/courses/108105132
2. Introduction to Basic Electronics: https://nptel.ac.in/courses/122106025

Expected Course Outcomes(CO):

After successfully completing the course, the student will be able to:

CO1: **Implement and verify** basic digital and arithmetic circuits using logic gates.

CO2: **Design and Analyse** basic electronic circuits using diodes, transistors, MOSFETs and OP-AMPS.

CO3: **Generate and Analyse** analog and digital modulation schemes waveforms using suitable techniques.

Assessment Details (CIE & SEE)

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).

The CIE marks awarded shall be based on the weekly evaluation (**WE**) using a defined set of rubrics (Conduction, Record Writing, Viva-Voce). Each experiment will be evaluated for 30 marks. Two laboratory tests (**LT**) will be conducted and evaluated for total of 20 marks. Test-1 for Part –A in the middle of the semester for 10 marks and Test-2 for Part-B at the end of the semester after the completion of all the experiments (whichever is early) shall be conducted for 10 marks. For both CIE and SEE, the student is required to conduct one experiment each from both Part A and Part B.

- To qualify and become eligible to appear for SEE, in the **CIE component**, a student must secure **a minimum of 40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE component**, a student must secure **a minimum of 35% of 50 marks**, i.e., 18 **marks**.

A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks**.

Rubrics for Weekly Evaluation (WE).
Each experiment is evaluated on continuous basis for 15 marks.

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
Weekly Evaluation	15 Marks Each	15 × Number of Experiments	30	12
1 Mid Semester Test	50	50	20	08
1 Semester End Test	50	50	20	08
TOTAL CIE MARKS			50	20
Semester End Evaluation				
Semester End Examination		100	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Part A – Conventional Experiments: Rubric

Assessment Criterion	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (0–2)
1. Conduction of Experiment	Demonstrates complete understanding of objective, circuit design, component selection and connections; performs the experiment systematically and independently.	Understands objective and circuit; selects components and performs connections with minor assistance / errors.	Performs the prescribed procedure with some assistance and minor errors.	Has limited understanding and requires significant assistance; major errors in procedure/connections .
2. Record Writing & Results	Accurately presents circuit diagrams, observations, calculations, graphs/waveforms and compares results with theoretical values.	Record is substantially complete with minor errors in calculations, diagrams or graphs.	Record contains essential observations and calculations but has some omissions/errors.	Record is incomplete with significant errors in observations, calculations, diagrams or graphs.
3. Viva-Voce	Clearly explains principles, circuit operation, formulae, observations, results and practical applications.	Explains most concepts and practical applications with minor gaps.	Demonstrates basic understanding of the experiment and related concepts.	Unable to adequately explain fundamental concepts or practical applications.

Part B – Open-Ended Experiments / Programs: Rubric

Assessment Criterion	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (0–2)
1. Design & Implementation	Independently understands the problem, develops an appropriate circuit/program, selects suitable parameters and implements it correctly.	Develops and implements an appropriate solution with minor assistance or errors.	Implements the basic solution with guidance and requires some corrections.	Has difficulty developing/implementing the solution and requires substantial assistance.
2. Analysis, Record & Results	Accurately documents design, code/circuit, parameters, calculations, waveforms/graphs and critically compares results with theory.	Documentation and analysis are substantially correct with minor errors or omissions.	Presents basic results and analysis but with limited interpretation or some errors.	Documentation is incomplete and results/analysis contain significant errors.
3. Viva-Voce & Interpretation	Clearly explains design choices, working principle, code/circuit, parameters, waveforms, results and practical applications; demonstrates independent understanding.	Explains most concepts, design decisions and results with minor gaps.	Demonstrates basic understanding and explains major results with assistance.	Has limited understanding of the design, code/circuit, results or applications.

Rubrics for Lab IA Test.

Assessment Criterion	Excellent (9-10)	Good (6-8)	Satisfactory(3-5)	Needs Improvement (1-2)
1. Understanding of Objective & Principle	Clearly explains objective, principle, circuit/program and relevant concepts independently.	Explains objective and principle with minor gaps.	Demonstrates basic understanding with some assistance.	Limited understanding of objective/principle.
2. Circuit Design / Program Implementation	Correctly designs and implements circuit/program independently; appropriate components/parameters are selected.	Implementation is substantially correct with minor errors or assistance.	Implements basic solution with guidance and requires corrections.	Unable to implement correctly without significant assistance.
3. Experimental Procedure / Execution	Performs experiment systematically, safely and independently; follows appropriate procedure.	Performs experiment correctly with minor procedural errors.	Completes experiment with some assistance.	Requires substantial assistance and makes major procedural errors.
4. Observation, Analysis & Results	Records accurate observations; performs calculations; obtains correct results and critically interprets waveforms/graphs.	Results and analysis are substantially correct with minor errors.	Basic observations/results are obtained but analysis is limited.	Incomplete/incorrect observations, calculations or results.
5. Viva-Voce / Interpretation	Answers confidently and explains formulae, parameters, results and practical applications.	Answers most questions correctly with minor gaps.	Answers basic questions but requires prompting.	Unable to explain fundamental concepts/results.

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

Department of Electrical & Electronics Engineering

Course Name: Basic Electrical Lab | Semester: 1st / 2nd

Course Code	L (H/W)	T (H/W)	P (H/W)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26BEEL106/206	0	0	2	30	0	30	1
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
50	50	100	50:50		3 Hr	3 Hr	Practical

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Verify Ohm's law and Kirchhoff's laws experimentally.

CLO2: Measure resistance, impedance, power and power factor in electrical circuits.

CLO3: Analyze single-phase and three-phase AC circuits using electrical measuring instruments.

CLO4: Understand fuses, earthing, wiring, and electrical safety.

CLO5: Perform fault detection and troubleshooting in simple circuits.

CONVENTIONAL EXPERIMENTS	**PART A**	**Duration:15 Hr**

(1) Verification of Ohm's law and Kirchhoff's laws.

(2) Measurement of low range resistance using voltmeter-ammeter method.

(3) Verification of fuse characteristics.

(4) Measurement of resistance, inductance, impedance, power and power factor using voltmeter, ammeter and wattmeter in single-phase AC circuits.

(5) Measurement of three-phase power of an inductive load by 2-wattmeter method, when the load is (a) star connected and (b) delta connected. Calculation of resistance, reactance, impedance and power factor.

(6) Wiring an appropriate electric circuit, understanding the basic principle used for 2-way and 3-way control of load.

TYPICAL OPEN-ENDED EXPERIMENTS	**PART B**	**Duration:15 Hr**

(1) Measurement of earth's resistance by 3-electrode method.

(2) Trouble shooting experiments in simple DC circuits. The trouble may be due to loose connection, faulty component leading to open circuits or short circuits. Detection of fault and the reasons for that and conclusion.

(3) Measurement of voltage between line and neutral, ground and line, ground and neutral in respect of healthy and unhealthy 3-pin socket. Conclusions arrived for the faulty wiring. Allowable ground voltage. Identification of positive and negative terminals of DC supply

(4) A 12 V battery is available. It is required to obtain 3 V from the battery to charge a mobile. Create a circuit to obtain the required voltage. Specify all the ratings of the components used.

(5) Only three ammeters and standard resistance are available in the laboratory. Using the same measure the single phase power consumed by an inductive load.

(6) Only three voltmeters and standard resistance are available in the laboratory. Using the same measure the single phase power consumed by an inductive load.

References:	1. Manual prepared for the conventional experiments by EEE Department.

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1:Conduct standard electrical experiments to verify theoretical principles.

CO2: Measure key electrical parameters such as resistance, inductance, impedance, power, and power factor with standard methods.

CO3: Design and perform experiments to solve practical open-ended electrical problems

CO4: Analyse experimental data from non-routine method to arrive at a solution.

Assessment Details (CIE & SEE): The assessment of the practical course is for a maximum of 100 marks. Both CIE and SEE are evaluated for 50 marks each.

(a)CIE Assessment

(i)The CIE marks of 25 shall be based on the work carried out during the laboratory hours. The components considered for assessment of marks shall be based on the experiment conducted under both PART-A and PART-B and the laboratory record.

(ii)The rest 25 marks shall be for the test conducted under PART-A and PART-B.

(iii)The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early), shall be conducted for both PART-A and PART-B.

(iv)PART-A shall be evaluated for a maximum of 15 marks and PART-B for a maximum of 10 marks. Each student has to conduct the PART-A experiment individually. The time allotted for this is 1.5 hours. The question under PART-B may be attempted by an individual or a group of students. The time allotted for this is 1.5 hours.

(v)The evaluation process shall as per University notification.

(b)SEE Assessment

The maximum SEE mark for the final examination is 100 marks. While PART-A carries a maximum of 70 marks, PART-B carries a maximum of 30 marks. The sum total of PART-A and PART-B should be scaled down to 50 marks.

Passing Standard

(i)To become eligible to appear for SEE, the marks secured by a student in CIE must be a minimum of 40 % of 50 marks, i.e., 20 marks.

(ii)For a pass in SEE, the marks secured by a student must be a minimum of 35 % of 50 marks, i.e., 18 marks.

(iii) A student is deemed to have successfully completed the course if the sum total of CIE and SEE is at least 40 out of 100 marks.

Rubrics for Practical assessment

Performance Indicator	Excellent (5)	Very Good (4)	Good (3)	Needs Improvement (1-2)
Fundamental Knowledge (5) (PO1)	The student has an in depth knowledge of the topics related to the course.	Student has ample knowledge of the topics related to course.	Student has good amount of knowledge but not in detail.	Student has some knowledge.
Design of Experiment (5) (PO2 & PO3)	Student can conceive more than one design for the problem statement and capable of proving the best suitable design.	Student is capable of discussing few designs for the problem statement but not certain about its suitability.(	Student is capable of discussing one of the designs and explain completely	Student is not capable of completing the design to its logical end.
Implementation (5) (PO3 & PO8)	Student is capable of implementing the design with ease to obtain optimal solution.	Student is capable of implementing the design successfully, along with a solution and explanation	Student is capable of implementing the design with a solution and average explanation	student is capable of implementing the design, but unable to justify the result
Result & analysis (5) (PO4)	Student is able to get the expected results with justifications	Student is able to get the expected results and able to justify only partially	Student is able to get the expected results and unable to justify	Student is able to get the expected results but unable to justify
Demonstration (5) (PO9)	The lab record is well organized, with clear sections (e.g., introduction, Theory, Method, Results, Conclusions	The lab record is organized, with clear sections, but some sections are not well-defined	The lab record lacks clear organization or structure. Some sections are unclear or incomplete	The lab record is poorly organized with missing or unclear sections.

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PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF HUMANITIES

Course Name: Communication Skills | Semester: 1st /2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26ENGX107/207	15	0	0	15	15	30	01

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1 Hour	2 Hours	OMR

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Develop effective communication and interpersonal skills to express ideas clearly, listen actively, and communicate confidently in professional and social contexts.

CLO2: Enhance emotional intelligence and self-awareness by recognizing, managing, and responding appropriately to emotions, stress, and interpersonal situations.

CLO3: Set personal and professional goals effectively using SMART goal-setting techniques and develop creativity, empathy, adaptability, and a growth-oriented mindset.

CLO4: Apply systematic problem-solving and time-management strategies to identify challenges, analyse alternatives, prioritize tasks, and make effective decisions.

CLO5: Demonstrate teamwork, negotiation, conflict-resolution, and critical-thinking skills to collaborate effectively and make responsible, well-reasoned decisions in academic and professional environments.

Module 1	**COMMUNICATION SKILLS**	**Duration: 3 Hours**

Glimpses of Essential English for Engineers (General Overview). Communication Skills: Process, Verbal and Non-Verbal, Proxemics, Chronemics and Barriers. **Writing**: Word Classification – Parts of Speech, Sentence structures. **Speaking & Listening:** Listening to English Pronunciation – English Phonemes – Intelligible Accent – Speech Organs-Syllable Structures, Stress, Intonation, and Practice.

Reading Material	"The Chimney Sweeper" by William Blake Martin Luther King Jr's "I Have a Dream" Speech
Assessment Techniques and Tools	Role Play: Formal/informal scenarios, Group Discussion (GD), Case Studies Analysis: Identify barriers and suggest solutions, Mini-Presentation: Focused on proxemics.

Module 2	**INTERPERSONAL SKILLS**	**Duration: 3 Hours**

Speaking: Role Play Exercises Based on Workplace Contexts, Introducing Oneself - PEP Talks- Personal Empowerment, Participating in Group Discussion and Debates, Giving Technical Presentation. **Reading:** Reading the Interview of an Achiever (Skimming and Scanning) (Case Studies). **Writing:** Writing a Short Biography of an Achiever Based on given reflections, **Grammar:** Sentence patterns. **Vocabulary** Development: Idioms and Phrases.

Assessment Techniques and Tools	Group discussion performance (listening, turn-taking, clarity) Technical presentations (confidence, structure, clarity) Role plays (relevance, tone, spontaneity) Case Studies Oral communication rubric (clarity, relevance, tone, confidence, non-verbal cues), Activity: Read a short interview of an achiever (e.g., A. P. J. Abdul Kalam, Sudha Murthy) LMS (Learning Management Systems): Moodle or Google Classroom for submissions and reflections. Video Submissions: Students submit videos of role plays or presentations for asynchronous review.

Module 3	**ENGLISH FOR EMPLOYABILTY**	**Duration: 3 Hours**
Writing: Formal Letter writing (Enquiry, Order, and Complaint). Tenses – Reported Speech-Voice - Email Etiquettes, Structure, Writing and Responding to Emails. Paragraph Writing (Descriptive, Argumentative, Expository, Short Story, and Narrative), Blog Writing. **Reading**: Proof Reading (Spelling, Punctuation, Grammar). Error Identification Exercises. **Speaking:** Questions & Requests (non-Wh questions and Question tags).		
Assessment Techniques and Tools	Paragraph Writing - Descriptive, Argumentative, Expository, Short Story, Narrative - Paragraph rubric (structure, logic, vocabulary, grammar)	
Module 4	**ENGLISH IN DIGITAL WORLD**	**Duration: 3 Hours**
Writing: Framing of search terms / keywords in search engines/ Commands for search on open AIs - Tools to support synchronous communication such as webinar platforms, and asynchronous communication such as forums and social media - Online communication - Types – pros and cons of online communication. Acceptable online roles and behaviours – Netiquettes - Etiquettes of social media. Problems and opportunities in handling digital resources -Tools to check grammar. **Writing:** Citing information accurately from source material - Plagiarism – Infringement, Importance of academic integrity.		
Assessment Techniques and Tools	Write a short essay (150–200 words) on the problems and opportunities. Evaluation rubric (structure, coherence, grammar). Grammar assessment rubric (before vs after comparison, understanding of corrections).	
Module 5	**APPLYING FOR JOBS**	**Duration: 3 Hours**
Listening: TED Talks. **Speaking:** Mock Interview, Telephone Interviews. **Reading:** Reading a Job Interview- language used in formal professional settings, formal vs. informal tone, non-verbal communication cues, Statement of Purpose, Company Profile and Completing Comprehension Exercises **Writing:** Job Applications and Resumes **Grammar:** Conditional Clauses, Modal verbs **Vocabulary Development:** Technical Vocabulary, Purpose Statement.		
Assessment Techniques and Tools	TED Talk worksheet - Listening rubric (comprehension, inference, note-taking), Reading comprehension tests, Resume & Application rubric (content, layout, tone, language), Grammar	
References:	1. Kumar, A. R. (2008). English for engineers and technologists. Orient Black Swan. 2. Raman, M., & Sharma, S. (2015). Technical communication: Principles and practice (3rd ed.). Oxford University Press. 3. Floyd, K., & Cardon, P. W. (2019). Business and professional communication (3rd ed.). Principles of Scientific and Technical Writing, 1e, By Pratap K. J. Mohapatra, Sanjib Moulick, © 2025 | Published: December 23, 2024 4. Effective Technical Communication, 3e, By Ashraf M. Rizvi, Priyadarshi Patnaik, © 2024 | Published: September 12, 2024 5. Yadav, D. P. (2022). A course in English pronunciation. Notion Publications.	

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1: Build essential verbal, non-verbal, and phonetic communication skills for clarity and effectiveness.

CO2: Use interpersonal skills in group discussions, presentations, and professional interactions.

CO3: Apply formal writing, email etiquette, and creative content development for employability.

CO4: Communicate effectively in digital platforms, following netiquette and academic integrity.

CO5: Prepare job applications, resumes, and perform confidently in interviews.

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	25 Each	50	25	10
ABL 1	50	50	10	10
ABL 2	50	50	15	
TOTAL CIE MARKS			**50**	**20**
Semester End Evaluation				
Semester End Examination		50	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

TW & SL Details (Duration & Rubrics for Evaluation)

Component	Activity & Student Submission	Performance Indicator and Marks Distribution	
ABL (TW & SL)	Role plays, Group Discussions, Presentations, Creative writing, Email writing, Case studies, and Interview-based activities	Communication & Clarity	10
		Content & Relevance	10
		Language accuracy	10
		Participation & Confidence	10
		Creativity & Presentation	10
		TOTAL	**50**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF HUMANITIES

Course Name: Indian Constitution & Engineering Ethics | Semester: 1st / 2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26ICEX108/208	15	0	0	15	15	15	00

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
100	00	100	100:00	1 hour	NA	NA

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Explain the necessity, making, basic structure, Preamble, and salient features of the Indian Constitution.

CLO2: Analyse the Fundamental Rights, Directive Principles of State Policy, and Fundamental Duties, and explain their relevance in society and nation-building.

CLO3: Examine the structure and functions of the Union Executive, Parliament, Parliamentary Committees, and the Supreme Court of India.

CLO4: Analyse the State Executive, electoral process, constitutional amendments, and emergency provisions in India.

CLO5: Demonstrate an understanding of engineering ethics, professional responsibility, integrity, reliability, risk, safety, and liability.

Module 1	**Introduction to Indian Constitution**	**Duration:03 Hours**

The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.

Module 2	**FR's, FD's and DPSP's**	**Duration:03 Hours**

Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.

Module 3	**Union Executive**	**Duration:03 Hours**

Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.

Module 4	**State Executive & Elections, Amendments and Emergency Provisions**	**Duration:03 Hours**

State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions.

Module 5	**Professional Ethics**	**Duration:03 Hours**

Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.

References:

Textbook:

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022.
2. "Engineering Ethics", M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice Hall, 2004.

Reference Books:

3. "Samvidhana Odu" - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.

4. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
5. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu): Prentice –Hall, 2008.
6. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1: Analyse the basic structure of Indian Constitution.

CO2: Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.

CO3: know about our Union Government, political structure & codes, procedures.

CO4: Understand our State Executive & Elections system of India.

CO5: Remember the Amendments and Emergency Provisions, other important provisions given by the constitution

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	25 Each	50	50	20
ABL 1	50	50	20	20
ABL 2	50	50	25	
TOTAL CIE MARKS			**100**	**40**

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF HUMANITIES

Course Name: Soft Skills						Semester: 1st / 2nd	
Course Code	L (H/S)	T (H/W)	P (H/W)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26SSX109/209	15	0	0	15	-	15	0
CIE Marks	SEE Marks	Total Marks	CIE: SEE		CIE Duration	SEE Duration	SEE Type
100	0	100	100:0		1 Hour	NA	NA

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: Apply social skills for clear communication, self-awareness, and active listening.
CLO2: Use emotional skills to build confidence, manage time & stress, and adapt to change.
CLO3: Set ambitious goals, practice empathy, and apply creativity for problem-solving.
CLO4: Demonstrate discipline, structured problem-solving and professional workplace etiquette.
CLO5: Work in teams, negotiate, resolve conflicts, and think critically.

Module 1	**Social Skills**	**Duration:3 hours**

Communication: Principles of clear and effective exchange of ideas in professional and social contexts.
Self-Awareness: Identifying personal strengths, weaknesses, opportunities, and challenges (SWOC analysis).
Active Listening: Paraphrasing, questioning techniques, and demonstrating attentiveness.

Module 2	**Emotional Skills - I**	**Duration: 3 hours**

Emotional Intelligence (EI): Recognizing and managing emotions, empathy, relationship management, and conflict resolution.
Stress Management: Identifying stress triggers, relaxation techniques, work-life balance strategies, and mindfulness practices.
Time Management: Prioritization (Eisenhower Matrix), setting SMART goals, avoiding procrastination, and effective scheduling.
Adaptability & Resilience: Handling change, bouncing back from setbacks, and developing a growth mindset.

Module 3	**Emotional Skills - II**	**Duration: 3 hours**

Ambition & Goal Setting: Defining personal and professional aspirations, creating SMART goals, and aligning actions with long-term vision.
Sympathy & Empathy: Understanding emotional perspectives, differentiating between the two, and applying them in workplace and social interactions.
Creativity & Innovation: Generating original ideas, problem-solving, and applying creative thinking techniques (mind-mapping, SCAMPER).

Module 4	**Professional Skills - I**	**Duration: 3 hours**

Problem Solving: Identifying root causes, analysing options, and implementing solutions using methods like 5 Whys and Fishbone Diagram.
Discipline: Building consistency, accountability, and professional habits.
Workplace Behaviour and Etiquette: Professional conduct, workplace norms, interpersonal behaviour, professional appearance, communication etiquette, and appropriate workplace interactions.

Module 5	**Professional Skills - II**	**Duration: 3 hours**

Case Analysis, Etiquette & Legal Aspects .Interpret and apply the case method for managerial learning and decision-making. Analyse business cases using structured approaches and frameworks. Best practices and challenges in case preparation and presentation. Role and advantages of etiquette in managerial communication. Legal aspects such as invasion of privacy, misrepresentation, and fraud in communication.

References:	1. Principles of Scientific and Technical Writing, 1e, By Pratap K. J. Mohapatra, Sanjib Moulick, © 2025 | Published: December 23, 2024 2. Soft Skills, 1e, By Soma Mahesh Kumar © 2024 | Published: June 8, 2023 3. Effective Technical Communication, 3e, By Ashraf M. Rizvi, Priyadarshi Patnaik, © 2024 | Published: September 12, 2024 4. Yadav, D. P. (2022). A course in English pronunciation. Notion Publications. **Learning Resources:** 5. Oxford Advance Learners Dictionary 6. Cambridge English Skills Real Listening and Speaking by Miles Craven 7. Communicative English for Professionals by Nitin Bhatnagar and Mamta Bhatnagar

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1: Demonstrate effective communication, active listening, and self-awareness in interpersonal and professional interactions.

CO2: Apply emotional and self-management strategies to build confidence, manage time and stress, and respond effectively to change.

CO3: Apply goal-setting, empathy, and creative thinking techniques to address personal, academic, and professional challenges.

CO4: Demonstrate discipline, structured problem-solving, and appropriate workplace behaviour and etiquette in professional situations.

CO5: Demonstrate effective teamwork, negotiation, conflict resolution, and critical thinking in collaborative situations.

Assessment Details (CIE & SEE)

Formative: Role-plays, activities, group discussions, peer feedback.

Summative: Presentations, written reflections, problem-solving exercises.

CO1 – Role-Play & Oral Presentation (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Clarity &Articulation	Speaks fluently, precise pronunciation	Minor lapses	Frequent lapses	Hesitant, unclear	7
Non-Verbal Communication	Confident posture, gestures, eye contact	Mostly confident	Minimal use	Poor body language	7
Active Listening	Accurately paraphrases, responds appropriately	Mostly accurate	Limited paraphrasing	Ignores cues	6

CO2 – Stress Management & Reflection Journal (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Understanding of EI Concepts	Deep insight + examples	Good understanding	Basic understanding	Misunderstands	6
Application in Activity	Fully applies techniques	Mostly effective	Few techniques	No application	6
Reflection Quality	Highly personal, analytical	Some insights	Descriptive only	No reflection	4
Structure & Clarity	Well-organized	Mostly clear	Some disorganization	Poorly structured	4

CO3 – Goal-Setting & Creativity Project (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
SMART Goal Setting	All SMART criteria, inspiring	Most criteria	Some criteria	Vague	6
Creativity & Originality	Highly original	Some originality	Limited	None	6
Presentation & Visuals	Engaging, clear, strong visuals	Clear visuals	Basic visuals	Poor/no visuals	4
Feasibility & Relevance	Practical, relevant	Mostly practical	Partially relevant	Irrelevant	4

CO4 – Problem-Solving Exercise and etiquette simulation (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Problem Analysis	Identifies all root causes	Most causes	Few causes	No clear causes	4
Application of Tools	Fully accurate	Mostly accurate	Partial	Incorrect	4
Solution Quality	Highly logical, feasible	Mostly logical	Some gaps	Illogical	4
Structure & Clarity	Clear flow	Mostly clear	Some unclear parts	Disorganized	4
Workplace Behaviour & Etiquette	Demonstrates highly professional, respectful and appropriate behaviour throughout the simulation	Demonstrates appropriate professional behaviour with minor lapses	Demonstrates basic workplace etiquette but needs occasional guidance	Displays inappropriate or unprofessional behaviour and requires significant improvement	4

CO5 – Debate/Negotiation Simulation (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Team Collaboration	Fully cooperative	Mostly cooperative	Limited	Uncooperative	4
Argument Quality	Strong evidence-based reasoning	Mostly sound	Weak reasoning	No reasoning	6
Conflict Resolution	Balanced, win–win focus	Mostly balanced	Minimal attempt	Aggressive/avoidant	4
Critical Thinking	Insightful, anticipates counterpoints	Thoughtful	Limited depth	None	6

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF HUMANITIES

Course Name: ಬಳಕೆ ಕನ್ನಡ | Semester: 1st /2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26KANX108/208	15	0	0	15	15	30	01

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	50	100	50:50	1 Hour	2 Hours	OMR

Course Learning Objectives:

The purpose of the course is to facilitate the learners to;

CLO1: To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.

CLO2: To enable learners to Listen and understand the Kannada language properly.

CLO3: To speak, read and write Kannada language as per requirement.

CLO4: To train the learners for correct and polite conservation.

CLO5: To know about Karnataka state and its language, literature and General information about this state.

Module 1 — Duration: 3 Hours

1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language.
2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities, Key to Transcription
3. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - Personal Pronouns, Possessive Forms, Interrogative words

Module 2 — Duration: 3 Hours

1. **ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - Possessive forms of nouns, dubitive question and Relative nouns**
2. **ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, Quantitative and Colour Adjectives, Numerals**
3. **ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು –ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ – (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ) –Predictive Forms, Locative Case**

Module 3 — Duration: 3 Hours

1. **ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು - Dative Cases, and Numerals**
2. **ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು -Ordinal numerals and Plural markers**
3. **ನ್ಯೂನ/ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು & ವರ್ಣ ಗುಣವಾಚಕಗಳು —Defective/Negative Verbs & Colour Adjectives**

Module 4 — Duration: 3 Hours

1. **ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತು ಒತ್ತಾಯ ಆರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು Permission, Commands, encouraging and Urging words (Imperative words and sentences)**
2. **ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು Accusative Cases and Potential Forms used in General Communication**
3. **"ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು -** Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs
4. **ಹೋಲಿಕೆ (ತರತಮ) , ಸಂಬಂಧ ಸೂಚಕ, ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ-** Comparitive, Relationship, Identification and Negation Words

Module 5	**Duration: 3 Hours**

1. **ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು -**Different types of Tense, Time and Verbs
2. **ದ್, -ತ್, - ತು, - ಇತು, - ಆಗಿ, - ಅಲ್ಲ, - ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ -** Formation of Past, Future and Present Tense Sentences with Verb Forms
3. **Kannada Vocabulary List :ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು -Kannada Words in Conversation**

References:

ಬಳಕೆ ಕನ್ನಡ
ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ
ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ,
ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

ವಿಶೇಷ ಸೂಚನೆ : 1. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮಕ್ಕೆ ಸೀಮಿತವಾಗಿ ಅಂತಿಮ ಪರೀಕ್ಷೆಯ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ ಇರುತ್ತದೆ.
2. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮವನ್ನು ಹೊರತುಪಡಿಸಿದ ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದಲ್ಲಿನ ಉಳಿದ ಭಾಗಳನ್ನು ಹೆಚ್ಚುವರಿ ಪೂರಕ ಓದಿಗಾಗಿ ಬಳಸಿಕೊಳ್ಳಬಹುದು. ಅಂತಿಮ ಪರೀಕ್ಷೆಯಲ್ಲಿ ಈ ಪಾಠಗಳಿಂದ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುವುದಿಲ್ಲ.

Expected Course Outcomes:

After successfully completing the course, the student will be able to;

CO1: Understand the necessity of learning of local language for comfortable life

CO2: Speak, read and write Kannada language as per requirement

CO3: Communicate (converse) in Kannada language in their daily life with Kannada speakers

CO4: Listen and understand the Kannada language properly

CO5: Speak in polite conservation

Assessment Details (CIE & SEE)

Nature of Assessment	Conducted for (Marks)	Total Marks	Reduced to (Marks)	Minimum Marks
Continuous Internal Evaluation				
2 Internal Assessment	25 Each	50	25	10
ABL 1	50	50	10	10
ABL 2	50	50	15	
TOTAL CIE MARKS			**50**	**20**
Semester End Evaluation				
Semester End Examination		50	50	18
TOTAL MARKS (CIE + SEE)			**100**	**40**

Skill Lab

PES INSTITUTE OF TECHNOLOGY & MANAGEMENT

NH-206, SAGAR ROAD, SHIVAMOGGA - 577204

DEPARTMENT OF CIVIL ENGINEERING

Course Name: Skill Lab | Semester: 1st / 2nd

Course Code	L (H/S)	T (H/S)	P (H/S)	Contact Hours	TW & SL (H/S)	TH / S	Credits
26SKLX109 / 209	0	0	30	30	0	30	1

CIE Marks	SEE Marks	Total Marks	CIE: SEE	CIE Duration	SEE Duration	SEE Type
50	0	50	50:0	1 Hour	-	Practical

Module 1	**Email Etiquette**	Duration: 2 Hours

What is a Professional Email? Parts of an Email, Subject Line & Greeting, Email Body Structure, CC, BCC & Reply All, Attachments & File Naming, Professional Language

Module 2	**MS Word**	Duration: 8 Hours

Introduction to MS Word, Typing & Editing, Font Formatting, Paragraph Formatting, Practical Exercise - format a 2-page unformatted passage

Page Setup, Tables, Page Layout, Columns Practical Task

Insert Objects, Image Formatting, Headers & Footers, Styles, Hyperlinks, Practical Activity

Introduction to Report Structure, Styles & Automatic Table of Contents, References & Citations, Equations & Symbols, Final Document Formatting, Final Submission

Module 3	**MS Excel**	Duration: 8 Hours

Introduction to Excel, Data Entry, Formatting Cells, Number Formatting, Row & Column operations, Practical Exercise

Understanding Formulas, Basic Functions, Marks Calculation, IF Function, Relative & Absolute References, Practical Exercise

Sorting, Filtering, Conditional Formatting, Charts, Practical Activity

Engineering Calculations, Unit Conversion, Engineering Data Analysis, Basic Statistical Functions, Practical Exercise

Module 4	**MS PowerPoint**	Duration: 8 Hours

Introduction to PowerPoint, Creating Slides, Text Formatting, Working with Text, Slide Design Basics, Practical Exercise

Working with Images, Shapes, SmartArt, Tables, Slide Master - Basic Introduction, Practical Activity

Charts, Audio & Video, Hyperlinks & Action Buttons, Transitions, Animations, Quick Challenge

How to Structure a Technical Presentation, Technical Slide Design, Speaker Notes, Presentation Delivery Skills, Final Practical Assignment

Module 5	**Presentation Skills**	Duration: 4 Hours

What is an Effective Presentation? Structure of a Presentation, How to Start a Presentation, Voice & Speech, Body Language, Individual Practice

How to Explain Technical Topics, Explaining a Diagram, How to Use PPT While Presenting, Handling Questions, Q&A Role Play, Final Individual Presentation

Expected Course Outcomes:
After successfully completing the course, the student will be able to;
CO1: Write / Communicate professionally through e-mail
CO2: Use MS word & Excel effectively for documentations
CO3: Prepare and deliver presentations