ACHARIYA

COLLEGE OF ENGINEERING TECHNOLOGY

AN AUTONOMOUS INSTITUTION

(Approved by AICTE, New Delhi, and affiliated to Pondicherry University) Accredited by NAAC & ISO 9001:2008 Certified Institution

Pondicherry – 605010

Curriculum and Syllabus for

B. Tech. (ELECTRICAL AND ELECTRONICS ENGINEERING)

REGULATION - 2026

(Effective from Academic year 2026-27)

(Subject to the Approval of the First Academic Council meeting of Achariya College of Engineering Technology)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ACHARIYA COLLEGE OF ENGINEERING TECHNOLOGY

COLLEGE VISION & MISSION

VISION:

To be a center of excellence in technical education, producing globally competent and ethically strong engineering professionals who contribute to the development of society and nation.

MISSION:

1. Provide high-quality engineering education through state-of-the-art infrastructure.
2. Foster innovation, research, and entrepreneurship among students.
3. Maintain lifelong connection with alumni and industry partners.
4. Inculcate moral values and psychological well-being.

DEPARTMENT VISION & MISSION

VISION

To be a centre of excellence in Electrical and Electronics Engineering education, research, and innovation by producing competent engineers capable of developing sustainable and intelligent technological solutions for the benefit of society.

MISSION

1. To impart strong theoretical knowledge and practical skills in Electrical and Electronics Engineering through effective teaching-learning practices.
2. To promote innovation, research, and entrepreneurship in emerging areas of electrical engineering and allied technologies.
3. To develop industry-ready professionals through continuous interaction with industry, academia, and professional bodies.
4. To encourage the utilization of sustainable energy resources and environmentally responsible engineering practices.
5. To foster ethical values, leadership qualities, and lifelong learning for professional excellence and societal development.

CURRICULUM AND SYLLABUS

The Curriculum of B.Tech. (Electrical and Electronics Engineering) is designed to fulfil the Program Educational Objectives (PEO) and the Program Outcomes (PO) listed below.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO1	Graduates will apply knowledge of electrical and electronic engineering, mathematics, science, and engineering fundamentals to solve engineering problems in industry and professional practice.
PEO2	Graduates will develop technical skills, analytical thinking, and problem-solving abilities to design, analyze, operate, and maintain electrical and electronic systems**.**
PEO3	Graduates will demonstrate professionalism, communication skills, teamwork, ethical responsibility, and lifelong learning to adapt to emerging technologies and contribute effectively to society.

PROGRAM OUTCOMES (PO)

PO1	**Engineering Knowledge**	Apply the knowledge of Mathematics, Natural science, Computing, Engineering Fundamentals and an Engineering Specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems
PO2	**Problem Analysis**	Identify, formulate review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development (WK1-WK4)
PO3	**Design / Development of solutions**	Design creative solutions for complex engineering problems and design / develop systems / components / processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO4	**Conduct Investigations of complex problems**	Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis and interpretation of data to provide valid conclusions (WK8).
PO5	**Engineering Tool Usage**	Create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems (WK2 & WK6).

PO6	**The Engineer and the world**	Analyse and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment (WK1, WK5 and WK7).
PO7	**Ethics**	Apply ethical principles and commit to professional ethics, human values. 4 Diversity and inclusion, adhere to national and international laws (WK9).
PO8	**Individual and Collaborative Team Work**	Function effectively as an individual, and as a member or leader in diverse / multi-disciplinary teams.
PO9	**Communication**	Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentations, make effective presentations considering cultural, language, and learning differences
PO10	**Project Management and Finance**	Apply knowledge and understanding of engineering management principles and economic decision making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	**Life-long learning**	Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK8).

KNOWLEDGE AND ATTITUDE PROFILE (WK)

WK1	**Natural Sciences**	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences
WK2	**Mathematics**	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline
WK3	**Engineering Fundamentals**	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
WK4	**Specialist Knowledge**	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5	**Engineering Design/Ops**	Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area

WK6	**Engineering Practice**	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
WK7	**Society & Sustainability**	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development
WK8	**Research Literature**	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues
WK9	**Ethics & Conduct**	Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO1	Apply the fundamentals of electrical and electronics engineering to solve real-world engineering problems. Design and analyze electrical systems using core engineering concepts.
PSO2	Use modern engineering tools, software, and automation technologies for industrial applications. Develop sustainable and energy-efficient electrical solutions.
PSO3	Demonstrate professional ethics, teamwork, and lifelong learning in engineering practice. Apply innovative ideas and research skills to meet industry and societal needs.

SUSTAINABLE DEVELOPMENT GOALS

SDG01	**No Poverty**	End poverty in all its forms everywhere (eradicate extreme poverty currently measured as people living on less than $1.25 a day.)
SDG02	**Zero Hunger**	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
SDG03	**Good Health and Well-being**	Ensure healthy lives and promote well-being for all at all ages
SDG04	**Quality Education**	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
SDG05	**Gender Equality**	Achieve gender equality and empower all women and girls
SDG06	**Clean Water and Sanitation**	Ensure availability and sustainable management of water and sanitation for all
SDG07	**Affordable and Clean Energy**	Ensure access to affordable, reliable, sustainable and modern energy for all

SDG08	**Decent Work and Economic Growth**	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
SDG09	**Industry, Innovation, and Infrastructure**	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
SDG10	**Reduced Inequalities**	Reduce inequality within and among countries
SDG11	**Sustainable Cities and Communities**	Make cities inclusive, safe, resilient, and sustainable.
SDG12	**Responsible Consumption and Production**	Ensure sustainable consumption and production patterns.
SDG13	**Climate Action**	Ensure sustainable consumption and production patterns.
SDG14	**Life Below Water**	Conserve and sustainably use marine resources.
SDG15	**Life on Land**	Protect ecosystems, manage forests, combat desertification, and halt biodiversity loss.
SDG16	**Peace, Justice, and Strong Institutions**	Promote peaceful societies, access to justice, and effective institutions.
SDG17	**Partnerships for the Goals**	Strengthen the global partnership for sustainable development.

DEFINITION OF CREDIT

TEACHING ACTIVITY	CREDIT EQUIVALENT
1 Hour Lecture (L) per week per semester	**1 Credit**
1 Hour Tutorial (T) per week per semester	**1 Credit**
1 Hour Practical / Laboratory (P) per week per semester	**0.5 Credit**
3 Hours Practical / Laboratory (P) per week per semester	**1.5 Credit**

SCHEME OF CREDIT DISTRIBUTION-SUMMARY

	I	II	III	IV	V	VI	VII	VIII	Total
Basic Science Courses	8.5	07	04						**19.5**
Engineering Science Courses	09	10.5							**19.5**
Professional Core Courses			21.5	21	18	11.5	03		**75**
Professional Elective Courses						03	03	03	**09**
Humanities and Social Management	03	03			03	01	03		**13**
Open Elective Courses						03	06		**09**
Project / Internship / Seminar/NPTEL/Hackathon					01	02	05	06	**14**
Mandatory Courses									
Career Development Skill	01	01	01	01	01	01			**06**
Skill Development				01	01	01	01		**04**
TOTAL	**21.5**	**21.5**	**26.5**	**23**	**24**	**22.5**	**21**	**09**	**169***

STRUCTURE OF THE UG PROGRAMME (Total: 169 Credits)

Sl. No.	CODE	CATEGORY	SUGGESTED CREDITS (176)	CREDIT POINTS (169)
1	BSC	Basic Science Courses	32*	19.5
2	ESC	Engineering Science Courses	29*	19.5
3	PCC	Professional Core Courses	64*	75
4	PEL	Professional Elective Courses	15*	09
5	HSM	Humanities and Social Management	12*	13
6	OEL	Open Elective Courses	09*	09
7	PROJ	Project / Internship / Seminar	15*	14
8	MAN	Mandatory Courses	Non-Credit	NC
9	CDS	Career Development Skill	--	6
10	SDL	Skill Development Learning	--	4
11	AEC	Ability Enhancement Courses	Non-Credit	NC
		TOTAL	**176**	**169**

ABBREVIATION

S.NO	ABBREVIATION	FULL FORM
1	BSC	Basic Science Courses
2	ESC	Engineering Science Courses
3	HSM	Humanities and Social Management
4	CDS	Career Development Skill
5	PCC	Professional Core Courses
6	MAN	Mandatory Courses
7	PROJ	Project
8	PEC	Professional Elective Courses
9	OEC	Open Elective Courses
10	PET	Physical Education & Training
11	AEC	Ability Enhancement Course
12	SDL	Skill Development Learning
13	MA	Mathematics
14	UH	Universal Human Values
15	CS	Computer Science
16	IT	Information Technology
17	BO	Biology
18	ME	Mechanical Engineering
19	CD	Carrier Development
20	PE	Physical Education
21	EN	English
22	EE	Electrical & Electronics
23	PC	Physics & Chemistry
24	NS	National Social Service
25	MN	Mandatory
26	NIH	NPTEL / Internship / Hackathon
27	YOC	Yoga

List of Program Offered

S.No.	Programme	Programme Code
UNDER GRADUATE		
B.Tech., Programmes Offered		
1	B.Tech., - Artificial Intelligence and Data Science	AD
2	B.Tech., - Computer Science Engineering	CS
3	B.Tech., - Electronics and Communication Engineering	EC
4	B.Tech., - Electrical and Electronics Engineering	EE
5	B.Tech., - Mechanical Engineering	ME
6	B.Tech., - Information Technology	IT
7	B.Tech., - Robotics and Automation	RA
8	B.Tech., - Computer Science Engineering *(IOT including Cyber Security and Block Chain Management)*	CB
POSTGRADUATE		
M. Tech., Programmes Offered		
1	M.Tech., - Artificial Intelligence and Data Science	AS
MBA		
1	MBA – General	MA

SEMESTER-WISE COURSES AND CREDITS

I SEMESTER

Course Code	Course Title	L	T	P	Hrs/Wk	SL	C	CIA	ESE	Total	Category
MAC26101	Matrices and Calculus	3	1	0	4	6	**4**	40	60	100	BSC
ENC26102	Technical English and Communication	3	0	0	3	3	**3**	40	60	100	HSM
EEC26103	Basics of Electrical and Electronics Engineering	3	0	0	3	4	**3**	40	60	100	ESC
PCT26104	Physics and Chemistry for Electronics Engineering	3	0	0	3	3	**3**	40	60	100	BSC
MET26105	Basic Civil and Mechanical Engineering	3	0	0	3	3	**3**	40	60	100	ESC
EEL26101	Basics of Electrical and Electronics Engineering Laboratory	0	0	3	3	4	**1.5**	60	40	100	ESC
PCL26102	Physics and Chemistry Laboratory	0	0	3	3	3	**1.5**	60	40	100	BSC
MEL26103	Engineering Drawing Laboratory	0	0	3	3	4	**1.5**	60	40	100	ESC
CDC26101	Career Development Skill – I	0	0	2	2	5	**1**	100	0	100	CDS
PEC26101	Physical Education and Sports Activities/PET	0	0	1	1	2	**0**	100	0	100	AEC
TOTAL		**15**	**1**	**12**	**28**	**37**	**21.5**	**580**	**420**	**1000**	**-**

II SEMESTER

Course Code	Course Title	L	T	P	Hrs/Wk	SL	C	CIA	ESE	Total	Category
MAC26201	PDE & Transforms	3	1	0	4	6	**4**	40	60	100	BSC
UHC26202	Universal Human Values	3	0	0	3	3	**3**	40	60	100	HSM
CSC26203	Problem Solving and Python Programming	3	0	0	3	4	**3**	40	60	100	ESC
BET26204	Biology for Electronic Engineers	3	0	0	3	3	**3**	40	60	100	BSC
EET26205	Introduction of EV Technology	3	0	0	3	3	**3**	40	60	100	ESC
CSL26201	Python Programming Laboratory	0	0	3	3	4	**1.5**	60	40	100	ESC
MEL26202	Engineering Workshop Laboratory	0	0	3	3	3	**1.5**	60	40	100	ESC
DTL26203	Design Thinking and Idea Laboratory	0	0	3	3	4	**1.5**	60	40	100	ESC
CDC26201	Career Development Skill – II	0	0	2	2	5	**1**	100	0	100	CDS
PEC26201	National Social Service /Village camp / Rally	0	0	1	1	2	**0**	100	0	100	AEC
TOTAL		**15**	**1**	**12**	**28**	**37**	**21.5**	**580**	**420**	**1000**	**-**

III SEMESTER

Course Code	Course Title	L	T	P	Hrs/Wk	SL	C	CIA	ESE	Total	Category
MAC26301	Probability & Statistics and Numerical methods	3	1	0	4	6	**4**	40	60	100	BSC
EET26302	Electric Circuit Analysis	3	1	0	4	5	**4**	40	60	100	PCC
EET26303	DC Machines & Transformers	3	0	0	3	3	**3**	40	60	100	PCC
EET26304	Electromagnetic Theory	3	0	0	3	4	**3**	40	60	100	PCC
EET26305	Electronic Devices	3	0	0	3	4	**3**	40	60	100	PCC
EET26306	Digital Electronics	3	1	0	4	3	**4**	40	60	100	PCC
MNC26306	Environmental Science	1	0	0	1	3	**0**	100	0	100	MAN
EEL26301	DC Machines & Transformers Laboratory -1	0	0	2	2	3	**1.5**	60	40	100	PCC
EEL26302	Electronic Devices Laboratory	0	0	2	2	4	**1.5**	60	40	100	PCC
EEL26303	Digital Electronics Laboratory	0	0	2	2	5	**1.5**	60	40	100	PCC
CDC26301	Career Development Skill – III	0	0	2	2	2	**1**	100	0	100	CDS
PEC26301	Physical Education	0	0	1	1	2	**0**	100	0	100	AEC
TOTAL		**19**	**3**	**9**	**31**	**44**	**26.5**	**720**	**480**	**1200**	**-**

IV SEMESTER

Course Code	Course Title	L	T	P	Hrs/Wk	SL	C	CIA	ESE	Total	Category
EET26401	Electric Power Generation, Transmission & Distribution	3	1	0	4	6	**4**	40	60	100	PCC
EET26402	AC Machines	3	0	0	3	3	**3**	40	60	100	PCC
EET26403	Measurement and Instrumentation	3	0	0	3	5	**3**	40	60	100	PCC
EET26404	Control Engineering	3	1	0	4	3	**4**	40	60	100	PCC
EEI26405	Linear Integrated Circuits	3	0	2	5	3	**4**	40	60	100	PCC
MNC26406	Indian Constitution	1	0	0	1	3	**0**	0	100	100	MAN
EEL26401	AC Machines Laboratory	0	0	3	3	3	**1.5**	60	40	100	PCC
EEL26402	Measurement and Control Laboratory	0	0	3	3	3	**1.5**	60	40	100	PCC
NIH26001	NPTEL / Internship / Hackathon	0	0	0	0	5	**1**	100	0	100	SDL
CDC26401	Career Development Skill – IV	0	0	2	2	2	**1**	100	0	100	CDS
PEC26401	Physical Education	0	0	1	1	2	**0**	100	0	100	AEC
TOTAL		**16**	**2**	**11**	**29**	**38**	**23**	**620**	**480**	**1100**	**-**

V SEMESTER

Course Code	Course Title	L	T	P	Hrs/Wk	SL	C	CIA	ESE	Total	Category
EET26501	Power System Analysis	3	1	0	4	6	**4**	60	40	100	PCC
EET26502	Power Electronics	3	1	0	4	4	**4**	60	40	100	PCC
EET26503	Electrical Machine Design	3	1	0	4	5	**4**	60	40	100	PCC
EET26504	Microprocessor and Microcontroller	3	0	0	3	3	**3**	60	40	100	PCC
ORC26505	Operations Research	3	0	0	3	3	**3**	40	60	100	HSM
EEL26501	Power Electronics Laboratory	0	0	3	3	3	**1.5**	60	40	100	PCC
EEL26502	Microprocessor and Microcontroller Laboratory	0	0	3	3	3	**1.5**	60	40	100	PCC
EEP26501	Micro Project	0	0	2	2	4	**1**	100	0	100	PROJ
NIH26002	NPTEL / Internship at IIT/ NIT/ Government Sector Company / Hackathon	0	0	0	0	5	**1**	100	0	100	SDL
CDC26501	Career Development Skill – V	0	0	2	2	2	**1**	100	0	100	CDS
TOTAL		**15**	**3**	**10**	**28**	**38**	**24**	**700**	**300**	**1000**	**-**

VI SEMESTER

Course Code	Course Title	L	T	P	Hrs/Wk	SL	C	CIA	ESE	Total	Category
EET26601	Power System Operation and Control	3	1	0	4	4	**4**	40	60	100	PCC
EET26602	Solid State Drives	3	0	0	3	3	**3**	40	60	100	PCC
EET26603	Utilization of Electrical Energy	3	0	0	3	5	**3**	40	60	100	PCC
EEPE26XX	Professional Elective – I	3	0	0	3	3	**3**	40	60	100	PEL
EEOE26XX	Open Elective – I	3	0	0	3	3	**3**	40	60	100	OEL
EEL26601	Power System Simulation Lab	0	0	3	3	3	**1.5**	60	40	100	PCC
EEP26602	Mini Project	0	0	4	4	5	**2**	100	0	100	PROJ
ENC26601	Communication Skills Laboratory	0	0	2	2	4	**1**	40	60	100	HSM
NIH26003	NPTEL / Internship at IIT/ NIT/ Government Sector Company / Hackathon	0	0	0	0	5	**1**	100	0	100	SDL
CDC26601	Career Development Skill –VI	0	0	2	2	2	**1**	100	0	100	CDS
TOTAL		**15**	**1**	**11**	**27**	**37**	**22.5**	**600**	**400**	**1000**	**-**

VII SEMESTER

Course Code	Course Title	L	T	P	Hrs/Wk	SL	C	CIA	ESE	Total	Category
EET26701	Protection and Switchgear	3	1	0	3	3	**3**	40	60	100	PCC
EDT26702	Entrepreneurship Development	3	0	0	3	2	**3**	40	60	100	HSM
EEPE26XX	Professional Elective – II	3	0	0	3	3	**3**	40	60	100	PEL
EEOE26XX	Open Elective – II	3	0	0	3	3	**3**	40	60	100	OEL
EEOE26XX	Open Elective – III	3	0	0	3	3	**3**	40	60	100	OEL
EEP26701	Project Work – Phase I	0	0	10	10	20	**5**	50	50	100	PROJ
NIH26004	NPTEL / Internship at IIT/ NIT/ Government Sector Company / Hackathon	0	0	0	0	5	**1**	100	0	100	SDL
TOTAL		**15**	**1**	**10**	**25**	**39**	**21**	**350**	**350**	**700**	**-**

VIII SEMESTER

Course Code	Course Title	L	T	P	Hrs/Wk	SL	C	CIA	ESE	Total	Category
EEPE26XX	Professional Elective – III	3	0	0	3	3	**3**	40	60	100	PEL
EEP26702	Project Work – Phase II	0	0	12	12	20	**6**	60	40	100	PROJ
TOTAL		**3**	**0**	**12**	**15**	**23**	**9**	**100**	**100**	**200**	**-**

SEMESTER - I

MAC26101	*MATRICES AND CALCULUS*	CATEGORY	L	T	P	SL	CREDIT
		BSC	3	1	0	6	4

Course Prerequisite / Preamble

- Basic knowledge of algebra, trigonometry, and calculus.
- Understanding of matrices and elementary differential equations.
- Foundation for advanced engineering mathematics and applications.

Course Objective

- To introduce the concepts of Eigen values, Eigen vectors, matrix transformations, and quadratic forms.
- To develop problem-solving skills in multivariable differential calculus and optimization techniques.
- To provide knowledge of double and triple integrals and their applications in area and volume calculations.
- To familiarize students with vector calculus operations and integral theorems used in engineering applications.
- To enable students to solve higher order and simultaneous differential equations arising in scientific and engineering problems.

Course Outcome

CO	COURSE OUTCOME	K LEVEL
CO1	Apply matrix algebra concepts including Eigen values, Eigen vectors, diagonalization, and quadratic forms to solve mathematical problems.	K3
CO2	Use multivariable differential calculus techniques to analyze functions of several variables and optimization problems.	K3
CO3	Evaluate double and triple integrals for computing area, volume, and coordinate transformations.	K3
CO4	Apply vector calculus operations and integral theorems to analyze vector fields and physical problems.	K3
CO5	Solve higher order and simultaneous differential equations using appropriate analytical methods.	K3

Syllabus		
Unit 1	**Eigen Values and Quadratic Forms**	**(12)**
Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley-Hamilton theorem (excluding proof) – Diagonalization of matrices – Reduction of Quadratic form to canonical form by using orthogonal transformation – Nature of a Quadratic form.		
Unit 2	**Multivariable Differential Calculus**	**(12)**
Partial derivatives (excluding Euler's theorem) – Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
Unit 3	**Multiple Integrals**	**(12)**
Double integrals – Change of order of integration – Double integrals in polar co-ordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals		
Unit 4	**Vector Calculus**	**(12)**
Vector Differential Operator – Gradient – Properties – Directional derivative – Divergence and Curl properties and relations – Solenoidal and Irrotational vector fields – Green's theorem – Stoke's theorem – Gauss divergence theorem.		
Unit 5	**Differential Equations**	**(12)**
Higher order linear differential equations with constant coefficients – Method of undetermined coefficients – Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.		

Text Books:

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers.
2. S. S. Sastry, *Engineering Mathematics Volume I*, Prentice Hall of India.
3. N. P. Bali and Manish Goyal, *Engineering Mathematics*, Laxmi Publications.
4. *Advanced Engineering Mathematics*, Wiley India Edition.
5. Veerarajan T., *Engineering Mathematics I & II*, Tata McGraw-Hill, New Delhi, 2014 & 2015.

Reference:
1. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, Narosa Publishing House. 2. B. V. Ramana, *Higher Engineering Mathematics*, McGraw Hill Education. 3. H. K. Dass, *Engineering Mathematics*, S. Chand Publications. 4. A. Singaravelu, *Engineering Mathematics*, Meenakshi Agency.
Web / NPTEL Resources:
1. https://nptel.ac.in/courses/111105160 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_ma58 3. https://www.coursera.org/specializations/mathematics-engineers

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	1
CO2	3	3	-	-	-	-	-	-	-	-	-	2	1
CO3	3	2	1	-	-	-	-	-	-	-	-	2	1
CO4	3	3	1	1	-	-	-	-	-	-	-	2	2
CO5	3	3	1	-	-	-	-	-	-	-	-	2	1

Assessment Methodology		
Assessment Methodology	**Assessment Tools**	**Marks**
CAT I	Written Examination	30
CAT II		
CAT III		
Continuous Assessment	Assignment / Activities	5
Attendance	Based on course wise attendance percentage	5
Total		**40**

ENC26102	TECHNICAL ENGLISH AND COMMUNICATION	CATEGORY	L	T	P	SL	CREDIT
		HSM	3	0	0	3	3

Course Prerequisite / Preamble
• Enhances communication skills for academic and professional environments. • Develops LSRW skills for engineering students. • Focuses on technical, interpersonal, and employability communication skills.
Course Objective
• To develop effective LSRW skills for academic and professional communication. • To enhance technical and workplace communication skills. • To improve employability and professional communication practices.

Course Outcome		
On the successful completion of the course, students will be able to:		
CO1	Apply effective communication principles in academic and professional contexts	**K3**
CO2	Demonstrate reading comprehension and analytical skills using technical materials	**K3**
CO3	Prepare structured technical and professional documents	**K4**
CO4	Demonstrate oral communication skills through presentations, discussions, and interviews	**K3**
CO5	Use grammar, vocabulary, and workplace communication effectively in engineering contexts	**K3**

Syllabus		
Unit 1	**FUNDAMENTALS OF TECHNICAL COMMUNICATION**	**(9)**
Introduction to Communication – Process of Communication – Verbal and Non-verbal Communication – Barriers to Communication – Principles of Effective Communication – Seven C's of Communication – Technical Communication in Engineering – Formal and Informal Communication – Digital Communication Etiquette – Listening Skills – Reading Skills.		
Unit 2	**READING AND LANGUAGE DEVELOPMENT**	**(9)**
Reading Techniques – Skimming – Scanning – Intensive and Extensive Reading – Reading Technical Articles, Manuals and Reports – Vocabulary Building – Root Words – Prefixes and Suffixes – Synonyms and Antonyms – Homophones and Homonyms – One-word Substitutes – Abbreviations and Acronyms – Contextual Meaning.		
Unit 3	**PROFESSIONAL WRITING SKILLS**	**(9)**

Sentence Structures – Paragraph Development – Coherence and Cohesion – Technical Description – Process Writing – Email Writing – Business Letters – Memorandum – Meeting Minutes – Resume Writing – Report Writing – Essay Writing – Instructions and Recommendations.		
Unit 4	**ORAL COMMUNICATION AND PRESENTATION SKILLS**	**(9)**
Phonetics and Pronunciation – Stress and Intonation – Public Speaking – JAM Sessions – Group Discussions – Debates – Role Plays – Technical Presentations – Presentation Tools and Visual Aids – Interview Skills – Corporate Communication Etiquette.		
Unit 5	**WORKPLACE COMMUNICATION AND EMPLOYABILITY SKILLS**	**(9)**
Grammar for Professional Communication – Subject Verb Agreement – Articles and Prepositions – Error Correction – Punctuation – Common Workplace Errors – Indianisms – Cross-cultural Communication – Communication in Teams – Workplace Ethics – Communication for Innovation and Entrepreneurship – AI-assisted Communication Tools.		

Text Books:

- Technical Communication: English Skills for Engineers Meenakshi Raman & Sangeeta Sharma, Oxford University Press, New Delhi, 2nd Edition, 2009.
- Effective Technical Communication, M. Ashraf Rizvi, McGraw Hill Education, New Delhi, 2nd Edition, 2017.
- Business Communication Today, Courtland L. Bovee & John V. Thill, Pearson Education, 14th Edition, 2018.
- Communicative English for Engineers and Professionals, Nitin Bhatnagar & Mamta Bhatnagar,Pearson Longman, 2009.
- English for Engineers and Technologists, Orient BlackSwan Publications, Hyderabad, 2010.

Reference:

- Practical English Usage, Michael Swan, Oxford University Press, 4th Edition, 2016.
- Advanced Grammar in Use, Martin Hewings,, Cambridge University Press, 3rd Edition, 2013.
- The Elements of Style, William Strunk Jr. & E.B. White, Pearson Education, 4th Edition, 2000.

Web / NPTEL Resources:

1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_hs34
2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc19_hs33
3. https://onlinecourses.nptel.ac.in/e-learning

CO PO Mapping													
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	1	1	-	-	-	2	-	1	2	3	-	1	-
CO2	1	2	-	1	-	-	-	-	1	3	-	1	1
CO3	1	2	1	-	1	-	-	1	2	3	-	2	1
CO4	-	-	-	-	-	1	-	1	3	3	-	1	2
CO5	1	1	-	-	1	2	-	2	2	3	1	1	1

Assessment Methodology		
Assessment Methodology	**Assessment Tools**	**Marks**
CAT I	Written Examination	30
CAT II		
CAT III		
Continuous Assessment	Assignment / Activities	5
Attendance	Based on course wise attendance percentage	5
Total		**40**

EEC26103	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	CATEGORY	L	T	P	SL	CREDIT
		ESC	3	0	0	5	3

Course Prerequisite / Preamble

- Introduce the fundamentals of electrical circuits and basic electrical quantities.
- Provide basic knowledge of DC, AC and magnetic circuits.
- Develop understanding of electrical wiring, safety, protection and earthing.
- Introduce semiconductor devices and basic electronic circuits.
- Provide fundamental knowledge of digital electronics and operational amplifiers.

Course Objective

- Introduce the basic concepts of electrical circuits, DC and AC circuits, and magnetic circuits.
- Develop fundamental knowledge of electrical wiring, safety practices, protection devices and earthing.
- Introduce the operating principles and basic applications of semiconductor electronic devices.
- Provide fundamental knowledge of digital electronics, logic gates and basic digital circuits.
- Introduce the basic concepts and applications of operational amplifiers.

Course Outcome

On the successful completion of the course, students will be able to:

CO1	Apply basic laws and principles to analyze simple DC and magnetic circuits.	K2
CO2	Analyze basic AC circuits and determine voltage, current, power and power factor.	K3
CO3	Explain basic electrical wiring, safety practices, protection devices, cables and earthing.	K2
CO4	Explain the working principles and basic applications of semiconductor devices such as diodes, transistors, JFET and MOSFET.	K2
CO5	Apply basic concepts of logic gates, digital circuits and operational amplifiers to simple electronic applications.	K3

Syllabus

Unit 1	DC AND MAGNETIC CIRCUITS	9 hours

Voltage, current, power and energy - Basic electrical circuits - Ohm's law - Kirchhoff's laws - Series and parallel circuits - Voltage and current division - Basic network analysis - Magnetic circuits - Magnetic materials - Electromagnetic induction - Faraday's law - Lenz's law - Self and mutual induction.

Unit 2	AC CIRCUITS	9 hours

AC fundamentals - AC waveform - RMS and average values - R, L and C circuits - Phasors - Impedance - AC power - Power factor - Single-phase and three-phase circuits - Star and Delta connections - Line and phase values.

Unit 3	ELECTRICAL WIRING AND SAFETY	9 hours
Electrical safety - Electrical tools - Wiring types - Domestic wiring - Basic lighting circuits - Fuses and circuit breakers - Electrical shock and protection - Industrial wiring - Cables and conductors - Earthing - Electrical installation - Basic energy audit and ECAD.		
Unit 4	**BASIC ELECTRONIC DEVICES**	**9 hours**
Semiconductors – PN Junction Diode – Forward and Reverse Bias – Zener Diode – LED – Photodiode – Basic Rectifiers – BJT: NPN and PNP – JFET and MOSFET – Basic Applications.		
Unit 5	**DIGITAL ELECTRONICS AND OP-AMP**	**9 hours**
Basic Number Systems – Logic Gates – Boolean Algebra – Half Adder and Full Adder – Basic Flip-Flops – Counters – Shift Registers – Introduction to Op-Amp – Inverting and Non-Inverting Amplifiers – Integrator – Differentiator – Comparator.		

Text Books:

1. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, McGraw Hill Education.
2. S. Salivahanan and N. Suresh Kumar, Electronic Devices and Circuits, McGraw Hill Education.

Reference:

1. V. K. Mehta and Rohit Mehta, Principles of Electrical Engineering, S. Chand Publishing.
2. Thomas L. Floyd, Electronic Devices, Pearson Education.
3. M. Morris Mano, Digital Logic and Computer Design, Pearson Education.
4. ·R. P. Jain, Modern Digital Electronics, McGraw Hill Education.

Web / NPTEL Resources:

- NPTEL – Basic Electrical Engineering
- NPTEL – Electrical Circuits
- NPTEL – Basic Electronics
- NPTEL – Digital Circuits
- NPTEL – Analog Electronic Circuits

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	1	-	-	-	-	-	-	2	1
CO2	3	2	-	-	1	-	-	-	-	-	-	2	1
CO3	3	2	1	-	1	1	1	-	-	-	-	2	1
CO4	3	2	1	1	2	-	-	-	-	-	-	2	2
CO5	3	2	1	1	2	-	-	-	-	-	-	2	2

Assessment Methodology		
Assessment Methodology	**Assessment Tools**	**Marks**
CAT I	Written Examination	30
CAT II		
CAT III		
Continuous Assessment	Assignment / Activities	5
Attendance	Based on course wise attendance percentage	5
Total		**40**

PCT26104	PHYSICS AND CHEMISTRY FOR ELECTRONICS ENGINEERING	CATEGORY	L	T	P	SL	CREDIT
		BSC	3	0	0	3	3

Course Prerequisite / Preamble
• To make the students understand the importance in studying electrical properties of materials, semiconductor physics, wave function in quantum mechanics and its practical application in technologies. • To make the students understand the importance of water and cells
Course Objective
• To provide fundamental knowledge of physics and chemistry principles relevant to engineering applications. • To develop understanding of materials, energy systems, and modern technological advancements. • To apply scientific concepts in solving engineering and industrial problems effectively. • To enhance analytical, experimental, and problem-solving skills through practical learning. • To create awareness of sustainable technologies, environmental protection, and interdisciplinary engineering applications.

Course Outcome		
On the successful completion of the course, students will be able to:		
CO1	Explain the fundamental concepts of physics and chemistry relevant to engineering applications.	K2
CO2	Apply principles of materials science, optics, electrochemistry, and energy systems in engineering problems.	K2
CO3	Analyze the properties and behavior of engineering materials, semiconductors, fuels, and chemical processes.	K2
CO4	Perform laboratory experiments and interpret scientific data using analytical and experimental techniques.	K2
CO5	Demonstrate awareness of environmental sustainability, modern technologies, and interdisciplinary engineering applications.	K2

Syllabus		
Unit 1	**SEMICONDUCTOR PHYSICS**	**(9)**
Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type& P-type		

semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport – Einstein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions.		
Unit 2	**QUANTUM PHYSICS**	**(9)**
De Broglie hypothesis of matter waves; properties of matter wave; Wave function; Physical interpretation of wave function; Heisenberg uncertainty principle; Schrodinger's time dependent and time independent wave equation; Particle trapped in one-dimensional infinite potential well, – tunneling (qualitative) - scanning tunneling microscope, Quantum Computing.		
Unit 3	**OPTICS AND LASERS**	**(9)**
Interference: Air-wedge –Newton's rings –Michelson's interferometer –Determination of Wavelength of a Monochromatic Light Source. Lasers: Principles of laser –Spontaneous and Stimulated emissions –Einstein's theory of A and B coefficients –Types of Lasers –GaAs laser. Fiber Optics: Fermat's principle-optical fiber – principle and construction – acceptance cone - numerical aperture –types of fibers - fiber optic communication principle – fiber optic sensors		
Unit 4	**WATER CHEMISTRY**	**(9)**
Water chemistry-hard and soft water, Determination of hardness by EDTA method Disadvantages of hard water- Boiler Scales, sludges, Softening of water: Internal conditioning, External conditioning - ion exchange and zeolite processes. Desalination-Reverse osmosis.		
Unit 5	**ELECTROCHEMICAL CELLS AND CORROSION**	**(9)**
Electrode potential, electromotive force, reference electrodes-hydrogen, Ag/AgCl, calomel and glass electrodes. Nernst equation and applications. Batteries- Dry cell, alkaline battery, Ni-Cd battery and lead-acid battery. Fuel Cell-Hydrogen-oxygen fuel cell. Corrosion-dry and wet corrosion, mechanism and types of electrochemical corrosion. Corrosion control methods.		

Text Books:

1. Umesh K Mishra & Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.
2. Bhattacharya, D.K. & Poonam, T. ―Engineering Physics‖. Oxford University Press, 2015.
3. P.C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 17 ED, (2020-21).

Reference:

1. Y.B.Band and Y. Avishai, Quantum Mechanics with Applications to Nanotechnology and Information Science, Academic Press, 2013.
2. Avadhanulu M. N., P. G. Kshirsagar, A text book of Engineering Physics, Radiant publishers, 2017.
3. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand and Company Ltd, New Delhi, 28th ED, 2020.

Web / NPTEL Resources:

1. NPTEL Official Website
2. Engineering Physics I – NPTEL
3. Engineering Chemistry – NPTEL Courses

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	-	-	2	-	-	-	-	2	-	1
CO2	3	3	3	-	-	2	-	-	-	-	2	-	1
CO3	3	3	3	-	-	2	-	-	-	-	2	-	1
CO4	3	3	3	-	-	2	-	-	-	-	2	-	1
CO5	3	3	3	-	-	2	-	-	-	-	2	-	1

Assessment Methodology		
Assessment Methodology	**Assessment Tools**	**Marks**
CAT I	Written Examination	30
CAT II		
CAT III		
Continuous Assessment	Assignment / Activities	5
Attendance	Based on course wise attendance percentage	5
Total		**40**

MET26105	BASIC CIVIL AND MECHANICAL ENGINEERING	CATEGORY	L	T	P	SL	CREDIT
		ESC	3	0	0	3	3

Course Prerequisite / Preamble
• Introduces the basic concepts and applications of Civil and Mechanical Engineering. • Covers surveying, civil engineering materials, buildings, infrastructure, engines, power plants, pumps, refrigeration and air conditioning. • Provides an understanding of engineering systems used in society and everyday life.
Course Objective
• To introduce the major branches and applications of Civil and Mechanical Engineering. • To provide basic knowledge of surveying, civil engineering materials, building components and infrastructure. • To explain the working principles of engines, power plants, pumps, refrigeration and air conditioning systems.

Course Outcome		
On the successful completion of the course, students will be able to:		
CO1	Explain the basic concepts and applications of Civil and Mechanical Engineering.	**K2**
CO2	Describe basic surveying methods and common civil engineering materials.	**K2**
CO3	Explain building components, infrastructure and green building practices.	**K2**
CO4	Explain the working principles of engines, power plants, pumps and turbines.	**K2**
CO5	Explain the basic principles and applications of refrigeration and air conditioning systems.	**K2**

Syllabus		
Unit 1	**Introduction to Civil and Mechanical Engineering**	**(9)**
Civil Engineering: Role in society – Major areas: Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering – National Building Code – Basic building terms: Plinth area, Carpet area, Floor area, Built-up area and Floor Space Index – Residential and Industrial buildings. **Mechanical Engineering**: Introduction – Contributions to society – Manufacturing, Automation, Automobile and Energy Engineering – Interdisciplinary applications.		
Unit 2	**Surveying and Civil Engineering Materials**	**(9)**
Surveying: Purpose – Classification – Basic principles – Measurement of distances and angles – Leveling – Area measurement – Contours. Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel – Timber – Modern materials – Thermal and acoustic insulating materials – Decorative panels – Waterproofing materials – Uses of gypsum – Prefabricated building components.		
Unit 3	**Building Components and Infrastructure**	**(9)**

Building plans – Setting out of buildings – Foundations and types – Bearing capacity and settlement – Brick and stone masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering – Types of bridges and dams – Water supply network – Rainwater harvesting – Solid waste management – Introduction to highways and railways – Green buildings.		
Unit 4	**Internal Combustion Engines and Power Plants**	**(9)**
Classification of power plants – Working principles of Steam, Gas, Diesel, Hydroelectric and Nuclear power plants – Internal combustion engines – Petrol and Diesel engines – Two-stroke and Four-stroke cycles – Comparison – Boilers and turbines – Single-acting and double-acting reciprocating pumps – Centrifugal pumps – Hybrid engines – Industrial safety practices and protective devices.		
Unit 5	**Refrigeration and Air Conditioning**	**(9)**
Basic terminology – Principle of refrigeration – Vapour Compression and Vapour Absorption systems – Layout of domestic refrigerator – Window and Split air conditioners – Properties of air-water mixture – Introduction to psychrometry – Basic psychrometric processes.		

Text Books:

1. R. K. Rajput, A Textbook of Basic Civil Engineering, S. Chand Publishing.
2. S. Ramamrutham, Basic Civil Engineering, Dhanpat Rai Publishing Company.
3. R. S. Khurmi and J. K. Gupta, A Textbook of Thermal Engineering, S. Chand Publishing.

Reference:

1. R. K. Bansal, A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publications.
2. V. Ganeshan, Internal Combustion Engines, McGraw Hill Education.
3. C. P. Arora, Refrigeration and Air Conditioning, McGraw Hill Education.

Web / NPTEL Resources:

1. NPTEL – Basic Civil Engineering.
2. NPTEL – Internal Combustion Engines and Power Plant Engineering.
3. NPTEL – Refrigeration and Air Conditioning.

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	1	2	1	1	1	1	1	2	1
CO2	3	3	2	2	2	1	1	1	1	1	1	2	2
CO3	3	3	3	2	2	2	2	1	2	1	1	2	2
CO4	3	3	2	3	2	1	1	1	1	1	2	2	2
CO5	3	2	2	3	2	2	2	1	1	1	1	2	2

Assessment Methodology		
Assessment Methodology	**Assessment Tools**	**Marks**
CAT I	Written Examination	30
CAT II		
CAT III		
Continuous Assessment	Assignment / Activities	5
Attendance	Based on course wise attendance percentage	5
Total		**40**

EEL26101	BASICS OF ELECTRICAL AND ELECTRONICS LABORATORY	CATEGORY	L	T	P	SL	CREDIT
		ESC	0	0	3	3	1.5

Course Prerequisite / Preamble
• Understand the basic concepts of electrical quantities and circuits. • Apply Ohm's law, Kirchhoff's laws and basic circuit principles. • Understand the fundamentals of AC circuits, magnetic circuits and electrical measurements. • Gain basic knowledge of electronic devices, digital circuits and operational amplifiers. • Develop practical skills in electrical measurements, circuit testing, wiring and safety practices.
Course Objective
• Develop practical knowledge of basic electrical circuits and measurements. • Provide hands-on experience in DC, AC and magnetic circuit experiments. • Develop skills in testing and analyzing electronic devices and rectifier circuits. • Familiarize students with digital circuits, flip-flops, counters and op-amp circuits. • Develop practical skills in circuit construction, testing, measurement and electrical safety.

Course Outcome		
On the successful completion of the course, students will be able to:		
CO1	Verify basic electrical laws and analyze simple DC and AC circuits.	K3
CO2	Perform electrical measurements and verify magnetic and three-phase circuit principles.	K3
CO3	Test and analyze the characteristics of basic electronic devices and rectifier circuits.	K4
CO4	Construct and verify basic digital circuits such as logic gates, adders, flip-flops and counters.	K3
CO5	Implement and analyze basic operational amplifier circuits and follow electrical safety practices.	K4

LIST OF EXPERIMENTS

1. Verification of Ohm's Law and Kirchhoff's Laws.
2. Verification of Voltage and Current Division Rules in Series and Parallel Circuits.
3. Study of Magnetic Induction and Verification of Faraday's and Lenz's Laws.

4. Measurement of AC Voltage, Current and Power in R-L, R-C and R-L-C Circuits.
5. Measurement of Three-Phase Power using Two-Wattmeter Method.
6. Study and Testing of PN Junction Diode and Zener Diode Characteristics.
7. Construction and Testing of Half-Wave and Full-Wave Rectifiers.
8. Study of BJT Characteristics and its Basic Switching Operation.
9. Verification of Basic Logic Gates and Half Adder/Full Adder.
10. Implementation of Basic Op-Amp Circuits – Inverting, Non-Inverting Amplifier and Comparator.
11. Study of LED and Photodiode Characteristics.
12. Study of Flip-Flop and Counter Circuits.
13. Study of Earthing and Electrical Safety Devices.
14. Study of Domestic Wiring and Basic Lighting Circuits.

Text Books:

- D.P.Kothari and I.J.Nagrath, Basic Electrical Engineering, McGraw Hill Education, 4th Edition, 2019.
- V.K.Mehta and Rohit Mehta, Principles of Electronics, S. Chand Publishing, 12th Edition, 2020.
- Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson Education, 11th Edition, 2015.

Reference:

- S. K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education, 2nd Edition, 2017.
- Thomas L. Floyd, Electronic Devices, Pearson Education, 10th Edition, 2018.
- M. S. Sukhija and T. K. Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press, 2nd Edition, 2019.
- K. Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai Publications, 2016.

Web / NPTEL Resources:

- NPTEL – Basic Electrical Circuits
- NPTEL – Basic Electrical Engineering
- Virtual Labs – IIT Kharagpur (Basic Electronics Lab)
- Virtual Labs – Electrical Machines and Circuits Lab
- MIT OpenCourseWare – Electronics and Circuits

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	2	2	-	-	-	-	-	-	2	1
CO2	3	3	1	2	3	-	1	-	-	-	-	2	1
CO3	3	3	2	2	3	-	-	-	-	-	-	2	2
CO4	3	3	2	2	3	-	-	-	1	-	-	2	2
CO5	3	2	2	2	3	1	1	-	1	-	-	2	2

Evaluation Criteria	Assessment Methodology	Marks
Observation and Record	Regular lab Observation and Record writing and timely submission	20
Model Practical Test	Internal Practical Test	15
Continuous Laboratory Performance	Lab Performance, Experiment completion	10
Vivo -Voce	Oral question during lab sessions	5
Attendance	Based on laboratory attendance percentage	10
	Total	60

PCL26102	PHYSICAL SCIENCE LABORATORY (PHYSICS & CHEMISTRY)	CATEGORY	L	T	P	SL	CREDIT
		BSC	0	0	3	3	1.5

Course Prerequisite / Preamble

- Knowledge on solid-state physics basics

Course Objective

- To develop practical skills in conducting Physics and Chemistry experiments.
- To understand the principles behind scientific instruments and measurements.
- To enhance analytical and observation skills through laboratory investigations.
- To familiarize students with experimental procedures and data interpretation.
- To apply theoretical concepts of Physics and Chemistry in practical applications.

Course Outcome

CO	Course Outcome	K LEVEL
CO1	Perform Physics experiments using standard laboratory instruments and techniques.	(K3)
CO2	Analyse experimental results and verify scientific principles in Physics.	(K4)
CO3	Conduct Chemistry experiments related to volumetric and instrumental analysis.	(K3)
CO4	Apply safety measures and good laboratory practices during experiments	(K3)
CO5	Interpret experimental observations and prepare laboratory reports effectively	(K4)

Physics Laboratory

List of Experiments	Hours
1. Radius of curvature of lens – Newton's Ring	(2 Hours)
2. Determination of particle size of lycopodium powder using semiconductor laser.	(2 Hours)
3. Determination of wavelength of laser light using semiconductor laser diffraction.	(2 Hours)
4. Determination of numerical aperture and acceptance angle in an optical fiber.	(2 Hours)
5. Determination of wavelength of mercury spectrum – spectrometer grating.	(2 Hours)
6. Determination of solar cell characteristics**.**	(2 Hours)

Text Books

1. C.L. Arora, Practical Physics, S. Chand Publications.
2. Vogel's Textbook of Quantitative Chemical Analysis, Pearson Education.
3. B.D. Khosla, Senior Practical Physics, R. Chand Publications.
4. Lab Manual, Department of Chemistry, Puducherry Technological University, Puducherry, 2018.
5. V. Venkateswaran, R. Veeraswamy and A.R. Kulandaivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, 2012
6. J. Mendham, R.C. Denney, J.D. Barnes and M. Thomas, Vogel's Text Book of Quantitative Chemical nalysis, PearsonEducation, New Delhi, 6th ED, 2009.

Reference

1. V.K. Ahluwalia, Practical Chemistry, University Press.
2. S. Chand and Company, Engineering Chemistry Laboratory Manual.
3. P. R. Sasi Kumar, Practical Physics Laboratory Manual.

Web / NPTEL Links

1. https://www.olabs.edu.in/
2. https://vlab.amrita.edu/

Evaluation Criteria	Assessment Methodology	Marks
Observation and Record	Regular lab Observation and Record writing and timely submission	20
Model Practical Test	Internal Practical Test	15
Continuous Laboratory Performance	Lab Performance, Experiment completion	10
Vivo -Voce	Oral question during lab sessions	5
Attendance	Based on laboratory attendance percentage	10
	Total	60

MEL26103	*ENGINEERING DRAWING LABORATORY*	**CATEGORY**	**L**	**T**	**P**	**SL**	**CREDIT**
		ESC	0	0	3	4	1.5

Course Prerequisite / Preamble

- Basic knowledge of plane geometry (Class X / XII level).
- Familiarity with drawing instruments and their usage.
- Understanding of spatial visualization and 3D shapes.
- Engineering Graphics is the universal language of engineering communication. This laboratory course equips students with the fundamental skills to interpret, construct, and communicate engineering information through standard graphical representations. Students are trained in manual drafting techniques, orthographic projections, isometric and perspective views, and the conventions of first-angle and third-angle projections in accordance with BIS standards.

Course Objective

- To impart proficiency in the use of drawing instruments and BIS conventions for engineering drawing.
- To develop the ability to construct conic sections, engineering curves, and their applications.
- To train students in orthographic projections of points, lines, planes, and solids.
- To develop skills in drawing isometric and perspective views from multi-view orthographic drawings.
- To enable conversion between 2D multi-view drawings and 3D pictorial representations.

CO	**COURSE OUTCOME**	**K LEVEL**
CO1	Draw engineering curves such as conic sections, involutes, and cycloids using standard drawing instruments following BIS conventions.	K3
CO2	Construct orthographic projections of points and lines in various quadrants and determine true lengths and true inclinations.	K3
CO3	Generate orthographic projections of planes and regular solids in different positions and inclinations.	K3
CO4	Produce isometric projections and isometric views from given orthographic multi-view drawings.	K3
CO5	Develop perspective projections and convert given pictorial views to orthographic drawings demonstrating spatial reasoning.	K3

S.No	**Topic**	**Hours**	**CO**
1	Drawing of engineering curves – Ellipse (Concentric circles method and Oblong method), Parabola and Hyperbola	6	CO1
2	Drawing of engineering curves – Cycloid, Epicycloid, Hypocycloid, and Involute of a circle and a square	6	CO1

3	Projection of points – projection of points in all four quadrants; determination of quadrant from given projections	3	CO2
4	Projection of straight lines – lines parallel and inclined to both reference planes; determination of true length and true inclination by rotating line method	6	CO2
5	Projection of planes – projection of triangular, rectangular, pentagonal, and hexagonal planes in various positions	6	CO3
6	Projection of regular solids (prisms and pyramids) with axis perpendicular and inclined to the reference planes	6	CO3
7	Projection of regular solids (cylinders and cones) with axis inclined to HP and VP; true shape of sections	6	CO3
8	Development of lateral surfaces of prisms, cylinders, pyramids, and cones (including cut solids)	6	CO3
9	Isometric projection and isometric view of simple and combination solids; conversion from orthographic multi-view to isometric view	9	CO4
10	Perspective projection of prisms and pyramids using visual ray method; conversion of pictorial views to orthographic projections (Mini-Exercise)	6	CO5

Text Books

1. Venugopal, K., *Engineering Drawing and Graphics + AutoCAD*, New Age International Publishers, New Delhi, 5th Edition, 2020.
2. Bhatt, N.D., *Engineering Drawing: Plane and Solid Geometry*, Charotar Publishing House, 53rd Edition, 2022.
3. Gopalakrishna, K.R., *Engineering Drawing (Vol. I & II)*, Subhas Stores, Bangalore, 2019.

Reference

1. French, T.E. and Vierck, C.J., *Engineering Drawing and Graphic Technology*, McGraw-Hill, New York, 2005.
2. Shah, M.B. and Rana, B.C., *Engineering Drawing*, Pearson Education, New Delhi, 2nd Edition, 2009.
3. BIS Standards Publication SP: 46 (*Engineering Drawing Practice for Schools and Colleges*), Bureau of Indian Standards, New Delhi.

CO PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	1	-	-	1	-	-	-	3	2
CO2	3	2	2	-	1	-	-	1	-	-	-	3	2
CO3	3	3	2	-	1	-	-	1	-	-	-	3	2
CO4	3	3	2	-	2	-	-	1	-	-	-	3	3
CO5	3	3	3	-	2	-	-	1	-	-	-	3	3

Evaluation Criteria	Assessment Methodology	Marks
Observation and Record	Regular lab Observation and Record writing and timely submission	20
Model Practical Test	Internal Practical Test	15
Continuous Laboratory Performance	Lab Performance, Experiment completion	10
Vivo -Voce	Oral question during lab sessions	5
Attendance	Based on laboratory attendance percentage	10
	Total	60

CDC26101	*CAREER DEVELOPMENT SKILL-I*	CATEGORY	L	T	P	SL	CREDIT
		CDS	0	0	2	4	3

Course Prerequisite / Preamble		
• Basic understanding of English communication and grammar. • Interest in developing aptitude and reasoning skills. • Willingness to participate in communication and personality development activities.		
Course Objective		
• To improve communication and interpersonal skills. • To develop aptitude and logical reasoning abilities. • To enhance confidence and professional skills.		
Course Outcome		
On the successful completion of the course, students will be able to:		
CO1	Develop effective verbal and non-verbal communication skills for academic and professional environments.	**K1**
CO2	Apply basic quantitative aptitude concepts to solve numerical and logical problems efficiently.	**K2**
CO3	Demonstrate improved vocabulary, grammar, and sentence construction skills for professional communication.	**K2**
CO4	Analyze and solve basic reasoning and analytical problems using logical thinking techniques.	**K3**
CO5	Exhibit positive attitude, teamwork, confidence, and time management skills for personal and career development.	**K1**

Syllabus		
Unit 1	**COMMUNICATION FUNDAMENTALS**	**(9)**
Basics of Communication, Verbal and Non-Verbal Communication, Listening Skills, Introduction to Public Speaking, Self Introduction Techniques, and Professional Etiquette.		
Unit 2	**VOCABULARY DEVELOPMENT**	**(9)**
Synonyms & Antonyms, Word Formation, Commonly Confused Words, One Word Substitution, Sentence Construction, and Basic Grammar Usage.		
Unit 3	**QUANTITATIVE APTITUDE – BASICS**	**(9)**
Number System, Simplification, HCF & LCM, Percentages, Ratio & Proportion, and Average Problems.		
Unit 4	**LOGICAL REASONING – INTRODUCTION**	**(9)**
Coding & Decoding, Series Completion, Blood Relations, Direction Sense Test, Odd One Out, and Basic Analytical Thinking.		
Unit 5	**PERSONALITY DEVELOPMENT**	**(9)**
Goal Setting, Positive Attitude, Confidence Building, Time Management, Team Work Activities, and Stress Management Basics.		

Text Books
1. R.S. Aggarwal, *Quantitative Aptitude*, S. Chand Publications. 2. Barun K. Mitra, *Personality Development and Soft Skills*, Oxford University Press. 3. S.P. Dhanavel, *English and Soft Skills*, Orient BlackSwan Publications.
Reference
1. Norman Lewis, *Word Power Made Easy*, Goyal Publishers. 2. M. Tyra, *Magical Book on Quicker Maths*, BSC Publishing. 3.Dale Carnegie, *How to Win Friends and Influence People*, Simon & Schuster.

CO PO Mapping												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	-	-	-	-	-	-	2	2	3	-	2
CO2	1	-	-	-	-	-	-	1	-	3	-	2
CO3	3	2	-	1	-	-	-	-	-	-	-	2
CO4	2	3	1	2	-	-	-	-	-	-	-	2
CO5	-	-	-	-	-	-	-	2	3	2	1	

Assessment Methodology		
Assessment Methodology	Assessment Tools	Marks
Continuous Internal Assessment	Observation / Record Work / Viva Voce	30
Internal Practical Examination	Laboratory Performance	30
End Semester Practical Examination	Experiment and Viva Voce	40
	Total	100

PEC26101	PHYSICAL EDUCATION AND SPORTS ACTIVITIES	CATEGORY	L	T	P	SL	CREDIT
		AEC	0	0	1	2	0

Course Prerequisite / Preamble

- This course focuses on physical fitness, sports participation, health awareness, and personality development through regular physical education and training activities.
  Students gain practical exposure to physical exercises, fitness training, sports skills, recreational activities, and wellness practices that contribute to overall physical and mental well-being.
- The course promotes discipline, teamwork, leadership, sportsmanship, and healthy lifestyle habits.

Course Objective

- To promote physical fitness and healthy lifestyle practices among students.
- To develop interest and participation in sports and physical activities.
- To improve physical endurance, flexibility, coordination, and mental fitness.
- To encourage teamwork, discipline, leadership, and sportsmanship qualities.
- To create awareness about health, nutrition, and wellness practices.

Course Outcome

CO1	Understand the importance of physical fitness, sports, and healthy lifestyle practices.	K2
CO2	Perform basic physical exercises and fitness activities effectively.	K3
CO3	Demonstrate participation in sports and recreational activities with discipline and teamwork.	K2
CO4	Apply health, hygiene, nutrition, and wellness practices for physical well-being.	K4
CO5	Develop leadership qualities, sportsmanship, and positive attitude through physical education activities.	K3

LIST OF ACTIVITIES

1. Introduction to physical fitness, health awareness, and importance of physical education.
2. Warm-up exercises, stretching, and flexibility training.
3. Physical fitness exercises for endurance, strength, and coordination.
4. Practice sessions in athletics – running, relay, jumping, and basic field events.
5. Training in indoor and outdoor sports activities.
6. Team games and recreational activities for teamwork and leadership development.
7. Yoga, breathing exercises, and relaxation techniques for mental wellness.
8. Awareness programme on nutrition, hygiene, and healthy lifestyle practices.
9. Participation in sports events, fitness competitions, and physical training drills.
10. Physical fitness assessment, activity record submission, and performance evaluation.

GUIDELINES

1. Students shall actively participate in all physical education and sports activities.
2. Proper sports attire and discipline shall be maintained during training sessions.
3. Students shall follow safety measures and instructor guidelines during physical activities.

4. Participation in fitness assessments, sports events, and wellness programmes is mandatory.
5. Students shall maintain an activity record / fitness logbook throughout the course.
6. Attendance and regular participation are essential for successful completion of the course.

Reference

1. Physical Education and Sports Training Manuals.
2. Ministry of Youth Affairs and Sports – Fitness Guidelines.
3. Yoga and Wellness Practice Handbooks.
4. Health and Nutrition Awareness Materials.

Web / NPTEL Resources

1. https://yas.nic.in/
2. https://fitindia.gov.in/
3. https://nptel.ac.in/
4. https://www.who.int/health-topics/physical-activity

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	2	2	-	-	-	2	3	3	1	2	2
CO2	2	3	2	2	-	-	-	2	3	3	1	2	2
CO3	2	3	2	2	-	-	-	2	3	3	1	2	2
CO4	2	3	2	2	-	-	-	2	3	3	1	2	2
CO5	2	3	2	2	-	-	-	2	3	3	1	2	2

Assessment Methodology

Assessment Methodology	Assessment Tools	Marks
Participation and Performance	Physical Activities / Sports Participation / Fitness Training	40
Physical Fitness Evaluation	Endurance, Flexibility, and Skill Assessment	30
Activity Record / Fitness	Logbook Documentation and Reflection	20
Discipline and Attendance	Regularity, Conduct, and Team Participation	10
	Total	100

SEMESTER – II

MAC26201	*PDE & TRANSFORMS*	CATEGORY	L	T	P	SL	CREDIT
		BSC	3	1	0	6	4

Course Prerequisite / Preamble
• Basic knowledge of Engineering Mathematics – I, calculus, differential equations, and complex numbers. • Understanding of integration, matrices, and elementary transforms. • This course is designed to provide students with mathematical tools required for solving engineering problems involving complex variables, Laplace transforms, inverse Laplace transforms, and Fourier transforms. The course develops analytical and problem-solving skills for applications in engineering systems, signal processing, heat transfer, fluid mechanics, and control systems.

Course Objective
• To formulate and solve problems involving analytic functions and conformal mappings. • To understand and apply Taylor and Laurent series expansions for complex functions. • To understand Laplace transforms and their properties. • To apply Laplace transforms in solving ordinary differential equations and simultaneous differential equations. • To understand and apply Fourier transform techniques and their engineering applications.

CO	COURSE OUTCOME	K LEVEL
CO1	Apply the concepts of analytic functions, Cauchy–Riemann equations, harmonic functions, and construction of analytic functions in solving complex variable problems.	K3
CO2	Analyze conformal and bilinear transformations, perform Taylor and Laurent series expansions, and classify singularities of complex functions.	K4
CO3	Understand the Laplace transform and its properties for engineering applications.	K3
CO4	Apply Laplace transforms to solve ordinary differential equations with constant coefficients and simultaneous ordinary differential equations.	K4
CO5	Understand and apply Fourier transform techniques including Fourier integral theorem, convolution, and Parseval's identity.	K4

SYLLABUS		
UNIT I	**Derivatives**	**(12)**

Continuity, derivative and analytic functions – Necessary conditions – Cauchy Riemann equations (Cartesian and polar form) and sufficient conditions (excluding proof) – Harmonic and orthogonal properties of analytic function – Construction of analytic functions.

UNIT II	Complex Functions	(12)

Conformal mapping – Simple and standard transformations like $w = z + c, cz, z^2, e^z, \sin z, \cosh z$and $z + \frac{1}{z}$– Bilinear transformation and cross ratio property (excluding Schwarz-Christoffel transformation). Taylor's and Laurent's theorem (without proof) – Series expansion of complex valued functions – Classification of singularities.

UNIT III	Transformations	(12)

Existence conditions – transforms of elementary functions – properties – transform of unit step function and unit impulse function – transforms of derivatives and integrals – transforms of periodic functions – initial and final value theorems. Inverse Laplace transforms – properties – convolution theorem – application to solution of ordinary differential equations with constant coefficients and simultaneous ordinary differential equations.

UNIT IV	Fourier	(12)

Fourier Integral theorem (statement only) – Fourier transform and its inverse – Fourier sine and cosine transforms – properties of Fourier transforms – convolution and Parseval's identity.

UNIT V	Laplace	(12)

Applications of Laplace and Fourier transforms in engineering problems – heat transfer analysis – vibration systems – electrical circuits – signal processing – boundary value problems.

Text Books

1. Veerarajan T., *Engineering Mathematics for First Year*, Tata McGraw Hill, 2010.
2. Venkataraman M.K., *Engineering Mathematics, Vol. II & III*, National Publishing Company, Chennai, 2012.
3. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, Delhi, 2007.

Reference

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 7th Edition, Wiley India, 2007.
2. Bali N.P. and Manish Goyal, *Text Book of Engineering Mathematics*, 3rd Edition, Laxmi Publications Pvt. Ltd., 2008.
3. Grewal B.S., *Higher Engineering Mathematics*, 40th Edition, Khanna Publishers, Delhi, 2007.

Web / NPTEL Resources

1. NPTEL – Advanced Engineering Mathematics: https://nptel.ac.in
2. MIT OpenCourseWare – Differential Equations and Linear Algebra: https://ocw.mit.edu
3. Khan Academy – Laplace and Fourier Transforms: https://www.khanacademy.org

CO PO Mapping													
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	-	-	-	-	-	-	-	-	-	2	1
CO2	3	3	-	1	-	-	-	-	-	-	-	2	1
CO3	3	2	1	-	-	-	-	-	-	-	-	2	1
CO4	3	3	2	1	-	-	-	-	-	-	-	2	1
CO5	3	3	2	2	-	-	-	-	-	-	-	2	2

Assessment Methodology		
Assessment Methodology	**Assessment Tools**	**Marks**
CAT I	Written Examination	30
CAT II		
CAT III		
Continuous Assessment	Assignment / Activities	5
Attendance	Based on course wise attendance percentage	5
Total		**40**

UHC26202	UNIVERSAL HUMAN VALUES	CATEGORY	L	T	P	SL	CREDIT
		HSM	3	0	0	3	3

Course Objective

- To understand the significance of human values and ethical behavior.
- To develop self-awareness and harmony in individual and social life.
- To inculcate professional ethics and social responsibility among students.
- To create awareness about sustainable living and environmental harmony.
- To promote holistic development for responsible citizenship and professional practice

Course Outcome

CO	Course Outcome	K LEVEL
CO1	Understand the importance of human values and ethical principles.	(K2)
CO2	Apply self-exploration methods for personal development and harmony.	(K3)
CO3	Analyze the role of relationships, family, and society in human life.	(K4)
CO4	Interpret professional ethics and social responsibilities in engineering practice.	(K4)
CO5	Evaluate sustainable living practices for harmony with nature and society.	(K5)

Syllabus

Unit 1	**INTRODUCTION TO HUMAN VALUES**	**(9)**
Need, basic guidelines, and content of value education – Self-exploration – Happiness and prosperity – Harmony in the human being – Understanding human aspirations – Continuous happiness and sustainable living – Right understanding, relationship, and physical facilities.		
Unit 2	**HARMONY IN THE FAMILY AND SOCIETY**	**(9)**
Family as the basic unit of human interaction – Values in relationships – Trust and respect – Understanding harmony in family – Justice in relationships – Human relationships and society – Role of education and culture in social harmony.		
Unit 3	**PROFESSIONAL ETHICS AND HUMAN VALUES**	**(9)**
Professional ethics – Engineering ethics – Ethical responsibilities of engineers – Integrity and accountability – Respect for human rights – Leadership qualities – Workplace ethics – Case studies on ethical dilemmas in professional life.		
Unit 4	**ENVIRONMENT AND SUSTAINABILITY**	**(9)**
Harmony with nature – Ecological balance – Environmental pollution and control – Sustainable development – Conservation of natural resources – Climate change and environmental ethics – Individual responsibility towards environment protection.		
Unit 5	**HOLISTIC HUMAN DEVELOPMENT**	**(9)**

Holistic perception of harmony – Health and happiness – Social responsibility – Universal human order – Peace and coexistence – Humanistic education – Role of technology in societal development – Vision for a humane and sustainable society.

Text Books:
1. R.R. Gaur, R. Sangal and G.P. Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books. 2. A.N. Tripathi, Human Values, New Age International Publishers. 3. M. Govindarajan, Professional Ethics and Human Values, PHI Learning. 4. B.S. Nagarajan, Human Values and Professional Ethics, Scitech Publications.

CO-PO Mapping													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	2	-	-	-	2	2	3	1	1	-	1	1
CO2	2	2	1	-	-	2	2	3	2	1	-	1	1
CO3	2	3	1	1	-	3	2	3	2	2	-	1	1
CO4	2	3	2	1	1	3	2	3	2	2	1	1	1
CO5	2	2	1	2	1	3	3	3	2	2	1	1	2

Assessment Methodology		
Assessment Methodology	**Assessment Tools**	**Marks**
CAT I	Written Examination	30
CAT II		
CAT III		
Continuous Assessment	Assignment / Activities	5
Attendance	Based on course wise attendance percentage	5
Total		**40**

CSC26203	PROBLEM SOLVING AND PYTHON PROGRAMMING	CATEGORY	L	T	P	SL	CREDIT
		ESC	3	0	0	4	3

Course Prerequisite / Preamble
• Basic understanding of computers, logical reasoning, and programming fundamentals. • This course provides the foundation for developing problem-solving skills and programming applications using Python.
Course Outcome
• To understand the fundamentals of Python programming language. • To apply decision-making and looping concepts in problem solving. • To develop modular programming skills using functions and modules. • To learn Python data structures and file handling techniques. • To implement object-oriented programming concepts using Python.

Syllabus		
Unit 1	**INTRODUCTION TO PYTHON**	**(9)**
Introduction to Python – Features of Python – Installation and execution – Variables and data types – Input and output statements – Operators and expressions – Type conversion – Python programming examples.		
Unit 2	**DECISION MAKING AND LOOPING**	**(9)**
Conditional statements – if, if-else, nested if – Looping statements – for loop, while loop – break, continue, pass statements – Pattern generation – Problem solving using loops.		
Unit 3	**FUNCTIONS AND MODULES**	**(9)**
Functions – Function arguments – Return values – Lambda functions – Recursive functions – Modules and packages – Import statements – Python standard libraries.		
Unit 4	**DATA STRUCTURES AND FILE HANDLING**	**(9)**
Strings – Lists – Tuples – Dictionaries – Sets – File operations – Reading and writing files – Exception handling – Applications using data structures and files.		
Unit 5	**OBJECT ORIENTED PROGRAMMING IN PYTHON**	**(9)**
Classes and objects – Constructors – Inheritance – Polymorphism – Encapsulation – Method overloading and overriding – Simple applications using Python.		

Text Books
1. Reema Thareja, Python Programming using Problem Solving Approach, Oxford University Press. 2. Y. Daniel Liang, Introduction to Programming using Python, Pearson Education. 3. Paul Deitel and Harvey Deitel, Python for Programmers, Pearson Publications.
Reference
1. Mark Lutz, Learning Python, O'Reilly Publications. 2. Allen B. Downey, Think Python, Green Tea Press.

3. Kenneth A. Lambert, Fundamentals of Python, Cengage Learning.

CO PO Mapping													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	-	-	1	-	-	-	-	-	-	2	1
CO2	3	3	1	-	1	-	-	-	-	-	-	2	1
CO3	3	3	2	1	1	-	-	-	-	-	-	2	2
CO4	3	3	2	1	2	-	-	-	-	-	-	2	2
CO5	3	3	3	2	2	-	-	-	-	-	-	2	2

Assessment Methodology		
Assessment Methodology	**Assessment Tools**	**Marks**
CAT I	Written Examination	30
CAT II		
CAT III		
Continuous Assessment	Assignment / Activities	5
Attendance	Based on course wise attendance percentage	5
Total		**40**

BET26204	BIOLOGY FOR ELECTRONIC ENGINEERS	CATEGORY	L	T	P	SL	CREDIT
		BSC	3	0	0	3	3

Course Prerequisite / Preamble
• Basic knowledge of school-level biology and chemistry. • Fundamental understanding of physics, electricity and electronics. • Basic knowledge of signals and systems is desirable but not mandatory. • Interest in interdisciplinary applications of biology and engineering. • Prior knowledge of biotechnology or biomedical engineering is required.
Course Objective
• To introduce the fundamental concepts of biology relevant to engineering students. • To understand the structure and functions of cells, biomolecules, genetics and biological systems. • To introduce biological mechanisms that can be utilized using engineering principles. • To familiarize students with biosensors, bioelectronics and biomedical instrumentation. • To develop an interdisciplinary perspective for applying electronics and electrical engineering concepts to healthcare and biological systems.

Course Outcome		
On the successful completion of the course, students will be able to:		
CO1	Explain the fundamental organization of living systems, cells and biomolecules.	K2
CO2	Describe biological processes, genetics, molecular biology and physiological systems.	K2
CO3	Explain the principles of biological sensing, neural communication and bio-signals.	K3
CO4	Analyze the basic principles of biosensors, bioelectronics and biomedical instrumentation.	K4
CO5	Apply biological principles to develop concepts for electronic, electrical and healthcare engineering applications.	K3

Syllabus		
Unit 1	**FUNDAMENTALS OF LIFE AND CELL BIOLOGY**	**(9)**
Introduction to Biology for Engineers – Characteristics of Living Organisms – Levels of Biological Organization – Classification of Living Systems – Cell as the Basic Unit of Life – Cell Theory – Prokaryotic and Eukaryotic Cells – Structure and Functions of Cell Organelles – Cell Membrane – Nucleus – Mitochondria – Ribosomes – Cell Division: Mitosis and Meiosis		
Unit 2	**BIOMOLECULES, METABOLISM AND GENETICS**	**(9)**
Biological Molecules – Carbohydrates – Lipids – Proteins – Amino Acids – Protein Structure – Enzymes and Enzyme Action – Nucleic Acids – DNA and RNA – Structure and Functions of DNA – Genes and		

Chromosomes – Mendelian Genetics – Genetic Information – DNA Replication – Transcription – Translation – Genetic Code.		
Unit 3	**HUMAN BIOLOGY, BIO-SIGNALS AND NEURAL SYSTEMS**	**(9)**
Basic Human Physiology – Nervous System – Neurons and Synapses – Generation and Propagation of Nerve Impulses – Brain and Spinal Cord – Sensory Systems – Vision and Hearing – Muscular System – Cardiovascular System – Respiratory System – Circulatory System –Electrical Activity of the Heart – Electrical Activity of the Brain – Introduction to ECG, EEG and EMG Signals.		
Unit 4	**BIOSENSORS, BIOELECTRONICS AND BIOMEDICAL INSTRUMENTATION**	**(9)**
Introduction to Biosensors – Bioreceptors and Transducers – Enzyme Biosensors – Immunosensors – DNA-Based Biosensors – Electrochemical Biosensors – Optical Biosensors – Piezoelectric Biosensors – Semiconductor-Based Biosensors –Biomedical Electrodes – Basic Biomedical Instrumentation – Pulse Oximeter – Blood Pressure Measurement – Glucose Monitoring Systems.		
Unit 5	**BIO-INSPIRED ELECTRONICS AND EMERGING APPLICATIONS**	**(9)**
Biological Neural Networks – Artificial Neurons – Introduction to Neuromorphic Engineering – Brain-Computer Interface (BCI) – Wearable and Implantable Electronics – Smart Healthcare Devices – Telemedicine – Biomedical Signal Processing – AI in Healthcare– Electronic Skin (E-Skin) – Prosthetic and Assistive Electronics		

Text Books:

1. Arthur T. Johnson, *Biology for Engineers*, CRC Press, 2011
2. Leslie Cromwell, *Biomedical Instrumentation*, Prentice Hall, **2011**.
3. S. Thyagarajan, N. Selvamurugan, M.P. Rajesh, R.A. Nazeer, W. Thilagaraj, S. Barathi and M.K. Jaganthan, *Biology for Engineers*, Tata McGraw-Hill, New Delhi, **2012**.

Reference:

1. Ibrahim D. Ozbolat, *3D Bioprinting: Fundamentals, Principles and Applications*, Academic Press, 2016.
2. Yoseph Bar-Cohen, *Biomimetics: Nature-Based Innovation*, CRC Press, 1st Edition, 2012.
3. tuart Fox and Krista Rompolski, *Human Physiology*, McGraw-Hill, 16th Edition, 2022.

Web / NPTEL Resources:

1. https://onlinecourses.nptel.ac.in/noc25_bt05/preview?utm_source=chatgpt.com.
2. https://www.nptel.ac.in/courses/102101068?utm_source=chatgpt.
3. https://nptel.ac.in/courses/121106008?utm_source=chatgpt.com.

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	–	–	2	1	1	–	–	–	1	1
CO2	3	3	1	1	–	2	1	1	–	–	–	1	1
CO3	3	3	2	2	2	2	1	1	1	1	–	2	2
CO4	3	3	3	3	3	2	1	2	2	1	1	3	3
CO5	2	3	3	2	3	2	2	2	3	2	2	3	3

Assessment Methodology		
Assessment Methodology	**Assessment Tools**	**Marks**
CAT I	Written Examination	30
CAT II		
CAT III		
Continuous Assessment	Assignment / Activities	5
Attendance	Based on course wise attendance percentage	5
Total		**40**

EET26205	*INTRODUCTION OF EV TECHNOLOGY*	**CATEGORY**	**L**	**T**	**P**	**SL**	**CREDIT**
		ESC	3	0	0	3	3

Course Prerequisite / Preamble

- Basic knowledge of Physics and Mathematics.
- Understanding of fundamental electrical and electronic concepts.
- Knowledge of basic electrical circuits, energy and power concepts.
- This course introduces the fundamentals of electric vehicles, their major components, batteries, charging systems, regenerative braking, safety and environmental aspects.
- The course provides foundational knowledge required for further study and applications in electric mobility.

Course Objective

- To understand the fundamental concepts, need, evolution and types of electric vehicles.
- To identify the major components and explain the basic working principle and energy flow of an electric vehicle.
- To understand EV batteries, battery terminology, battery types, charging/discharging and basic battery management systems.
- To introduce EV charging methods, regenerative braking, solar-powered charging and basic energy management.
- To understand electrical and battery safety, environmental benefits, recycling, charging infrastructure and future trends in electric mobility.

Course Outcome

On the successful completion of the course, students will be able to:

CO1	Explain the need, evolution, types, advantages, limitations and applications of electric vehicles.	K2
CO2	Identify the major components of an electric vehicle and explain its basic working principle and energy flow.	K2
CO3	Explain EV battery terminology, battery types, battery packs, charging/discharging, battery life and the basic functions of a BMS.	K2
CO4	Explain EV charging methods, regenerative braking, solar-powered charging and basic energy management concepts.	K2
CO5	Describe EV safety, environmental benefits, battery recycling, charging infrastructure, Indian EV initiatives and emerging trends in electric mobility.	K2

Syllabus

Unit 1	**INTRODUCTION TO ELECTRIC VEHICLES**	**(9)**

Introduction to Electric Vehicles – Need for Electric Vehicles – Evolution of Electric Vehicles – Conventional Vehicles and Electric Vehicles – Types of Electric Vehicles such as Battery Electric Vehicle (BEV), Hybrid Electric Vehicle (HEV), Plug-in Hybrid Electric Vehicle (PHEV) and Fuel Cell Electric Vehicle (FCEV) – Advantages and limitations of Electric Vehicles – Applications of Electric Vehicles.

Unit 2	**BASIC COMPONENTS OF AN ELECTRIC VEHICLE**	**(9)**

Basic Electric Vehicle Block Diagram – Major Components of an Electric Vehicle – Battery – Electric Motor – Motor Controller – Power Converter – Charger – Transmission – Accelerator and Braking System – Basic Working Principle of an Electric Vehicle – Energy Flow in an Electric Vehicle.

Unit 3	**EV BATTERY AND ENERGY STORAGE**	**(9)**

Introduction to EV Batteries – Basic Battery Terminology such as Voltage, Current, Capacity and Energy – Types of Batteries – Lead-Acid Battery – Lithium-Ion Battery – Lithium Iron Phosphate Battery – Battery Pack – Battery Charging and Discharging – Battery Life – Introduction to Battery Management System (BMS) – Basic Battery Safety.

Unit 4	**EV CHARGING AND REGENERATIVE BRAKING**	**(9)**

Introduction to EV Charging – Need for Charging – Types of EV Charging – Slow Charging and Fast Charging – AC and DC Charging – Home and Public Charging Stations – Basic EV Charging Process – Introduction to Regenerative Braking – Energy Recovery During Braking – Solar-Powered EV Charging – Basic Concept of Energy Management in Electric Vehicles.

Unit 5	**EV SAFETY, ENVIRONMENT AND FUTURE**	**(9)**

Electrical Safety in Electric Vehicles – Battery Safety and Fire Safety – Environmental Benefits of Electric Vehicles – Reduction of Air Pollution – Battery Recycling – EV Charging Infrastructure – Electric Vehicles in India – Basic Overview of Government Initiatives for Electric Mobility – Future of Electric Vehicles – Smart and Connected Electric Vehicles – Emerging Trends in Electric Mobility.

Text Books:

1. Electric Vehicle Technology Explained, James Larminie and John Lowry, Wiley.
2. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao and Ali Emadi, CRC Press.
3. Electric Vehicle Technology, James D. Halderman, Pearson.

Reference:
1. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design – Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, CRC Press. 2. Electric Vehicle Engineering – Jack Erjavec and Jeff Arias, Cengage Learning. 3. Battery Management Systems for Large Lithium-Ion Battery Packs – Davide Andrea, Artech House. 4. Electric Vehicle Technology – Dr. S. S. Thakur, relevant academic reference text for EV fundamentals and applications.
Web / NPTEL Resources:
1. NPTEL Course – Fundamentals of Electric Vehicles 2. NPTEL Course – Electric Vehicles Part 1 3. NPTEL Course – Electric Vehicles and Renewable Energy 4. NPTEL Course – Introduction to Hybrid and Electric Vehicles 5. NPTEL Course – EV Components, Charging Infrastructure and Grid Integration

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	-	2	2	-	-	-	2	1
CO2	3	2	3	1	2	-	-	-	-	-	-	2	1
CO3	3	2	2	1	2	-	2	-	-	-	-	3	2
CO4	3	2	3	2	2	-	2	-	-	-	-	3	2
CO5	3	2	2	1	2	2	3	2	-	-	-	2	2

Assessment Methodology		
Assessment Methodology	**Assessment Tools**	**Marks**
CAT I	Written Examination	30
CAT II		
CAT III		
Continuous Assessment	Assignment / Activities	5
Attendance	Based on course wise attendance percentage	5
Total		**40**

CSL26201	***PYTHON PROGRAMMING LABORATORY***	**CATEGORY**	**L**	**T**	**P**	**SL**	**CREDIT**
		ESC	0	0	2	3	1.5

Course Prerequisite / Preamble
• Basic programming language concepts and logic building. • This laboratory course introduces students to problem solving using Python programming language. • The course emphasizes hands-on programming skills through real-life, scientific, and technical applications. • Students gain knowledge in Python syntax, control structures, functions, file handling, exception handling, modules, libraries, and game development using Pygame. • The course enables students to develop logical thinking, computational skills, and programming proficiency for engineering applications.
Course Objective
• To develop applications using Python programming concepts and standard libraries. • To develop problem-solving ability using conditional statements and iterative loops. • To implement functions, strings, modules, and file handling techniques in Python. • To demonstrate exception handling and real-time programming applications. • To explore Pygame tool for developing interactive gaming applications.

CO	**COURSE OUTCOME**	**K LEVEL**
CO1	Develop applications for simple real-life problems using Python.	K3
CO2	Write programs using Python statements, expressions, conditionals, and iterative loops.	K3
CO3	Write programs by implementing functions, strings, and Python standard libraries.	K3
CO4	Demonstrate applications by dealing with exceptions and file handling.	K4
CO5	Explore Pygame tool by developing an interactive gaming application.	K5

Exp. No.	Title	Description / Problem Statements	CO
Ex.1	Real-Life / Scientific / Technical Problems	Identification and solving of simple real-life or scientific or technical problems – Electricity Billing, Retail Shop Billing, Sin Series, etc.	CO1
Ex.2	Simple Statements and Expressions	Python programming using simple statements and expressions – exchange values of two variables, circulate values of n variables, distance between two points.	CO2
Ex.3	Conditionals and Iterative Loops	Scientific problems using conditionals and iterative loops – Number Series, Number Patterns, Pyramid Pattern.	CO2
Ex.4	Lists and Tuples	Implementing real-time / technical applications using Lists and Tuples.	CO2
Ex.5	Sets and Dictionaries	Implementing real-time / technical applications using Sets and Dictionaries – language components, automobile elements, civil structure elements; operations of Sets & Dictionaries.	CO2
Ex.6	Functions	Implementing programs using Functions – Factorial, largest number in a list, area of shapes.	CO3
Ex.7	Strings	Implementing programs using Strings – reverse, palindrome check, character count, replacing characters.	CO3
Ex.8	Modules and Python Standard Libraries	Implementing programs using written modules and Python Standard Libraries – Pandas, NumPy, Matplotlib, SciPy.	CO3
Ex.9	File Handling	Implementing real-time / technical applications using File Handling – copy from one file to another, word count, longest word.	CO4
Ex.10	Exception Handling	Implementing real-time / technical applications using Exception Handling – divide by zero error, voter's age validity, student mark range validation.	CO4
Ex.11	Pygame – Gaming Application	Exploring Pygame tool; developing a game activity using Pygame – bouncing ball, car race, etc.	CO5

Total Hours: 45

Text Books
1. Allen B. Downey, *Think Python: How to Think Like a Computer Scientist*, 2nd Edition, O'Reilly Media, 2015. 2. Mark Lutz, *Learning Python*, 5th Edition, O'Reilly Media, 2013. 3. Wesley J. Chun, *Core Python Applications Programming*, 3rd Edition, Prentice Hall, 2012.
Reference
1. Guido van Rossum, Python Reference Manual – https://docs.python.org/3/ 2. Bill Lubanovic, Introducing Python: Modern Computing in Simple Packages, O'Reilly Media, 2019. 3. Wes McKinney, Python for Data Analysis, 3rd Edition, O'Reilly Media, 2022.
Web / NPTEL Resources
1. NPTEL – Programming, Data Structures and Algorithms using Python, IIT Madras: https://nptel.ac.in/courses/106106145 2. Python Official Documentation & Tutorials: https://docs.python.org/3/tutorial/ 3. Pygame Official Documentation: https://www.pygame.org/docs/

CO PO Mapping													
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	2	1	-	1	-	-	2	1	-	3	2
CO2	3	3	2	1	-	-	-	-	2	-	-	3	2
CO3	3	3	2	2	-	-	-	-	2	1	-	3	3
CO4	3	2	2	3	1	-	-	-	1	1	-	3	2
CO5	2	2	3	2	2	1	-	-	2	1	-	3	2

Evaluation Criteria	**Assessment Methodology**	**Marks**
Observation and Record	Regular lab Observation and Record writing and timely submission	20
Model Practical Test	Internal Practical Test	15
Continuous Laboratory Performance	Lab Performance, Experiment completion	10
Vivo -Voce	Oral question during lab sessions	5
Attendance	Based on laboratory attendance percentage	10
	Total	60

MEL26202	ENGINEERING WORSHOP LABORATORY	CATEGORY	L	T	P	SL	CREDIT
		ESC	0	0	2	3	1.5

Course Prerequisite / Preamble
• This laboratory course provides hands-on experience in fundamental workshop practices including electrical wiring, welding, and fitting operations. It develops practical skills essential for every engineer to understand manufacturing and installation processes

Course Objective
• To develop practical skills in electrical wiring and installation techniques.
• To familiarize students with welding processes and safety practices.
• To train students in fitting operations including marking, chipping, filing and drilling.
• To enable students to use hand tools and measuring instruments safely and effectively.
• To promote team work, safety awareness and professional work habits in a workshop environment.

Course Outcome		
On the successful completion of the course, students will be able to:		
CO1	Perform basic electrical wiring tasks including one-way, two-way switching circuits and plug point connections.	**K3**
CO2	Execute arc welding and gas welding operations on mild steel specimens with proper safety precautions.	**K3**
CO3	Carry out fitting operations including marking, filing, chipping, sawing and drilling to required dimensions.	**K3**
CO4	Use measuring instruments and test equipment to verify dimensions and electrical parameters.	**K4**
CO5	Apply safety standards and proper use of personal protective equipment during workshop operations.	**K3**

Syllabus
1. Wiring of one lamp controlled by one switch
2. Wiring of two lamps controlled by two-way switches (staircase wiring)
3. Wiring of fluorescent lamp with electronic ballast
4. Wiring of a three-pin plug point and socket outlet
5. Wiring of a simple distribution board with MCB
6. Earthing connection – Pipe earthing demonstration

7. Testing of wiring circuits using Megger and multimeter
8. Arc welding – Butt joint on mild steel plates
9. Arc welding – Lap joint on mild steel plates
10. Arc welding – T-joint on mild steel plates
11. Oxy-acetylene gas welding – Butt joint (demonstration)
12. Safety practices in welding – Identification and use of PPE
13. Study of fitting tools – Files, chisels, hammers, hacksaw, try square
14. Filing exercise – Preparation of a flat surface to required dimensions
15. Chipping exercise on mild steel block
16. Sawing – Cutting of mild steel rod/bar
17. Drilling and Tapping – Making holes and threads on mild steel plate
18. Assembly fitting – Square fitting using male-female joints

Text Books:

1. S.K. Hajra Choudhury, A.K. Hajra Choudhury, N. Roy, "Elements of Workshop Technology Vol. I", Media Promoters & Publishers, 2020.
2. R.S. Khurmi, "A Textbook of Workshop Technology", S. Chand Publications, 2019.
3. J.B. Gupta, "Electrical Wiring, Estimating and Costing", S.K. Kataria & Sons, 2019.

Reference:

1. IS 818:1968 – Code of Practice for Safety and Health Requirements in Electric and Gas Welding, BIS.
2. NSQF Level 4 – Electrician Trade Theory, NIMI, 2020.
3. H.S. Bawa, "Workshop Technology", Tata McGraw-Hill, 2018.

Web / NPTEL Resources:

1. NPTEL – Manufacturing Processes – I, IIT Kharagpur: https://nptel.ac.in/courses/112105141
2. Virtual Labs – Workshop Practice, IIT Bombay: https://vlab.co.in
3. SWAYAM – Basic Workshop Practices: https://swayam.gov.in

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1	2	2	2	1	2	1	2	3	2	1
CO2	2	3	2	3	2	2	2	2	1	2	2	2	1
CO3	2	3	2	3	1	2	2	2	1	2	2	2	1
CO4	3	2	3	3	1	1	1	2	1	2	2	2	2

CO5	1	2	1	2	3	3	2	2	1	2	2	2	1

Evaluation Criteria	**Assessment Methodology**	**Marks**
Observation and Record	Regular lab Observation and Record writing and timely submission	20
Model Practical Test	Internal Practical Test	15
Continuous Laboratory Performance	Lab Performance, Experiment completion	10
Vivo -Voce	Oral question during lab sessions	5
Attendance	Based on laboratory attendance percentage	10
	Total	60

DTL26203	DESIGN THINKING AND IDEA LABORATORY	CATEGORY	L	T	P	SL	CREDIT
		ESC	0	0	2	3	1.5

Course Prerequisite / Preamble
• This laboratory introduces students to the basic steps of Design Thinking and simple idea development. • Students gain hands-on practice in identifying problems, generating ideas, making simple prototypes, testing solutions, and presenting results.
Course Objective
• To understand the basic principles and stages of Design Thinking. • To identify user needs and define simple engineering or societal problems. • To generate and select useful ideas using simple ideation methods. • To develop and test basic prototypes or models. • To improve teamwork, communication, and presentation skills.

Course Outcome		
CO1	Understand the basic principles and stages of Design Thinking.	**K2**
CO2	Identify user needs and define simple problems using basic design tools.	**K3**
CO3	Generate and select suitable ideas using simple ideation techniques.	**K3**
CO4	Develop and test a basic prototype for a selected problem.	**K4**
CO5	Demonstrate teamwork, communication, and presentation skills through an idea-based project.	**K4**

Syllabus	
UNIT I – DESIGN THINKING BASICS	(6 Hours)
1. Introduction to Design Thinking and innovation process.	
2. Observation, empathy, and user needs – simple empathy map.	
3. Problem identification and problem statement.	
UNIT II – IDEATION AND CONCEPT DEVELOPMENT	(6 Hours)
1. Brainstorming and mind mapping for idea generation.	
2. Idea screening and selection based on usefulness and feasibility	

3. Concept sketching and simple solution planning.
UNIT III – PROTOTYPING AND TESTING (6 Hours)
1. Low-cost prototype development using paper, cardboard, foam, or simple digital models.
2. Prototype testing and collection of user feedback.
3. Iteration and improvement of the prototype.
UNIT IV – IDEA LABORATORY PROJECT (6 Hours)
1. Select an engineering or societal problem and prepare an idea proposal.
2. Develop and document a simple model or demonstration prototype.
3. Demonstrate the project and present the outcome with viva voce.
UNIT V – INNOVATION AND PRESENTATION (6 Hours)
1. Simple product improvement and sustainable idea development.
2. Idea communication using poster, pitch, or storyboard.
3. Final presentation and peer evaluation.
Text Books:
1. Tim Brown, Change by Design, Harper Business Publications. 2. Vijay Kumar, 101 Design Methods, Wiley Publications. 3. Idris Mootee, Design Thinking for Strategic Innovation, Wiley Publications.
Reference:
1. 1. Peter Rowe, Design Thinking, MIT Press. 2. Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Bloomsbury Publications. 3. Roger Martin, The Design of Business, Harvard Business Review Press.
Web / NPTEL Resources:
1. https://nptel.ac.in/courses/110106124 2. https://www.ideou.com/ 3. https://www.interaction-design.org/

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1	1	1	-	-	-	2	2	-	1	1
CO2	2	3	2	2	1	-	-	-	2	2	-	1	1
CO3	3	3	3	2	2	-	1	-	2	2	1	2	2
CO4	3	3	3	3	2	-	1	-	2	2	1	2	2
CO5	2	2	2	2	1	1	-	1	3	3	-	1	1

Evaluation Criteria	**Assessment Methodology**	**Marks**
Observation and Record	Regular lab Observation and Record writing and timely submission	20
Model Practical Test	Internal Practical Test	15
Continuous Laboratory Performance	Lab Performance, Experiment completion	10
Vivo -Voce	Oral question during lab sessions	5
Attendance	Based on laboratory attendance percentage	10
	Total	60

CDC26201	CAREER DEVELOPMENT SKILL-II (EMBEDDED SYSTEM)	CATEGORY	L	T	P	CREDIT
		CDS	0	0	2	1

Course Prerequisite / Preamble
• The students should possess a basic understanding of digital electronics, electronic circuits, microprocessors and microcontrollers, electrical measurements, and programming in the C language. • Familiarity with logic design, memory organization, input/output interfacing, and fundamental hardware–software integration concepts will enable students to effectively learn embedded system architecture, programming, real-time applications, and embedded solutions for electrical and industrial automation systems.

Course Objective
• Understand the fundamentals and architecture of embedded systems. • Learn microcontroller and processor-based embedded system design. • Develop embedded software using Embedded C. • Interface sensors, actuators, and communication modules with embedded platforms. • Design real-time embedded applications for electrical engineering systems.

Course Outcome		
On the successful completion of the course, students will be able to:		
CO1	Explain the architecture and characteristics of embedded systems.	K2
CO2	Apply embedded C programming for microcontroller-based applications.	K3
CO3	Interface sensors, actuators, and communication peripherals with embedded platforms.	K2
CO4	Develop real-time applications using RTOS concepts.	K2
CO5	Design embedded solutions for electrical and industrial automation systems.	K2

Syllabus		
Unit 1	**Introduction to Embedded Systems**	**(12)**
Introduction and classification of embedded systems - Characteristics and applications of embedded systems - Embedded system design flow - Hardware and software components of embedded systems - Real-time systems and performance requirements		
Unit 2	**Embedded Hardware Architecture**	**(12)**
Microcontrollers and Microprocessors - ARM Cortex architecture overview - Memory systems: ROM, RAM, Flash memory - Timers, Counters, Interrupts - ADC, DAC and PWM modules - Sensors and Actuators interfacing		

Unit 3	Embedded Programming and Interfacing	(12)
Embedded C programming fundamentals - GPIO programming - Interrupt handling - Serial communication protocols: UART, SPI, I²C, CAN Bus, Device driver concepts		
Unit 4	**Real Time Operating Systems (RTOS)**	**(12)**
Introduction to RTOS, Tasks - Threads and Processes - Scheduling algorithms - Inter-task communication - Semaphores and Mutexes - Real-time application development using Free RTOS		
Unit 5	**Embedded Applications in Electrical Engineering**	**(12)**
Smart Energy Metering Systems - Motor Control Applications - Industrial Automation and PLC Integration - IoT-based Monitoring and Control Systems - Renewable Energy Monitoring Systems - Electric Vehicle Embedded Control Systems		

Text Books

1. Embedded Systems: Architecture, Programming and Design – Raj Kamal, McGraw Hill.
2. Introduction to Embedded Systems – Tata McGraw Hill.
3. Embedded System Design – Wiley India.

Reference

1. Embedded Systems Architecture – Elsevier.
2. Embedded Microcomputer Systems: Real-Time Interfacing – Cengage Learning.
3. Computers as Components – Morgan Kaufmann.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	2	-	-	-	-	-	-	1
CO2	3	3	2	1	3	-	-	-	-	-	-	1
CO3	3	3	3	2	3	-	-	-	-	1	-	1
CO4	3	3	3	3	3	-	-	-	1	1	-	2
CO5	3	3	3	3	3	1	2	-	2	2	1	2

Assessment Methodology

Assessment Methodology	Assessment Tools	Marks
Continuous Internal Assessment	Observation / Record Work / Viva Voce	30
Internal Practical Examination	Laboratory Performance	30
End Semester Practical Examination	Experiment and Viva Voce	40
	Total	100

PEC26201	PHYSICAL EDUCATION (NATIONAL SOCIAL SERVICE / VILLAGE CAMP / RALLY)	CATEGORY	L	T	P	SL	CREDIT
		AEC	0	0	1	2	0

Course Prerequisite / Preamble

- This course provides students with opportunities to participate in community service activities, rural development programs, social awareness campaigns, village camps, and public welfare initiatives.
- The course aims to develop social responsibility, leadership qualities, teamwork, communication skills, and awareness about societal issues through active participation in extension and outreach activities.

Course Objective

- To promote social responsibility and community service among students.
- To create awareness about rural development, environmental protection, and social welfare activities.
- To develop leadership qualities, teamwork, and communication skills.
- To encourage active participation in village camps, rallies, and social awareness programs.
- To inculcate ethical values, discipline, and national integration.

CO	COURSE OUTCOME	K LEVEL
CO1	Understand the importance of community service and social responsibility.	(K2)
CO2	Participate actively in village camps, rallies, and social awareness programs.	(K3)
CO3	Develop leadership, teamwork, and interpersonal communication skills.	(K3)
CO4	Apply ethical values and social commitment in community development activities.	(K3)
CO5	Demonstrate discipline, environmental awareness, and national integration through extension activities.	(K4)

SYLLABUS

LIST OF ACTIVITIES

1. Orientation programme on National Social Service, social responsibility, and community engagement.
2. Campus cleanliness and environmental awareness activities.
3. Tree plantation and green campus initiatives.
4. Participation in village survey and rural development activities.
5. Health awareness rally and community interaction programme.

6. Awareness programmes on hygiene, sanitation, and public health.
7. Blood donation awareness / road safety / anti-drug awareness rally.
8. Village camp activities including teamwork, leadership, and social service.
9. Participation in national festivals, social campaigns, and public welfare programmes.
10. Preparation of activity report, reflection, and presentation of community service activities.

Reference
1. National Service Scheme Manual, Government of India.
2. Youth Red Cross and Community Service Handbooks.
3. Environmental and Rural Development Awareness Materials.
4. Swachh Bharat Mission and Social Welfare Programme Guidelines.
Web / NPTEL Resources
1. https://nss.gov.in/
2. https://www.india.gov.in/
3. https://www.mygov.in/
4. https://www.un.org/sustainabledevelopment/

CO-PO Mapping													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	1	1	-	-	-	3	3	3	1	1	1	1	1
CO2	1	1	-	-	-	3	3	3	2	2	1	1	1
CO3	1	1	-	-	-	2	2	2	3	3	1	1	1
CO4	1	1	-	-	-	3	3	3	2	2	1	1	1
CO5	1	1	-	-	-	3	3	3	2	2	1	1	1

Assessment Methodology		
Assessment Methodology	**Assessment Tools**	**Marks**
Participation and Involvement	Community Service Activities / Village Camp / Rally	40
Activity Record and Report	Field Diary / Documentation / Reflection Report	30
Presentation and Teamwork Group	Participation and Communication Skills	20
Discipline and Attendance	Regularity and Conduct	10
	Total	100