MANAKULA VINAYAGAR
INSTITUTE OF TECHNOLOGY
An Autonomous Institution
Affiliated to Pondicherry University, Approved by AICTE, New Delhi,
Accredited by NAAC with 'A' Grade
Kalitheerthalkuppam, Puducherry- 605 107.

Curriculum

&

Syllabus (1st year)

B.Tech

ELECTRICAL AND ELECTRONICS ENGINEERING

REGULATIONS 2025

(R - 2025)

(With effect from academic year 2025-26)

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UG Degree Course
in
B.Tech
ELECTRICAL and ELECTRONICS ENGINEERING

(Approved Curriculum & Syllabus
For 1st & 2nd sem- Autonomous)

REGULATION – 2025

(With effect from academic year 2025-26)

Manakula Vinayagar Institute of Technology
Department of EEE

Dr. C. SHANMUGASUNDARAM, B.E.,M.Tech.,Ph.D.
PROFESSOR AND HEAD
Dept. of Electrical and Electronics Engineering
Manakula Vinayagar Institute of Technology
Kalitheerthalkuppam, Puducherry-605 107.

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INSTITUTE VISION	DEPARTMENT VISION
To be a globally reputed Technical Institution creating Competent leaders and Skillful innovators in Science, Technology and Management.	To create comprehensive electrical engineers to meet up the growing technological demands of the society.
INSTITUTE MISSION	**DEPARTMENT MISSION**
M1: Providing a dynamic and creative learning environment for its students to acquire exemplary technical, analytical, professional skills.	**DM1: Higher Order Thinking**-To impart high quality education to help the students hone their professional skills.
M2: Imbibing a spirit of innovation and research among its students and faculty for solving critical problems.	**DM2: Competency** - To improve the competencies of students and faculties on contemporary technologies through continuous improvement programs.
M3: Promoting Innovation, Employability and entrepreneurship skills through industry academia collaboration.	**DM3: Continuous Learning** - To undertake research on frontier areas of electrical and electronics engineering.
M4: Serving the society through technical intervention and creating socially responsible Professionals.	**DM4: Entrepreneurship** - To imbibe the spirit of innovation and entrepreneurship among the students.

PROGRAM OUTCOMES:

POs	DESCRIPTION
PO1	**Engineering knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems
PO2	**Problem analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3	**Design/development of solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO4	**Conduct investigations of complex problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modeling, analysis & interpretation of data to provide valid conclusions. (WK8)
PO5	**Engineering tool usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modeling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO6	**The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)
PO7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8	**Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
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)

PSOs	EEE Dept. - Program Specific Outcome (PSO) After the successful completion of the program, the graduates will be able to:
PSO 1	**Products Development:** An ability to design, analysis and to implement power electronics converters in renewable energy applications.
PSO 2	**Design Thinking:** A capability to design and examine the power system and to solve the unit commitment with various constraints.

A. Definition of Credit:

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

B. Range of Credits: In the light of the fact that a typical Model AICTE Four-year Under Graduate degree program in Engineering has about163 credits, the total number of credits proposed for the four-year B. Tech in Electrical and Electronics Engineering as172.

C. Structure of UG Program in Electrical and Electronics Engineering (EEE): The structure of UG program in Electrical and Electronics Engineering (EEE**)**shall have essentially the following categories of courses with the breakup of credits as given:

S. No.	Category	AICTE	PU R-2023	MIT Proposed IT -R-2025
1	Humanities and Social Sciences including Management courses(HS)	16	16	**12**
2	Basic Science courses (BS)	**23**	**25**	**16**
3	Engineering Science courses including workshop, drawing, basics of electronics/electrical/mechanical/computer etc. (ES)	**29**	**24**	**24**
4	Professional core courses (PC)	**59**	**66**	**70**
5	Professional Elective courses relevant to chosen specialization/branch (PE)	12	12	12
6	Open subjects – Electives from other technical and /or emerging subjects (OE)	**09**	**09**	**12**
7	Core Enrichment Course (Project work, seminar, mini project and internship / in-plant training in industry or elsewhere) (CEC)	**15**	**17**	**16**
8	Employability Enhancement Courses (EEC)	**-**	**-**	**0**

9	Mandatory Courses (MCC) [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	non-credit	non-credit	non-credit
	Total	**163**	**169**	**162**

MVIT- B.Tech. EEE- Curriculum- R 2025

Academic Year 2025-2026

SUMMARY OF ALL COURSES

S.No	Course Category	I	II	III	IV	V	VI	VII	VIII	Total Credits
1	**HS**	**3**	**2**	**-**	**-**	**-**	**3**	**3+1**		**12**
2	**BS**	**4+3+1**	**4**	**4**						**16**
3	**ES**	**3+3+1+1**	**3+3+1+1**	**4**	**4**					**24**
4	**PC**		**3+4+1**	**3+3+4+1+1**	**3+3+4+4+1+1+1**	**3+4+3+4+1+1**	**3+4+1**	**4+4+1**		**70**
5	**PE**					**3**	**3**	**3**	**3**	**12**
6	**OE**					**3**	**3**	**3**	**3**	**12**
7	**CEC**				**1**		**2+1**	**4**	**8**	**16**
8	**EEC**	**0**	**0**	**0**	**0**	**0**	**0**			**0**
9	**MCC**									
Total		**19**	**22**	**20**	**22**	**22**	**20**	**23**	**14**	**162**

HS - Humanities and Social Sciences including Management Course; BS – Basic Science Course; ES – Engineering Science Course; PC – Professional Core Course; CEC – Core Enrichment Course (Project work, seminar, mini project and internship / in-plant training in industry or elsewhere) ; PE – Professional Elective Course; OE- Open Elective Courses ; EEC –Employability Enhancement Courses; MCC – Mandatory Course;

MVIT- B.Tech. EEE- Curriculum- R 2025

SEMESTER I							
S. No	**Course Code**	**Course Title**	**category**	**L**	**T**	**P**	**Credits**
Induction Program - Universal Human values-I							
THEORY							
1.	25UMAT11	Matrices & Calculus	BS	3	1	0	4
2.	25UPHT11	Physical science for Electrical and Electronics Engineers	BS	3	0	0	3
3.	25UEET13	Energy Engineering	ES	3	0	0	3
4.	25UEET14	Fundamentals of Electrical Engineering	ES	3	0	0	3
INTEGRATED COURSES							
5.	25UHSI16	Professional Communication for Engineers	HS	1	0	4	3
PRACTICAL							
6.	25UPHP11	Physical science Lab	BS	0	0	2	1
7.	25UEEP17	Basic Electrical Engineering Lab	ES	0	0	2	1
8.	25UGEP19	Engineering Graphics and Auto CAD	ES	0	0	2	1
EMPLOYABILITYENHANCEMENTCOURSES							
9.	25UPCE11	Career Development Skills	EEC	0	0	2	0
MANDATORYCOURSE							
10.	25UMCC11	IKS–Concepts and applications in Engineering and Science	MCC	1	0	1	0
11.	25UMCC12	Environmental Science & Sustainability	MCC	2	0	0	0
				Total			**19**

SEMESTER II							
S.No	**Course Code**	**Course Title**	**category**	**L**	**T**	**P**	**Credits**
THEORY							
1.	25UMAT21	Differential Equations and Transforms	BS	3	1	0	4
2	25UHST22	Universal Human Values-II	HS	2	0	0	2
3.	25UEET23	Electron Devices	ES	3	0	0	3
4.	25UEET24	Electric Circuit Theory	PC	3	0	0	3
INTEGRATED COURSES							
5.	25UCSI26	Programming in C	ES	2	0	2	3
6.	25UEEI26	Digital Electronics	PC	3	0	2	4
PRACTICAL							
7.	25UEEP27	Electron Devices Lab	ES	0	0	2	1
8.	25UEET28	Electric Circuit Theory Lab	PC	0	0	2	1
9.	25UGEP29	Design Thinking & Idea Lab	ES	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES							
10.	25UPCE21	Communication skills	EEC	0	0	2	0

11.	25UCCC21	Certification Course 1	CCC	0	0	2	0
MANDATORY COURSE							
12.	25UMCC21	IKS in Humanities and Social Science	MCC	1	0	1	0
13.	25UMCC22	Holistic Wellness	MCC	0	0	1	0
Total							**22**

SEMESTER III

S.No	Course Code	Course Title	category	L	T	P	Credits
THEORY							
1.	25UMAT31	Mathematics -III	BS	3	1	0	4
2.	25UEET32	Electrical Machines - I	PC	3	0	0	3
3.	25UEET33	Analog Electronics	PC	3	0	0	3
4.	25UEET34	Engineering Electro Magnetics	PC	3	1	0	4
INTEGRATED COURSES							
5	25UCSI35	Problem solving using Python	ES	2	0	4	4
PRACTICAL							
7.	25UEEP36	DC Machines and Transformers Lab	PC	0	0	2	1
8.	25UEEP37	Analog Electronics Lab	PC	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES							
9.	25UPCE31	Personality development Skills	EEC	0	0	2	0
MANDATORY COURSE							
10.	25UMCC31	Indian Constitution	MCC	2	0	0	0
Total							**20**

SEMESTER IV

S.No	Course Code	Course Title	category	L	T	P	Credits
THEORY							
1.	25UEET41	Electrical machines-II	PC	3	0	0	3
2.	25UEET42	Measurement and Instrumentation	PC	3	0	0	3
3.	25UEET43	Control Systems	PC	3	1	0	4
4.	25UEET44	Linear Integrated Circuits	PC	3	1	0	4
INTEGRATED COURSES							
5.	25UCSI45	Data Structures and Algorithms	ES	3	0	2	4
PRACTICAL							
6	25UEEP46	Electrical machines-II Lab	PC	0	0	2	1
7	25UEEP47	Measurement and Instrumentation Lab	PC	0	0	2	1

8	25UEEP48	Capstone course-I	PC	0	0	2	1
9	25UEEW49	Mini Project-I	CEC	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES							
10	25UPCE41	rofessionalism and Basic Aptitude	EEC	0	0	2	0
11	25UCCC41	Certification Course-2	CCC	0	0	0	0
MANDATORY COURSE							
12	25UMCC41	Introduction to Entrepreneurial skills and concepts	MCC	2	0	0	0
Total							**22**

SEMESTER V							
S.No	**Course Code**	**Course Title**	**category**	**L**	**T**	**P**	**Credits**
THEORY							
1.	25UEET51	Microprocessor And Micro Controller	PC	3	0	0	3
2.	25UEET52	Transmission and Distribution	PC	3	1	0	4
3.	25UEET53	Power Electronics	PC	3	0	0	3
4.	25UEELXX	Professional Elective - I	PE	3	0	0	3
5.	25UEEOXX	Open Elective - I	OE	3	0	0	3
INTEGRATED COURSES							
6.	25UEEI54	Computer Aided Power System Analysis	PC	3	0	2	4
PRACTICAL							
7.	25UEEP55	Microprocessor And Micro Controller Lab	PC	0	0	2	1
8.	25UEEP56	Power Electronics Lab	PC	0	0	2	1
Employability Enhancement Courses							
9.	25UPCE51	Quantitative & Verbal Aptitude	EEC	0	0	2	0
MANDATORY COURSE							
10.	25UMCC51	English for Career Pursuits	MCC	2	0	0	0
Total							**22**

SEMESTER VI							
S.No	**Course Code**	**Course Title**	**category**	**L**	**T**	**P**	**Credits**
THEORY							
1.	25UEET61	Protection and Switch Gear	PC	3	0	0	3
2.	25UEET62	Industrial Drives and Control	PC	3	1	0	4
3.	25UHST63	Principles of Management	HS	3	0	0	3
4.	25UEELXX	Professional Elective - II	PE	3	0	0	3
5.	25UEEOXX	Open Elective -II	OE	3	0	0	3
PRACTICAL							
6.	25UEEP64	Capstone course- II	PC	0	0	2	1
7.	25UEEW65	Seminar	CEC	0	0	2	1

8.	25UEEW66	Mini Project-II	CEC	0	0	4	2
EMPLOYABILITY ENHANCEMENT COURSES							
10	25UPCE61	Analytical & Reasoning skills	EEC	0	0	2	0
11	25UCCC62	Certification Course-3	CCC	0	0	0	0
MANDATORY COURSE							
12	25UMCC61	Foreign Language	MCC	2	0	0	0
Total							**20**

SEMESTER VII							
S.No	**Course Code**	**Course Title**	**category**	**L**	**T**	**P**	**Credits**
THEORY							
1.	25UHST71	Organizational Behavior	HS	3	0	0	3
2.	25UEET72	Power System Operation And Control	PC	3	1	0	4
3.	25UEET73	Electric and Hybrid Vehicles	PC	3	1	0	4
4.	25UEELXX	Professional Elective - III	PE	3	0	0	3
5.	25UEEOXX	Open Elective -III	OE	3	0	0	3
PRACTICAL							
6.	25UEEP74	E-MOBILITY LAB	PC	0	0	2	1
7.	25UHSP81	Professional Ethics	HS	1	0	0	1
8.	25UEEW76	Project Phase -I	CEC	0	0	8	4
Total							**23**

SEMESTER VIII							
S.No	**Course Code**	**Course Title**	**category**	**L**	**T**	**P**	**Credits**
THEORY							
1	25UEELXX	Professional Elective - IV	PE	3	0	0	3
2	25UEEOXX	Open Elective -IV	OE	3	0	0	3
PRACTICAL							
3	25UEEW82	Internship/In-plant Training	CEC	0	0	0	0
4	25UEEW83	Project Phase -II	CEC	0	0	16	8
Total							**14**

LIST OF PROFESSIONAL ELECTIVE COURSES (PE)

PROFESSIONAL ELECTIVE COURSES-I (OFFERED IN SEMESTER V)			Periods			
S.No	Course Code	Course Title	L	T	P	Credits
1	25UEEL51	INTERNET OF THINGS FOR ELECTRICAL ENGINEERING	3	0	0	3
2	25UEEL52	ELECTRICAL MACHINE DESIGN	3	0	0	3
3	25UEEL53	UTILIZATION OF ELECTRICAL ENERGY	3	0	0	3
4	25UEEL54	POWER QUALITY	3	0	0	3
5	25UEEL55	ELECTRICAL SAFETY	3	0	0	3
PROFESSIONAL ELECTIVE COURSES-II (OFFERED IN SEMESTER VI)						
1	25UEEL61	EMBEDDED SYSTEMS	3	0	0	3
2	25UEEL62	HVDC TRANSMISSION SYSTEM	3	0	0	3
3	25UEEL63	SIGNAL SYSTEM	3	0	0	3
4	25UEEL64	INDUSTRIAL AUTOMATION	3	0	0	3
5	25UEEL65	GREEN TECHNOLOGY	3	0	0	3
PROFESSIONAL ELECTIVE COURSES-III(OFFERED IN SEMESTER VII)						
1	25UEEL71	ENERGY MANAGEMENT AND AUDITING	3	0	0	3
2	25UEEL72	RESTRUCTURED POWER SYSTEMS	3	0	0	3
3	25UEEL73	SMART GRID TECHNOLOGIES	3	0	0	3
4	25UEEL74	AI TECHNIQUES IN ELECTRICAL SYSTEM	3	0	0	3
5	25UEEL75	FLEXIBLE AC TRANSMISSION SYSTEM	3	0	0	3
PROFESSIONAL ELECTIVE COURSES-IV(OFFERED IN SEMESTER VIII)						
1	25UEEL81	OPTIMIZATION TECHNIQUES	3	0	0	3
2	25UEEL82	AI IN SMART GRID	3	0	0	3
3	25UEEL83	ENERGY STORAGE AND BATTERY MANAGEMENT SYSTEM	3	0	0	3
4	25UEEL84	SOFT COMPUTING TECHNIQUES	3	0	0	3
5	25UEEL85	POWER SYSTEM OPTIMIZATION	3	0	0	3

LIST OF OPEN ELECTIVES(OE)

Sl. No.	Course Code	Course Title
1	25UEEO01	ANALOG AND DIGITAL ELECTRONICS
2	25UEEO02	BASICS OF ELECTRICAL CIRCUITS
3	25UEEO03	CONTROL SYSTEM ENGINEERING
4	25UEEO04	ELECTRIC POWER UTILIZATION
5	25UEEO05	ELECTRICAL MACHINES
6	25UEEO06	POWER ELECTRONICS IN POWER SYSTEMS
7	25UEEO07	INTRODUCTION TO ROBOTICS AND AUTOMATION
8	25UEEO08	POWER SYSTEM ENGINEERING

9	25UEEO09	ENERGY ENGINEERING
10	25UEEO10	SENSORS AND TRANSDUCER
11	25UEEO11	POWER PLANT ENGINEERING
12	25UEEO12	ELECTRIC VEHICLE TECHNOLOGY

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
2025-2026
(First Year Curriculum)

SEMESTER I							
S.No	**Course Code**	**Course Title**	**category**	**L**	**T**	**P**	**Credits**
Induction Program - Universal Human values-I							
THEORY							
1.	25UMAT11	Matrices & Calculus	BS	3	1	0	4
2.	25UPHT11	Physical science for Electrical and Electronics Engineers	BS	3	0	0	3
3.	25UEET13	Energy Engineering	ES	3	0	0	3
4.	25UEET14	Fundamentals of Electrical Engineering	ES	3	0	0	3
INTEGRATED COURSES							
5.	25UHSI16	Professional Communication for Engineers	HS	1	0	4	3
PRACTICAL							
6.	25UPHP11	Physical Science Lab	BS	0	0	2	1
7.	25UEEP17	Basic Electrical Engineering lab	ES	0	0	2	1
8.	25UGEP19	Engineering Graphics and Auto CAD	ES	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES							
9.	25UPCE11	Career Development Skills	EEC	0	0	2	0
MANDATORY COURSE							
10.	25UMCC11	IKS – Concepts and applications in Engineering and Science	MCC	1	0	1	0
11.	25UMCC12	Environmental Science & Sustainability	MCC	2	0	0	0
Total							**19**

SEMESTER II							
S.No	**Course Code**	**Course Title**	**category**	**L**	**T**	**P**	**Credits**
THEORY							
1.	25UMAT21	Differential Equations and Transforms	BS	3	1	0	4
2.	25UHST22	Universal Human Values-II	HS	2	0	0	2
3.	25UEET23	Electron Devices	ES	3	0	0	3
4.	25UEET24	Electric Circuit Theory	PC	3	0	0	3
INTEGRATED COURSES							
5.	25UCSI26	Programming in C	ES	2	0	2	3
6.	25UEEI26	Digital Electronics	PC	3	0	2	4
PRACTICAL							
7.	25UEEP27	Electron Devices Lab	ES	0	0	2	1
8.	25UEET28	Electric Circuit Theory Lab	PC	0	0	2	1
9.	25UGEP29	Design Thinking & Idea Lab	ES	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES							
10.	25UPCE21	Communication skills	EEC	0	0	2	0
11.	25UCCC21	Certification Course 1	CCC	0	0	2	0
MANDATORY COURSE							
12.	25UMCC21	IKS in Humanities and Social Science	MCC	1	0	1	0
13.	25UMCC22	Holistic Wellness	MCC	0	0	1	0
Total							**22**

SEMESTER–I

25UMAT11	MATRICES & CALCULUS	Category	L	T	P	Credit
		BS	3	1	0	4

Course Prerequisite:

- Higher Secondary Level Mathematics

Course Objective:

- To understand and gain the knowledge of matrix algebra, partial differentiation, double integration, triple integration and their application, curl, divergence. To familiar with vector differential operators, integral theorems (Green's, Stoke's, Gauss divergence).

Course Outcome		
On the successful completion of the course, students will be able to		
CO1	Find eigenvalues and eigenvectors, verify the Cayley-Hamilton theorem, and perform orthogonal diagonalization.	Apply (K3)
CO2	Compute partial derivatives, determine total derivatives, Jacobians, employ Taylor's series, and find extremes of functions of two variables.	Apply (K3)
CO3	Demonstrate proficiency in evaluating double integration and triple integration and using them to compute area and volume.	Apply (K3)
CO4	Compute gradients, divergence, curl, directional derivatives, and apply vector identities to solve vector field problems.	Apply (K3)
CO5	Apply Green's theorem, Stoke's theorem and Gauss divergence theorem.	Apply (K3)

SYLLABUS

UNIT I MATRICES 12 Hours

Eigenvalues and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigen values and Eigenvectors- Cayley-Hamilton Theorem, Diagonalization of matrices. Reduction of a quadratic form to canonical form by orthogonal transformation -Nature of quadratic forms.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12 Hours

Partial derivatives-Total derivative- Differentiation of implicit functions, Change of variables- Jacobians and their properties-Taylor's series for functions of two variables- Maxima and minima, Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS 12 Hours

Multiple Integral – Change of order of integration (Cartesian form). Applications: Areas as a double integral (Cartesian form) – Volume as a triple integral (Cartesian form).

UNIT IV VECTOR DIFFERENTIATION 12 Hours

Scalar and vector valued functions-gradient, tangent plane – directional derivative-divergence and curl- scalar and vector potentials. Statement of vector identities-simple problems.

UNIT V VECTOR INTEGRATION 12 Hours

Line, surface and volume integrals- statements of Green's, Stoke's and Gauss Divergence theorems – verification and evaluation of vector integrals using them.

TOTAL PERIODS: 60

TEXT BOOKS:

1.Veerarajan T., "Engineering Mathematics – I and II", Tata McGraw-Hill, New Delhi, 2014 and 2015.

2.Dr. M.K. Venkataraman, "Engineering Mathematics – Volume I and Volume II", The National Publishing Company, Chennai 2008.

REFERENCE BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.
3. Bali N.P and Manish Goyal., "A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd, 2011.
4. Erwin Kreyszig, Advanced Engineering Mathematics (9th Edition), John Wiley & Sons, New Delhi, 2011.

Online Courses/NPTEL/SWAYAM:

https://nptel.ac.in/courses/111106100

https://nptel.ac.in/courses/111104125

https://nptel.ac.in/courses/111105121

https://nptel.ac.in/courses/111107112

CO-PO -PSO Mapping (New)

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

Assessment Methodology	**Assessment Tools**	**Marks**
Test		25
Problem based Assignment	Moodle / Google form	5
Simulation (Python/Matlab/Scilab) Based Project assignment	Demo and viva	5
Attendance		5
Total		**40**

25UPHT11	PHYSICAL SCIENCE FOR ELECTRICAL AND ELECTRONICS ENGINEERS	Category	L	T	P	Credit
		BS	3	0	0	3

Course Prerequisite:

- 12^{th} standard knowledge of Wave motion, light properties, Crystal structure, Energy bands.
- Knowledge of functional groups, polymerization basics, and reaction mechanisms.

Course Objectives:

- To understand basics of oscillations, optics and lasers..
- To understand the concept of dielectrics and its applications.
- To instill knowledge on physics of semiconductors, determination of charge carriers and device applications
- To understand the basic electrochemical properties such as electrodes, cell potentials, lead storage batteries.
- To inculcate an idea of significance of nano structures, quantum confinement and ensuing nano device applications.

Course Outcome		
On the successful completion of the course, students will be able to		
CO1	Understand the basics of oscillations, interference phenomenon, apply it to understand optical based devices and classify the different laser systems used for various application	Understand
CO2	Understand properties and applications of dielectrics	Understand
CO3	Understand the principles of physics behind semiconductors, Hall effect and apply the same to identify type of any semiconductor sample, evaluate no. of charge carriers	Understand
CO4	Analyze the galvanic cells, electrode potentials, and the electrochemical series, including EMF measurement and the Nernst equation using hydrogen and calomel reference electrodes. Study different batteries and H_2-O_2 fuel cells, focusing on their types and applications.	Analyze
CO5	Understand the importance of nanotechnology and nanodevices.	Understand

Syllabus

Unit1- OSCILLATIONS, OPTICS AND LASERS **9 Hours**

imple harmonic motion – Electrical and mechanical oscillation - waves on a string - standing waves - traveling waves - Interference - Anti-reflection coating - Air Wedge – Michelson's Interferometer – Determination of wavelength of light and thickness of thin transparent sheet-Characteristics of Laser – Spontaneous and Stimulated Emissions – Einstein's Coefficients - Population inversion – Pumping Mechanism – Laser Action – Types of Laser: Nd:YAG laser CO_2 laser and semiconductor laser - Applications : Laser in medicine and materials Processing.

Unit 2- DIELECTRIC PROPERTIES **9 Hours**

Dielectric Polarization and Mechanism –Temperature dependence of polarization,Internal or local Field - Clausius-Mossotti relation. Basic ideas of Dielectric loss -frequency dependence of dielectric constant – Measurement of Dielectric constant and loss using Scherring bridge – Elementary ideas of Piezoelectrics, Ferroelectrics and Pyroelectric materials and Applications

Unit-3 PHYSICS OF SEMICONDUCTORS **9 Hours**

Elemental and compound semiconductors –Direct and Indirect band gap semiconductors- Drift and diffusion current – Intrinsic semiconductors: Intrinsic carrier concentration (derivation) – Fermi energy – Variation of Fermi energy level with temperature – Mobility and electrical conductivity – Band gap determination – Extrinsic semiconductors (Qualitative ideas}— Variation of Fermi level with temperature and impurity concentration – Variation of Electrical conductivity with temperature – Hall effect – Experiment and applications of Hall effect.

Unit – 4 ELECTRO CHEMICAL CELLS AND STORAGE DEVICES **9Hours**

Galvanic cells, single electrode potential, standard electrode potential, electrochemical series. EMF of a cell and its measurement. Nernst equation. Reference electrodes-hydrogen and calomel . Batteries and fuel cells: Types of batteries- alkaline battery-lead storage battery- nickel-cadmium and Lithium-ion battery - fuel cell H_2 -O_2 fuel cell-applications.

Unit – 5 NANODEVICES: **9Hours**

Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties (optical, electrical, mechanical, magnetic and catalytic). Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, chemicalvapour deposition, electrochemical deposition and electro spinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram). Applications of nanomaterials - medicine, Agriculture, electronics and catalysis.

Total No. Of Hours: 45

Text Book

1. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
2. P K. Palanisamy, Engineering Physics Vol I and II Scitech Publications (India) Pvt Ltd, 2018.
3 Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpa
4.William D Callister Jr., Material Science and Engineering, 6th Edition, John Wiley and sons, 2009.
5. Charles Kittel, Introduction to Solid State Physics, 7th Edition, John Wiley & sons,Singapore, 2007.
6. V Raghavan , Materials Science and Engineering- A First Course, 5th Edition, PrenticeHall of India, 2008.
7.P.C. Jain and Monika Jain, “Engineering Chemistry”, Dhanpat Rai and Sons, New Delhi 2004.

Reference Book & Web Resources

1.Laszlo Solymar, Walsh, Donald, Syms and Richard R.A., Electrical Properties of Materials, Oxford Univ. Press (Indian Edition) 2015.
2. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw- Hill Education (Indian Edition), 2019.
3. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
4. Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.
5. Tipler P.A. and Mosca, G.P., Physics for Scientists and Engineers with Modern Physics, W.H. Freeman, 2007.
6. Markert J.T., Ohanian. H. and Ohanian, M., Physics for Engineers and Scientists, W.W. Norton & Co., 2007.
7 Palanisamy P.K., ―Semiconductor physics and optoelectronics‖ Scitech Publications, 2003.

Online Courses/NPTEL/SWAYAM:

https://archive.nptel.ac.in/courses/115/102/115102124/
https://archive.nptel.ac.in/courses/122/106/122106034/
https://archive.nptel.ac.in/courses/115/101/115101107/

CO-PO -PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	1	-	-	-	-	-	1	1	-
CO2	3	2	1	1	1	-	-	-	-	-	1	1	-
CO3	3	2	1	1	1	-	-	-	-	-	1	1	-
CO4	3	1	1	1	2	2	2	2	1	1	2	-	-
CO5	3	3	3	3	3	1	2	1	2	2	2	-	1
CO6	3	3	3	3	3	1	2	1	2	2	2	-	-

Assessment Methodology	Assessment Tools	Marks
Test		25
MCQ unit wise 10 questions	Moodle / Google form	5
Virtual lab based assignment	Demo and viva	5
Attendance		5
Total		**40**

25UEET13	ENERGY ENGINEERING	Category	L	T	P	Credit
		ES	3	0	0	3

Course Prerequisite: HSS Physics

Course Outcome		
On the successful completion of the course, students will be able to		
CO1	Explain the current world and Indian energy scenario and the various resources	K2
CO2	Describe the working of different types of principles of different conventional energy sources	K2
CO3	Explain the potential and concept of the hydro and ocean energy technologies	K2
CO4	Illustrate the applications of different types of wind, solar energy and DG technologies.	K2
CO5	Discuss about the energy conservation and management	K2

Course Objective

The objective of the course is to introduce various energy resources right from the conventional energy systems to upcoming renewable energy systems. The course offers details on hydro electric technology, wind, solar and biomass energy technologies. Besides, it enables the students to understand the necessity of energy conservation and management.

Syllabus:

UNIT I : Energy Resources **9Hours**

World Energy Status, Indian scenario, Energy reserves – conventional and non-conventional, Forms of Energy - Fossil Fuel, Fuel cell, Hydrogen energy, Small hydro resources - Renewable Energy Sources - Energy Intensity - Gross Domestic product – Need for energy storage, Energy storage methods - Environmental aspects of energy.

UNIT II: Conventional Energy Sources **9Hours**

Coal fired steam thermal power plant– layout, working principle- Gas turbine power plant–various options, layout, working principle- Nuclear power plants: fuels, nuclear fuel cycle, reactors, nuclear power plant, and nuclear waste management.

UNIT III : Hydro and Ocean Energy Electric Technologies **9Hours**

Hydro Electric plants – Types, energy conversion schemes, power equation, environmental aspects– Hydro-Thermal co ordination-Ocean Energy Technology- Power plant-limitations.

UNIT IV: Wind, Solar Energy and DG Technologies **9Hours**

Wind turbine types and construction– wind energy conversion systems- grid connection environmental aspects. Solar energy basics- Solar PV plant- Distributed Generation- Impacts-Benefits.

UNIT V: Energy Conservation and Management **9 Hours**

Principle of energy conservation- waste heat recovery –Heat Exchanger– Economics of energy Conservation-co generation- Definition and Objectives of Energy Management, Energy Management System, Top management support, Energy policy purpose, Roles and responsibilities of energy manager**.**

Total No. Of Hours: 45

Text Books:

1. S. Rao and Dr.B.B. Parulekar, Energy Technology, Khanna pub., 3rd Edition, 1999.
2. B.H. Khan, Non-conventional Energy Resources, TMH, 2006.
3. Amalan Chakrabarti, Energy Engineering and Management, PHI Learning Pvt. Ltd., 2018.
4. D.P. Kothari, K.C. Singal, Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies, PHI, 2011.

Reference Book & Web Resources

1. Tyler Gregory Hicks, Handbook of Energy Engineering Calculations, McGraw Hill, 2011.
2. G.D. Rai, Non-Conventional Energy Sources, Khanna pub. Fourth Edition, 2002.
3. Abbasik, Renewable Energy Sources and their Environment, PHI, 2008.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	1								1	1
2	3	3	2	1								1	1
3	3	3	2	1								1	1
4	3	3	2	1								1	1
5	3	3	2	1								1	1

Assessment Methodology	**Assessment Tools**	**Marks**
Test		25
MCQ unit wise 10 questions	Moodle / Google form	5
IKS based assignment	Poster Presentation /chart Work	5
Attendance		5
Total		**40**

25UEET14	**FUNDAMENTALS OF ELECTRICAL ENGINEERING**	**Category**	**L**	**T**	**P**	**Credit**
		ES	**3**	**0**	**0**	**3**

Course Prerequisite : Physics

Course Objective:

- Understand basic electrical concepts, laws, and circuit analysis techniques in DC and AC systems.
- Gain knowledge of electrical wiring methods, safety practices, illumination, and energy-saving measures.
- Learn the fundamental principles and operations of DC machines, transformers, and single-phase

induction motors.

- Explore the structure and components of power generation, transmission, and distribution systems.
- Identify essential protective devices like fuses and circuit breakers used in electrical systems.

Course Outcome		
On the successful completion of the course, students will be able to		
CO1	Apply basic electrical laws and analysis techniques to solve DC circuits.	K3
CO2	Analyze single-phase AC circuits and explain power measurement methods.	K3
CO3	Identify wiring systems, safety measures, and understand energy conservation practices.	K3
CO4	Explain the working principles of basic electrical machines.	K2
CO5	Describe the structure of power systems and the fundamentals of power generation and protection.	K3

SYLLABUS

UNIT – I - DC CIRCUITS **9Hours**

Definition of Voltage, Current, Power & Energy, circuit parameters, Ohm's law, Kirchhoff's law & its applications – Simple Problems - Division of current in Series& parallel circuits - star/delta conversion - Node and Mesh methods of analysis of DC circuits.

UNIT – II - AC CIRCUITS **9Hours**

Concepts of AC circuits – rms value, average value, form and peak factors – Simple RLC series circuits – Concept of real and reactive power – Power factor - Introduction to three phase system-star/Delta connection balanced and unbalanced load, Power measurement by two wattmeter method.

UNIT III – WIRING, SAFETY, AND ILLUMINATION **9Hours**

Types of wiring-staircase & corridor wiring, wiring accessories. Basic safety measures at home and industry-earthing. Electrical tariff, energy audit and importance of energy saving. The Laws of Illumination-Electric lamps.

UNIT – IV – ELECTRICAL MACHINES **9Hours**

Law of Electromagnetic induction, Fleming's Right & Left hand rule - Principle of DC rotating machine, Single phase transformer and single phase induction motor (Qualitative approach only)

UNIT – V – POWER SYSTEMS **9Hours**

Simple layout of generation-various energy resources, transmission & distribution of power, Fundamentals of fuses and circuit breakers

Total No. Of Hours: 45

Text Books:

1. S. K. Sahdev, ―Fundamentals of Electrical Engineering and Electronics‖, Dhanpat Rai & Co, 2017.
2. S.S. Dash, C. Subramani, K. Vijayakumar, ―Basic Electrical Engineering‖, Vijay Nicole Imprints Pvt. Ltd, 1st Edition, 2013.
3. Leonard S Bobrow, ―Foundations of Electrical Engineering‖, Oxford University Press, Asian Edition, 2013.

Reference Books:

1. S. K. Bhattacharya, S. Chatterji, ―Projects in Electrical, Electronics, Instrumentation and Computer Engineering‖, S. Chand & Co, 2nd Edition, 2010.
2. David Herres, ―The Homeowner's DIY Guide to Electrical Wiring‖, McGraw Hill Professional, 7th Edition, 2015.
3. Gaurav Verma and Matt Weber, ―AutoCAD Electrical 2018 Black Book‖, Ingram short title, 4th Edition, 2018.

Web Resources:

1. https://www.electrical4u.com/
2. https:www.allaboutcicuits.com/

3. https: www.nptel.ac.in/couses/108105112/
4. https: demonstrations.wolfam.com/

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

Assessment Methodology	**Assessment Tools**	**Marks**
Test		25
MCQ unit wise 10 questions	Moodle / Google form	5
Virtual lab based assignment	Demo and viva	5
Attendance		5
Total		**40**

25UHSI16	**PROFESSIONAL COMMUNICATION FOR ENGINEERS**	**Category**	**L**	**T**	**P**	**Credit**
		HS	**1**	**0**	**4**	**3**

Course Prerequisite :

- Higher Secondary General English.

Course Objectives:

1. To improve the communicative competence of learners
2. To learn to use basic grammatic structures in suitable contexts
3. To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
4. To help learners use language effectively in professional contexts
5. To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.

SYLLABUS:

UNIT I :INTRODUCTION TO COMMUNICATION 9 Hours

EFFECTIVE COMMUNICATION:

What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C's of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

FUNDAMENTALS OF COMMUNICATION:

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

LAB ACTIVITY: Extempore (Oral), Conversation on asking directions, Listening – Telephone conversation; Speaking Self-introduction; Telephone conversation – Video conferencing etiquette

UNIT II: NARRATION AND SUMMATION 9 Hours

Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays – String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

LAB ACTIVITY: Listening – Travel podcast; Speaking – Narrating and sharing personal experiences through a podcast, Autobiography of a famous Personality

UNIT III:DESCRIPTION OF A PROCESS / PRODUCT 9 Hours

Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

LAB ACTIVITY: Listening – Railway / Airport Announcements, Travel Vlogs; Speaking – Describing a place or picture description.

UNIT IV:VISUALIZATION AND CLASSIFICATION 9 Hours

Listening – TED talks Speaking – Interviewing a celebrity/Famous Personality Reading – Company profiles, Business Letters Vocabulary– Discourse Markers, Linking words and Phrases Collocation. Grammar – Pronouns, Conjunction, Preposition Writing – Interpretation of Charts and Graphs.

LAB ACTIVITY: Picture Description, about purchasing a product, Summarizing a TED talk, Role play, Narrating an unforgettable event.

UNIT V: EXPRESSION COMMUNICATION 9 Hours

Listening – Watching Movies / Listening to Dialogues and Conversations Speaking – Role play, Panel Discussion, Debate Reading – Blogs, Novels, Short Stories Vocabulary – Phrasal Verbs Grammar– Simple/Compound/Complex Sentences, Error Spotting, Punctuation. Writing – Descriptive Essay, Dialogue Writing

LAB ACTIVITY: Listening /Reading Comprehension, Developing a story using given Vocabulary, Mini Presentation on General topic (ICT tools), Group Discussion.

Number of Practical Periods:	**30**
Total Number of Periods:	**75**

Assessment Methodology	**Assessment Tools**	**Marks**
Test		15
Listening and reading Comprehension	Online tool	5
Speaking assessment (Oral)	review	10
Online assessment test	Online tool	10
Content creation Competition	Peer review	5
Attendance		5
Total		**50**

25UPHP11	**PHYSICAL SCIENCE LAB**	**Category**	**L**	**T**	**P**	**Credit**
		BS	**0**	**0**	**2**	**1**

COURSE OBJECTIVES:

1. To provide an experimental foundation for the theoretical concepts introduced in the lectures
2. To teach how to make careful experimental observations and how to think about and draw conclusions from such data
3. To help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments
4. To introduce the concepts and techniques which have a wide application in experimental science but have not been introduced in the standard courses
5. To teach how to write a technical report this communicates scientific information in a clear and concise manner

Course Outcomes:		
Upon completion of this course the students will be able to:		
CO1	Apply the concepts of elasticity and beam bending to experimentally determine Young's modulus using the non-uniform bending setup and interpret the results to understand material stiffness.	Apply
CO2	Apply the principles of fluid mechanics to experimentally determine the viscosity of a given liquid using Poiseuille's method	Apply

CO3	Apply the concept of steady-state heat conduction to experimentally determine the thermal conductivity of a bad conductor using Lee's Disc apparatus	Apply
CO4	Apply the principles of wave optics and interference to experimentally determine the thickness of a thin spacer using the Air Wedge method, and interpret the fringe pattern to calculate precise measurements.	Apply
CO5	Apply the principles of laser diffraction and wave optics to experimentally determine the wavelength of a laser beam and calculate the particle size of a fine powder	Apply

Sl.No	**List of Experiments**
1.	Determination of Young's modulus of given material by non-uniform bending method
2.	Determination of viscosity of the given liquid using Poiseuille's method.
3.	Determination of Thermal conductivity of a bad conductor –Lee's Disc method
4.	Determination of the thickness of a given thin material– Air wedge method
5.	Determination of the wavelength of Laser and particle size of given powder
6.	Determination of the angle of divergence of a laser beam using semiconductor
7.	Determination of band gap of a semiconductor diode. **1.** Determination of radius of curvature of lens Newtons ring method. **2.** Determination of the wave spectrometer grating/ prism.
8.	Determination of the optical fibber's numerical aperture and Acceptance angles.
9.	Determination of radius of curvature of lens Newtons ring method
10.	Determination of the wavelength of mercury spectrum using spectrometer grating/ prism.
11.	Determination of the optical fibber's numerical aperture and Acceptance angles

Text Books:

1. Practical Physics – S.L. Gupta & V. Kumar
2. A Textbook of Practical Physics – M.N. Srinivasan
3. Engineering Physics Practical Manual – Dr.Arumugam M.
4. Engineering Physics Lab Manual – R.K. Shukla &Anchal Srivastava
5. Advanced Practical Physics for Students – B.L. Worsnop and H.T. Flint

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	3	0	3	0	1	1	1	1	0	2	1	0
CO2	2	2	2	0	0	0	1	1	1	0	2	1	0
CO3	2	2	2	2	0	0	1	1	1	0	2	1	0
CO4	2	1	1	1	0	0	1	1	1	0	1	0	0
CO5	2	2	1	1	1	0	1	1	1	0	1	0	0

Assessment Methodology	**Assessment Tools**	**Marks**
Laboratory Conduction	Observation	10
Record work		10

Assessment Methodology	Assessment Tools	Marks
Model exam		15
Viva		5
Virtual lab assignment	Review	5
STEM based model creation	Presentation	5
Attendance		10
Total		**60**

25UEEP17	BASIC ELECTRICAL ENGINEERING LAB	Category	L	T	P	C
		ES	0	0	2	1

Course Prerequisite : Physics

Course Objectives:

1. To equip students with knowledge and practical awareness of electrical safety measures.
2. To develop the ability to construct, test, and troubleshoot various residential and industrial wiring circuits.
3. To impart design and implementation skills for specific wiring layouts.
4. To train students in the effective use of electrical measuring instruments.
5. To reinforce fundamental electrical laws by performing hands-on verification of Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) in practical circuits.

Course Outcomes:		
On the successful completion of the course,		
CO1	Understand and apply electrical safety measures, tools, and accessories in practical scenarios.	K3
CO2	Demonstrate the ability to perform and test various residential and industrial wiring circuits.	K3
CO3	Develop skills in wiring design, including staircase, bedroom, doctor's room, and go-down layouts.	K3
CO4	Analyze and interpret measurements using CRO, meters, and fuse characteristics.	K3
CO5	Verify and apply fundamental electrical laws including Kirchhoff's Voltage and Current Laws.	K3

SYLLABUS – LIST OF EXPERIMENTS

1. Electrical Safety, Precautions, study of tools and accessories.
2. Practices of different joints.
3. Wiring and testing of series and parallel lamp circuits.
4. Staircase wiring.
5. Doctor's room wiring.
6. Bed room wiring.
7. Go down wiring.
8. Wiring and testing a ceiling fan and fluorescent lamp circuit.
9. Study of different types of fuses and A.C and D.C meters.
10. Study of CRO
    (a) Measurement of AC and DC voltages
    (b) Frequency and phase measurements (using Lissajou's figures)
11. Verification of Kirchhoff's Voltage and Current Laws

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	5
Circuit Construction Task	demo	5
Attendance		10
Total		**60**

25UGEP19	ENGINEERING GRAPHICS AND AUTOCAD	Category	L	T	P	C
		ES	0	0	2	1

Course Prerequisite.

- Students should have a fundamental understanding of engineering mathematics and basic geometric concepts, including lines, angles, shapes, and spatial visualization skills, typically covered in secondary school education.

Course Objectives:

- To develop knowledge of standard practices in engineering drawing, including lettering, line work, dimensioning, and projection techniques.
- To enable students to construct and interpret conic sections, spirals, involutes, helix curves, and projections of points, lines, planes, and solids.
- To understand the development and intersection of surfaces like cylinder-cylinder and cylinder-cone, essential for fabrication and design.
- To build skills in creating accurate isometric and orthographic projections for effective engineering communication.
- To introduce students to AutoCAD for creating 2D engineering drawings, enhancing their ability to use modern engineering tools.

Course Outcome

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

CO1	Understand and apply the principles of engineering drawing standards, including lettering, line types, dimensioning, and accurately construct conic sections, spirals, involutes, and helix curves.	K2
CO2	Interpret and generate projections of solid objects and their sectional views, aiding in better understanding of internal features in engineering components.	K3
CO3	Develop the lateral surfaces of solids essential for manufacturing and fabrication processes.	K3
CO4	Create and interpret isometric and orthographic projections of engineering objects to effectively communicate design intent.	K3
CO5	Utilize computer-aided drafting tools, particularly AutoCAD, to produce accurate 2D engineering drawings of simple geometries, enhancing proficiency in modern engineering software.	K3

Syllabus

UNIT-I

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning. Conic sections, Involutes, Spirals, Helix. Projection of Points, Lines and planes

UNIT-II

Projection of Solids and Sections of solids

UNIT-III

Development of surfaces

UNIT-IV

Isometric projections and Conversion of pictorial to Orthographic views

UNIT-V

Computer Aided Drafting: Introduction to Computer Graphics and Drafting, AutoCAD,2-D diagrams of simple geometries using Auto- CAD script.

Text Books:

1. K.R.Gopalakrishna and Sudhir Gopalakrishna, Engineering Graphics ,Inzinc Publishers, 2007.

Reference Books:

1. N.D.Bhatt, Engineering Drawing,49th edition,Chorotar Publishing House,2006.
2. K.Venugopal, Engineering DrawingandGraphics+AutoCAD,4th edition,NewAgeInternational Publication Ltd.,2004.
3. DavidIcook and Robert NMc Dougal, Engineering Graphics and Design with computer applications, Holt – Sounders Int. Edn.1985.
4. James D Bethuneandet.al., Modern Drafting,PrenticeHallInt.,1989.

Web Resources

1. **https://nptel.ac.in/courses/112/103/112103019/**
2. **https://archive.org/details/engineeringdrawingndbhatt**

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

Assessment Methodology	**Assessment Tools**	**Marks**
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Real Model Drawing	Review	5
CAD Simulation Test		5
Attendance		10
Total		**60**

25UPCC11	CAREER DEVELOPMENT SKILLS	Category	L	T	P	C
		EEC	0	0	2	0

Prerequisite: Basic communication skills and foundational knowledge of workplace behavior

Preamble/ Course Objective:
To empower students with the skills for self-discovery, goal achievement, effective time management, and personal effectiveness, alongside foundational knowledge in career planning, emotional intelligence, higher education, competitive exams, and entrepreneurship

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

CO1	Help students assess themselves, explore career options, and set actionable goals through structured planning.
CO2	Develop motivation, enhance personality effectiveness, and instill discipline for personal and professional growth.
CO3	Build awareness and practice of grooming, hygiene, positive attitudes, manners, and professional behaviour.
CO4	Strengthen self-awareness, time and stress management, and emotional intelligence for balanced personal development.
CO5	Introduce students to higher education paths, competitive exams, and the fundamentals of entrepreneurship and business planning

Syllabus

UNIT 1 **9 Hours**

Career Planning: Introduction to Career Planning - Self-Assessment for Career Planning - Exploring Career Options- Developing a Career Plan;
Goal Settings: Understanding Goal Setting - Setting Effective Goals - Action Plan Development - Practical Exercises

UNIT 2 **9 Hours**

Motivation – I:Definition and Importance of Motivation - Types of Motivation - Theories of Motivation - Factors Affecting Motivation
Personality Effectiveness: Components of Personality Effectiveness - Communication Skills - /Interpersonal Skills - Practical Exercises
Building Personality and Discipline: Introduction to Personality Development - Building Positive Habits - Discipline and Self-Control - Practical Application

UNIT 3 **9 Hours**

Grooming, hygiene and Cleanliness: Personal Hygiene Practices - Body Grooming Techniques - Environmental Cleanliness - Mental and Social Impact of Grooming and Hygiene.

Attitudes, Manners and Behaviour: Understanding Attitudes - Developing Positive Attitudes - Manners and Etiquette - Procedures and Protocols

UNIT 4 **9 Hours**

Self- Awareness & Self Confidence: Introduction to Self-Awareness- Understanding Strengths and Weaknesses- Building Self-Confidence- Practical Application

Time Management: Introduction to Time Management - Planning and Prioritizing Tasks-Overcoming Procrastination- Practical Time Management

Stress Management: Understanding Stress- Stress Management Techniques-Coping Strategies-Practical Application

Emotional Intelligence: Introduction to Emotional Intelligence- Managing Emotions- Social Awareness and Relationship Management-Practical Exercises

UNIT 5 **9 Hours**

Introduction to Higher Education, Competitive exams: Overview of Higher Education- Competitive Exams Overview - Exam Preparation Techniques

Introduction to Entrepreneurship: Understanding Entrepreneurship- Developing a Business Idea - Business Planning

Total No. Of Hours: 45

Text Book

1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI
2. Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education

Reference Book

1. The Emotionally Intelligent Workplace by DANIEL GOLEMAN.
2. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.
3. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA
4. Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing

Mapping with Programme Outcomes

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

25UMCC11	IKS – CONCEPTS AND APPLICATIONS IN ENGINEERING AND SCIENCE	Category	L	T	P	C
		MCC	1	0	1	0

Prerequisite: Basic understanding of science and engineering fundamentals

Preamble/ Course Objective

This course introduces students to the rich heritage of Indian Knowledge Systems (IKS) and their contemporary applications in engineering and science. The objective is to:

- Familiarize students with traditional Indian knowledge systems and their scientific foundations
- Explore the integration of ancient wisdom with modern engineering practices
- Understand sustainable technologies and innovations rooted in Indian traditions
- Develop appreciation for indigenous knowledge in solving contemporary challenges
- Foster research mindset towards validating and modernizing traditional practices

Course Outcome	
On the successful completion of the course, students will be able to:	
CO1	Understand the historical development and scientific basis of Indian Knowledge Systems
CO2	Analyze traditional Indian practices in mathematics, astronomy, metallurgy, and medicine
CO3	Apply IKS principles to contemporary engineering and scientific problems
CO4	Evaluate the sustainability aspects of traditional Indian technologies
CO5	Create innovative solutions by integrating traditional knowledge with modern science

Syllabus

UNIT I: Introduction to Indian Knowledge Systems **9 Hours**

Historical overview of Indian Knowledge Systems - Scientific methodology in ancient India - Major texts and scholars: Vedas, Upanishads, Charaka Samhita, Sushruta Samhita - Transmission and preservation of knowledge - Contemporary relevance and global recognition

UNIT II: Mathematics and Astronomy in Ancient India **9 Hours**

Indian contributions to mathematics: Zero, decimal system, trigonometry - Aryabhata, Brahmagupta, Bhaskara's contributions - Astronomical observations and calendar systems - Navigation techniques and geographical knowledge - Applications in modern engineering calculations.

UNIT III: Metallurgy, Materials, and Architecture **9 Hours**

Ancient Indian metallurgy: Iron pillar of Delhi, Wootz steel - Traditional building materials and techniques - Architectural marvels: Structural engineering principles - Water harvesting and management systems - Sustainable construction practices.

UNIT IV: Medicine, Agriculture, and Life Sciences **9 Hours**

Ayurveda: Principles and scientific validation - Traditional agricultural practices and crop management - Biodiversity conservation methods - Food preservation techniques - Biotechnology applications in traditional practices.

UNIT V: Integration with Modern Science and Technology **9 Hours**

Validating traditional knowledge through modern scientific methods - Case studies of successful IKS-modern science integration - Intellectual property and traditional knowledge protection - Research opportunities and career prospects - Future directions and challenges

Total No. Of Hours: 45

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Text Books:

1. Subhash Kak, “The Nature of Physical Reality”, Mount Meru Publishing, 2016
2. B.V. Subbarayappa, “Indian Astronomy: A Source Book”, Nehru Centre, 2008
3. Kapila Vatsyayan, “Traditional Indian Art and Culture”, Cambridge University Press, 2015

Reference Book & Web Resources:

1. P.P. Divakaran, “The Mathematics of India: Concepts, Methods, Connections”, Springer, 2018
2. S.N. Sen, “Ancient Indian History and Civilization”, New Age International, 2010
3. National Mission for Manuscripts - www.namami.gov.in
4. Digital Library of Traditional Ecological Knowledge - www.frlht.org
5. CSIR Traditional Knowledge Digital Library - www.tkdl.res.in

Mapping with Programme Outcomes

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

25UMCC12	ENVIRONMENTAL SCIENCE & SUSTAINABILITY	Category	L	T	P	C
		MCC	2	0	0	0

Course Prerequisites: Basic knowledge of chemistry, biology, and physics

Course Objectives:

This course provides comprehensive understanding of environmental science principles and sustainability concepts essential for engineering professionals. The objectives are to:

- Understand fundamental concepts of environmental science and ecology
- Analyze environmental problems and their engineering solutions
- Develop awareness about sustainable development and green technologies
- Explore renewable energy systems and waste management strategies
- Foster environmental consciousness and responsible engineering practices

Course Outcomes:	
On the successful completion of the course, students will be able to	
CO1	Understand fundamental principles of environmental science and ecosystem dynamics
CO2	Analyze various types of pollution and their impact on human health and environment
CO3	Apply principles of sustainable development in engineering design and decision-making
CO4	Evaluate renewable energy technologies and waste management systems
CO5	Design environmentally sustainable solutions for engineering problems

Syllabus

UNIT I: Introduction to Environmental Science and Ecology **6 Hours**

Definition, scope and importance of environmental science - Structure and function of ecosystems - Biogeochemical cycles: Carbon, nitrogen, phosphorus, sulfur cycles - Biodiversity and its conservation - Environmental impact assessment principles.

UNIT II: Environmental Pollution and Control **6 Hours**

Air pollution: Sources, effects, and control measures - Water pollution: Industrial and domestic sources, treatment methods - Soil pollution: Causes, effects, and remediation techniques - Noise pollution: Sources, effects, and control - Solid waste management: 3R principles, waste-to-energy.

UNIT III: Sustainable Development and Green Technologies **6 Hours**

Concept of sustainable development and SDGs - Life cycle assessment (LCA) principles - Green building concepts and LEED certification - Cleaner production and industrial ecology - Environmental management systems (ISO 14001)

UNIT IV: Renewable Energy and Climate Change **6 Hours**

Solar energy systems: Photovoltaic and thermal applications - Wind energy: Technology and site assessment - Hydroelectric and geothermal energy systems - Climate change: Causes, effects, and mitigation strategies - Carbon footprint and carbon trading mechanisms

UNIT V: Environmental Regulations and Case Studies **6 Hours**

Environmental laws and regulations in India - Environmental clearance procedures - Corporate environmental responsibility - Case studies of environmental disasters and lessons lear,ned - Future trends in environmental technology.

Total No. Of Hours: 30

Text Books:

1. G. Tyler Miller Jr., "Environmental Science: Working with the Earth", Cengage Learning, 2019
2. C. Anil Kumar, "Environmental Science and Engineering", PHI Learning, 2018
3. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, 2017

Reference Book & Web Resources:

2. Richard T. Wright, "Environmental Science: Toward a Sustainable Future", Pearson, 2017
3. Daniel B. Botkin, "Environmental Science: Earth as a Living Planet", Wiley, 2018
4. Central Pollution Control Board - www.cpcb.nic.in
5. Ministry of Environment and Forests - www.moef.gov.in
6. UN Environment Programme - www.unep.org
7. NPTEL Environmental Science Courses - nptel.ac.in

Mapping with Programme Outcomes

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

SEMESTER–II

25UMAT21	DIFFERENTIAL EQUATIONS AND TRANSFORMS	Category	L	T	P	C
		BS	3	1	0	4

Course Prerequisite:

- Engineering Mathematics I (Matrices & Calculus)

Course Outcome		
On the successful completion of the course, students will be able to		
CO1	Solve higher order differential equations	Apply(K3)
CO2	Formulate and solve various types of partial differential equations	Apply(K3)
CO3	Apply Laplace transforms and initial and final value theorems to solve engineering problems involving step, impulse and periodic functions.	Apply(K3)
CO4	Apply Laplace transforms to solve ordinary differential equations with constant coefficients and simultaneous ordinary differential equations	Apply(K3)
CO5	Apply Fourier transform techniques, including Fourier integral theorem, properties of Fourier transforms, convolution, and Parseval's identity	Apply(K3)

Syllabus

UNIT UNIT I ORDINARY DIFFERENTIAL EQUATIONS 12 Hours

Differential Equations (Higher order): Linear differential equations of higher order – with constant coefficients, the operator D, Euler 's linear equation of higher order with variable coefficients - simultaneous linear differential equations, solution by variation of parameters method.

UNIT II PARTIAL DIFFERENTIAL EQUATIONS 12 Hours

Formation of partial differential equations- Solutions of standard types of first order partial differential equations- Lagrange's linear equation- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT III LAPLACE TRANSFORM 12 Hours

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.

UNIT IV INVERSE LAPLACE TRANSFORM 12 Hours

Inverse Laplace Transforms – Properties, Convolution theorem, Application - Solution of ordinary differential equations with constant coefficients -Solution of simultaneous ordinary differential equations.

UNIT V FOURIER TRANSFORM 12 Hours

Fourier Integral theorem (statement only), Fourier transform and its inverse – Properties, Fourier sine and cosine transform - Properties, Convolution and Parseval's identity.

Total No. Of Hours: 60

Text Books:

1.Veerarajan T., "Engineering Mathematics – I and II",Tata McGraw-Hill, New Delhi, 2014 and 2015.
2.Dr. M.K. Venkataraman, "Engineering Mathematics – Volume I and Volume II", The National Publishing Company, Chennai 2008.

Reference Book & Web Resources

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2015.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.
3. Bali N.P and Manish Goyal., "A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd, 2011.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 9th Edition, 2011.
5. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.

Online Courses/NPTEL/SWAYAM:

1. https://nptel.ac.in/courses/111106139
2. https://nptel.ac.in/courses/111101153
3. https://nptel.ac.in/courses/111107119

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Mathematical modeling assignment	Analytical solution presentation	5
Transform applications project (MATLAB/Python)	Demo and viva	5
Attendance		5
Total		**40**

25UHST22	UNIVERSAL HUMAN VALUES-II	Category	L	T	P	C
		HS	2	0	0	2

Course Prerequisite :

- Universal Human Values 1

Course Objectives:

- To enable students to grasp the relevance of value-based living for personal and societal well-being.
- To help students identify the components of human existence and differentiate their individual needs.
- To promote an understanding of key human values that foster harmonious relationships.
- To develop an awareness of the symbiotic relationship between humans and nature
- To encourage ethical and humanistic behavior, particularly in professional and social contexts

Course Outcomes:

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

CO1	Understand the importance of value education in achieving happiness, prosperity, and holistic human development.	Understand
CO2	Distinguish between the needs of the self and the body to ensure inner harmony and well-being.	Distinguish
CO3	Illustrate trust, respect and justice in the family and society build harmony in human relationships.	Illustrate
CO4	Recognize the interconnectedness and mutual fulfillment among all orders of nature to live in harmony with existence.	Recognize
CO5	Describe the importance of ethical conduct based on natural acceptance of human values.re	Describe

Syllabus

UNIT-I INTRODUCTION TO VALUE EDUCATION 9 Hours

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) ; Understanding Value Education; Self-exploration as the Process for Value Education; Continuous Happiness and Prosperity – the Basic Human Aspirations; Happiness and Prosperity – Current Scenario; Method to Fulfill the Basic Human Aspirations: Exploring Natural Acceptance.

UNIT II – HARMONY IN THE HUMAN BEING: 9 Hours

Understanding Human being as the Co-existence of the Self and the Body; Distinguishing between the Needs of the Self and the Body; Exploring the difference of Needs of Self and Body; The Body as an Instrument of the Self; Understanding Harmony in the Self ; Harmony of the Self with the Body ; Programme to ensure self-regulation and Health; Exploring Harmony of Self with the Body.

UNIT III – HARMONY IN THE FAMILY AND SOCIETY: 9 Hours

Harmony in the Family – the Basic Unit of Human Interaction; **„**Trust' – the Foundational Value in Relationship; 'Respect' – as the Right Evaluation; Other Feelings, Justice in Human- to-Human Relationship; Understanding Harmony in the Society; Vision for the Universal Human Order.

UNIT IV – HARMONY IN THE NATURE/EXISTENCE: 9 Hours

Understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature: - Exploring the Four Orders of Nature; Realizing Existence as Co-existence at All Levels; The Holistic Perception of Harmony in Existence: - Exploring Co-existence in Existence.

UNIT V– IMPLICATIONS OF THE HOLISTIC UNDERSTANDING – A LOOK AT PROFESSIONAL ETHICS: 9 Hours

Natural Acceptance of Human Values; Definitiveness of (Ethical) Human Conduct: - Exploring Ethical Human

Conduct; A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order; Competence in Professional Ethics:- Exploring Humanistic Models in Education; Holistic Technologies, Production Systems and Management Models-Typical Case Studies; Strategies for Transition towards Value-based Life and Profession**.**

Total No. Of Hours: 45

Text Books:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethic", Excel Books, 2nd Revised Edition, New Delhi, 2019.
2. RR Gaur, R Asthana, G P Bagaria, "Teachers‟ Manual for A Foundation Course in Human Values and Professional Ethics", Excel Books, 2nd Revised Edition New Delhi, 2019.ISBN 978-93-87034-53.

Reference Books:

1. Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak," Jeevan Vidya" 1999.
2. A.N. Tripathi, "Human Values" New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth".

Mapping with Programme Outcomes

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

Assessment Methodology	**Assessment Tools**	**Marks**
Test		25
Case study analysis	Group discussion and report	5
Value-based project proposal	Presentation and peer evaluation	5
Attendance		5
Total		**40**

25UEET23	ELECTRONIC DEVICES	Category	L	T	P	C
		ES	3	0	0	3

Course Prerequisite: Higher Secondary Physics & Chemistry

Course Objectives:

- To provide a comprehensive understanding of semiconductor materials and construction and working of PN junction diodes with its characteristics.
- To provide a comprehensive understanding of construction, operating principle and characteristics of bipolar junction transistors (BJTs) EEPCCT-203 Electronic Devices
- To explore the construction and fabrication of field-effect transistors (FETs).
- To examine the construction, operating principle of various electronics switching devices – SCS, SCR, TRIAC, DIAC, GTO, and schokkely diode with its characteristics.
- To discuss the construction and operating principle of special semiconductor devices

Course Outcomes:

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

CO1	Apply the fundamental concepts of semiconductor physics, including energy band structures and charge carrier behavior in intrinsic and extrinsic materials, to analyze the construction, operation, and characteristics of PN junction and Zener diodes under various biasing and temperature conditions.	Apply (K3)
CO2	Apply the construction and working principles of NPN and PNP transistors to analyze their operation in common-base (CB), common-emitter (CE), and common-collector (CC) configurations. Utilize transistor characteristics and DC load line analysis to determine the operating point, and implement suitable biasing and compensation techniques to ensure stability in amplifier and switching circuits.	Apply (K3)
CO3	Apply the construction principles and operating characteristics of JFET and MOSFET devices, including enhancement and depletion modes, to analyze and bias FET-based electronic circuits.	Apply (K3)
CO4	Apply knowledge of various power switching devices including SCR, TRIAC, DIAC, and UJT to compare their operational behavior and select appropriate components for effective circuit implementation.	Apply (K3)
CO5	Discuss the construction and operating principle of special semiconductor devices	Apply (K3)

SYLLABUS

UNIT I SEMICONDUCTOR THEORY AND DIODES 9 Hours

Introduction to Semiconductor materials – Energy band structure of insulators, conductors and semiconductors – intrinsic and extrinsic semiconductors – Construction of PN Diode – forward and reverse bias operation – mathematical model of a PN diode – Effects of temperature on diode operation – Static and dynamic resistances –- Transition and diffusion capacitances – Zener diode and its characteristics- Applications of diodes.

UNIT II BIPOLAR JUNCTION TRANSISTORS 9 Hours

Construction and operation – NPN and PNP transistors – CB, CE and CC configurations – Transistor characteristics and regions of operation – Biasing of BJTs– DC load line characteristics – Operating point – stabilization – Biasing circuits – Bias compensation techniques.

UNIT III FIELD EFFECT TRANSISTORS 9 Hours

Comparison between JFET and BJT, JFET – Construction – drain and transfer characteristics – Shockley's equation

— MOSFET –characteristics of Enhancement and Depletion modes. – Biasing of FETs -Comparison of MOSFET with JFET

UNIT IV POWER DEVICES **9 Hours**

Construction, principle of operation and characteristics of Power Diode – Shockley diode – SCR – SCS – GTO– DIAC – TRIAC – UJT

UNIT V SPECIAL SEMICONDUCTOR DEVICES **9 Hours**

Apply the construction and characteristics of advanced semi conductor devices such as Schottky barrier diode, MESFET, FINFET, PINFET, CNTFET, and Dual Gate MOSFET to implement circuit solutions in high-speed, low-power, or nanoscale applications.

Total No. Of Hours: 45

Text Books:

1. J. Millman, C. Halkias and S. Jit, Electronic Devices and Circuits, Tata McGrawHill, 4th edition, 2015
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hall India, 2015
3. Donald Neamen , Dhrubes Biswas "Semiconductor Physics and Devices" McGraw-Hill Education, 4th edition, 2021.

Reference Book & Web Resources

1. Allen Mottershed, "Electronic Devices and Circuits: An Introduction", PHI Learning 2011.
2. Ben G Streetman, "Solid-state electronic devices", Prentice Hall of India, 6th edition, 2008.
3. Theodre. F. Boghert, 'Electronic Devices & Circuits', Pearson Education, 6th Edition, 2003. Ben G. Streetman and Sanjay Banerjee, 'Solid State Electronic Devices', Pearson Education, 2002 / PHI.

Online Courses/NPTEL/SWAYAM:

1. NPTEL Course - Fundamentals of Semiconductor Devices
2. NPTEL Course - Semiconductor Devices and Circuits
3. NPTEL Course - Introduction to Semiconductor Devices

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Application based Hobby circuits	Presentations	5
Simulation (TCAD, PSPICE, LT SPICE) Project based assignment	Demo and viva	5
Attendance		5
Total		**40**

25UEET24	ELECTRIC CIRCUIT THEORY	Category	L	T	P	C

		PC	**3**	**0**	**0**	**3**

Course Prerequisite:

- Fundamentals of Electrical Engineering

Course Objectives :

- To impart knowledge on solving circuit equations using network theorems for DC circuits.
- To impart knowledge on solving circuit equations using network theorems for AC circuits.
- To analyze the two-port network.
- To impart knowledge on obtaining the transient response of RC, RL and RLC circuits.
- To familiarize the phenomenon of resonance in series and parallel circuits.

Course Outcomes:		
On the successful completion of the course, students will be able to		
CO1	Analyse DC circuits and apply circuit theorems	K3
CO2	Examine AC circuits using circuit theorems	K3
CO3	Analyse of two port networks functions	K3
CO4	Analyse series and parallel resonant circuits	K3
CO5	obtain the transient response of DC and AC Circuits	K3

SYLLABUS

Unit I:NETWORK REDUCTION AND THEOREMS FOR DC CIRCUITS

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenin's and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem

Unit II:NETWORK REDUCTION AND THEOREMS FOR AC CIRCUITS

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenin's and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem

Unit III: TWO PORT NETWORK AND NETWORK FUNCTIONS

Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, and hybrid parameters, interconnections of two port networks.

Unit IV :**RESONANCE AND COUPLED CIRCUITS**

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

Unit V :**TRANSIENT RESPONSE ANALYSIS**

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

Text Books:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 9th edition, New Delhi, 2020.
2. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Schaum Series and Systems", Schaum"s Outlines, Tata McGrawHill, Indian. 5th Edison , 2017
3. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2019.

Reference Books:

1. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpat Rai & Sons, New Delhi, 2013.
2. Allan H. Robbins, Wilheim C. Miller, "Circuit Analysis: Theory and Practice", 5th Edition, Cengage publishers, 2013.

3. Richard C. Dorf and James A. Svoboda, “Introduction to Electric Circuits”, 7th Edition, John Wiley Sons, Inc. 2018.

Web Resources

1.https://www.electrical4u.com/
2.https://www.allaboutcircuits.com/
3. https://archive.nptel.ac.in/courses/108/104/108104139/
4. NPTEL:Electrical Engineering - NOC: Basic Electric Circuits
5. Example videos in www.circuitlab.com

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

Assessment Methodology	**Assessment Tools**	**Marks**
Test		25
Application based Hobby circuits	Presentations	5
Simulation (MATLAB,TCAD, PSPICE, LT SPICE, VIRTUAL LAB) Project based assignment	Demo and viva	5
Attendance		5
Total		**40**

25UCSI26	PROGRAMMING IN C	Category	L	T	P	Credit
		ES	2	0	2	3

Course Prerequisite

- Basic programming skills.

Course Objective

- To impart the knowledge of basic programming constructs of C language, arrays and strings, functions, structures, pointers and input/output file handling.

Course Outcomes:

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

CO1	Demonstrate knowledge on C Programming constructs and develop simple program in C using basic constructs.	Understand (K2)
CO2	Apply arrays and string operations to solve basic problems using C	Apply (K3)
CO3	Develop modular programs using functions, recursion, and pointers	Apply (K3)
CO4	Implement user-defined data types using structures, unions, and manage memory dynamically.	Apply (K3)
CO5	Implement file operations and manage memory dynamically using pointers and pre-processor directives.	Apply (K3)

Syllabus

UNIT I INTRODUCTION TO PROGRAMMING PARADIGMS: 9 Hours

Introduction to programming paradigms – Applications of C Language – Structure of C program – C programming: Data Types – Constants – Enumeration Constants – Keywords – Operators: Precedence and Associativity – Expressions – Input/Output statements, Assignment statements – Decision making statements – Switch statement – Looping statements – Compilation process.

UNIT II DECISION MAKING, ARRAYS AND STRINGS 9 Hours

Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays – String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT III FUNCTIONS AND POINTERS 9 Hours

Modular programming – Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.

UNIT IV STRUCTURES AND UNION 9 Hours

Structure – Nested structures – Pointer and Structures – Array of structures – Self-referential structures – typedef – Union – Storage classes and Visibility.

UNIT V FILE MANAGEMENT AND DYNAMIC MEMORY ALLOCATION 9 Hours

Files- Types of file processing, I/O Operations of File, Random access file, Command line arguments,Dynamic memory allocation – malloc, calloc, free, Preprocessor directive, Macro substitution, Compiler control directive.

TEXTBOOKS:

1. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. E. Balagurusamy, "Programming in C" McGraw-Hill, 8th Edition, 2019.
3. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCE BOOKS:

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", 8thedition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", 2ndEdition, Oxford University Press, 2013.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013

ONLINE/ NPTEL COURSES:

1. C for Everyone: Programming Fundamentals- https://www.coursera.org/learn/c-for-everyone
2. Art of C programming -https://onlinecourses.swayam2.ac.in/cec24_cs05/preview
3. Introduction to Programming in C.- https://onlinecourses.nptel.ac.in/noc22_cs40/preview

PRACTICE EXERCISES:

1. Study of Compilation and execution of simple C programs
2. Simple computational problems using arithmetic expressions (Arithmetic Operations, Area &circumference of a circle)
3. Problems involving if-then-else structures (ODD/EVEN numbers, Greatest Numbers)
4. Iterative problems e.g., sum of series (Factorial, Sum of Digits)
5. 1D and 2D, multi-dimensional arrays, traversal
6. Matrix problems, String operations (Addition, Subtraction, Multiplication, Palindrome String Operations, String Handling Functions)
7. Simple functions (nCr Program, Swapping using call-by-reference)
8. Programming for solving Numerical methods problems (Palindrome Checking, Searching and Sorting Names)
9. Recursive functions (Factorial using Recursion)
10. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
11. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
12. Files: reading and writing, File pointers, file operations, random access, processor directives

CO-PO Mapping - PROGRAMMING IN C

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

Assessment Methodology	Assessment Tools	Marks
Theory Test		15
Coding assignments	Online submission	10
Mini project implementation	Code demo and documentation	10
Model Practical		10
Attendance		5
Total		**50**

25UEEI26	DIGITAL ELECTRONICS	Category	L	T	P	C
		PC	3	0	2	4

Course Prerequisite:

- Basic Electron Devices

Course Objective:

- To understand the fundamental principles of number systems, binary codes, and error detection/correction mechanisms.
- To understand the fundamental concepts to build any combinational circuit with logic gates and exclusively using universal gates.
- To understand the concepts of Sequential logic circuits.
- To understand the sequential circuits, emphasize is given to the variety of counter circuits both under synchronous.
- To understand the Asynchronous sequential logic circuits.

Course Outcomes:

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

CO1	Apply knowledge of number systems, binary codes, and logic families in digital design.	K3
CO2	Design and simplify combinational logic circuits using K-map and logic gates.	K3
CO3	Design sequential circuits using flip-flops, counters and shift registers	K3
CO4	Design synchronous sequential logic circuits Moore and Mealy models	K4
CO5	Analyze asynchronous sequential circuits and address hazards and race conditions.	K4

SYLLABUS

Unit I - NUMBER SYSTEM AND LOGIC FAMILIES **9 Hours**

Review of number systems, binary codes, error detection and correction codes. Digital Logic Families – Introduction to RTL, DTL, TTL, ECL and MOSL families – wired and operation, characteristics of digital logic family – comparison of different logic families.

UNIT II - COMBINATIONAL LOGIC **9 Hours**

Representation of logic functions – SOP and POS forms, K-map representations – minimization using K-maps-simplification and implementation of combinational logic – multiplexers and demultiplexers – code converters, adders, subtractors.

UNIT III- SEQUENTIAL LOGIC **9 Hours**

SR, JK, D and T flip-flops – level triggering and edge triggering – counters – Pulse forming circuits - asynchronous and synchronous type – Modulo counters – Shift registers – Ring counters.

UNIT IV -SYNCHRONOUS SEQUENTIAL LOGIC CIRCUITS **9 Hours**

State table and excitation tables - state diagrams - Moore and Mealy models - design of counters - analysis of synchronous sequential logic circuits - state reduction and state assignment.

UNIT V -ASYNCHRONOUS SEQUENTIAL LOGIC CIRCUITS **9 Hours**

Transition table, flow table – race conditions – circuits with latches, analysis of asynchronous sequential logic circuits – implication table – hazards.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Morris Mano.M, 'Digital Logic and Computer Design', Prentice Hall of India, 3rd Edition, 2005.
2. Donald D. Givone, 'Digital Principles and Design', Tata McGraw Hill, 1st Edition, 2003.
3. Thomas L Floyd, 'Digital fundamentals', Pearson Education Limited, 11th Edition, 2015.

REFERENCES

1. Tocci R.J., Neal S. Widmer, 'Digital Systems: Principles and Applications', Pearson Education Asia, 2014.
2. Donald P Leach, Albert Paul Malvino, Goutam Sha, 'Digital Principles and Applications', Tata McGraw Hill, 7th Edition, 2010.

ONLINE/ NPTEL COURSES:

1. https://nptel.ac.in/courses/117105080 – NPTEL Course: Digital Systems Design by IIT Delhi
2. https://www.allaboutcircuits.com – Resource for logic gates, flip-flops, and VHDL
3. https://www.tutorialspoint.com/vhdl – VHDL Tutorials
4. https://www.eetimes.com – Articles and updates in digital design
5. https://www.coursera.org/learn/digital-systems – Coursera Course: Introduction to Digital Systems

PRACTICE EXERCISES:

List of Experiments:

1. Design and implementation of the following Code convertors
   a. BCD to excess-3 code and vice versa b. Binary to gray code and vice-versa
2. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC7483
3. Magnitude comparator
   a. Study of 4-bit magnitude comparator IC
   b. Realization of 8-bit magnitude comparator using 4-bit magnitude comparator ICs.
4. Multiplexers and Encoders
   a. Realization of 16×1 multiplexer using 8×1 multiplexer ICs
   b. Realization of a combinational circuit using multiplexer
   c. Construction and study of a simple Priority Encoder
5. Decoders and DeMultiplexers
   a. Realization of 4 to 16 line decoder using 3 to 8 line decoder ICs
   b. Realization of a combinational circuit using a decoder IC
6. Shift register
   a. Construction of ring counter and Johnson counter using a shift register IC and study of their timing diagrams
   b. Designing a PN Sequence Generator using a shift register IC
7. Ripple Counters and their timing diagrams
   a. 3-bit binary up/down counter
   b. BCD counter using mod-10 counter ICs
8. Design and implementation of Synchronous Counters and study of their timing diagrams
   a. Binary counter
   b. Non-sequential binary counter
   c. 3-bit binary up/down counter
   d. A modulo-N-counter

9. Study of a Memory IC
   a. READ and WRITE operations involving memory chips
   b. Expansion of memory size
10. Simulate the following circuits:
   a. Half Adder and Full Adder
   b. Multiplexer and DeMultiplexer
   c. Binary Up-down Counter
   d. Shift Register

Mapping with Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	**3**	**3**	**2**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**1**
2	**3**	**3**	**3**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**1**
3	**3**	**3**	**3**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**1**
4	**3**	**3**	**3**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**1**
5	**3**	**3**	**3**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**1**

Assessment Methodology	**Assessment Tools**	**Marks**
Theory Test		15
Logic design project	Hardware implementation	10
Digital system simulation (Quartus/Vivado)	Demo and viva	10
Model Practical		10
Attendance		5
Total		**50**

25UEEP27	ELECTRON DEVICES LAB	Category	L	T	P	C
		ES	0	0	2	1

Course Prerequisite:

- Basic Electrical Engineering lab

Course Objectives :

- To enable students to proficiently use basic electronic measurement instruments.
- To analyze and interpret the Voltage-Current (V-I) characteristics of semiconductor devices of diodes, transistors.
- To study and evaluate the V-I characteristics of power electronic devices of SCR, TRIAC and UJT.
- To implement and construct diode-based circuits including half-wave, full-wave, and bridge rectifiers, with and without filter components.
- To design and analyze transistor biasing circuits using transistor.

Course Outcomes:

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

CO1	Proficient in using basic electronic measurement instruments such as multimeters, oscilloscopes, and function generators. They should be able to measure voltage, current, frequency, and other relevant parameters accurately	K3
CO2	Analyze the V-I characteristics of diodes, transistors	K3
CO3	Analyze the V-I characteristics of SCR,TRIAC and UJT	K3
CO4	Implement the application of diode by constructing the rectifiers with and without filters	K3
CO5	Design self-bias and fixed bias circuits using transistor	K3

List of experiments

1. Obtain the V-I characteristics of PN junction diode and determine its static, dynamic resistance and Impedance.
2. Determine the VI characteristics of zener diode.
3. Determine the input and output characteristics of BJT and identify cut-off, active and saturation region for CB configurations.
4. Determine the input and output characteristics of BJT and identify cut-off, active and saturation region for CE configurations.
5. Obtain the transfer and drain characteristics of JFET and determine their drain resistance, mutual conductance.
6. Obtain the transfer and drain characteristics of MOSFET and determine their drain resistance, mutual conductance.
7. Determine the characteristics of SCR
8. Determine the characteristics of TRIAC
9. Determination of intrinsic stand-off ratio of UJT.
10. Design of half wave, full wave rectifier circuits with and without filters and determine the ripple factor.
11. Design of self-bias and fixed bias circuits using transistor and compare their performance.

Virtual Lab:

https://sil-coep.vlabs.ac.in/

Mapping with Programme Outcomes

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

Assessment Methodology	**Assessment Tools**	**Marks**
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	5
Circuit Construction Task	demo	5
Attendance		10
Total		**60**

25UEET28	ELECTRIC CIRCUIT THEORY LAB	Category	L	T	P	C
		PC	0	0	2	1

Course Prerequisite:

- Fundamentals of Electrical Engineering

Course Objectives:

To understand the network theorem in DC circuits.
To verify the phenomenon of resonance in AC circuits.
To verify the phenomenon of two port network.
To obtain the transient response of DC circuits.
To verify the phenomenon of resonance in AC circuits

Course Outcomes:		
On the successful completion of the course, students will be able to		
CO1	Apply circuit theorems for DC circuits	K3
CO2	Apply circuit theorems for AC circuits	K3
CO3	Analyse of two port network	K3
CO4	obtain the transient response of DC circuits	K3
CO5	Analyse coupled circuits, series and parallel resonant circuits.	K3

LIST OF EXPERIMENTS

1. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
2. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
3. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
4. Simulation and experimental verification of Maximum Power transfer Theorem.
5. Study of Analog and digital oscilloscopes and measurement of sinusoidal voltage, frequency and power factor.
6. Simulation and Experimental validation of R-C electric circuit transients.
7. Simulation and Experimental validation of frequency response of RLC electric circuit.
8. Design and Simulation of series resonance circuit.
9. Design and Simulation of parallel resonant circuits.
10. Design the Impedance (Z) and admittance (Y) parameters of a two port network.
11. Design the transmission and hybrid parameters of a two-port network

ADDITIONAL EXPERIMENTS:

1. Experimental determination of power in three phase circuits by two-watt meter method
2. Determination of two port network parameters.
3. Simulation of three phases balanced and unbalanced star, delta networks circuits.

TOTAL: 30 PERIODS

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	10
Attendance		10
Total		**60**

25UGEP29	DESIGN THINKING & IDEA LAB	Category	L	T	P	C
		ES	0	0	2	1

Course Prerequisite:

- Basic Knowledge of Science and interest in creative problem solving

Course Objectives:

- To introduce students to the principles, methodologies, and frameworks of design thinking for solving real-world problems.
- To cultivate user-centric, empathetic, and creative thinking through experiential learning and hands-on activities.
- To enable students to prototype, test, and present innovative solutions using collaborative tools and idea lab resources.

Course Outcomes:

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

CO. No	Description	Blooms level
CO1	Explain the fundamental concepts and stages of Design Thinking and their relevance to problem solving.	K1
CO2	Describe different learning styles, memory processes, and the role of empathy in user-centric design	K2
CO3	Apply engineering tools such as schematic design, PCB layout, 3D printing, and laser cutting to create prototypes.	K3
CO4	Analyze real-world user challenges and evaluate creative problem-solving approaches to develop innovative product designs.	K4
CO5	Interpret feedback from prototype testing and iteratively improve the design to better align with user needs.	K4

Syllabus

UNIT I: LEARNING, EMOTIONS, AND FOUNDATIONS OF DESIGN THINKING 6 Hours

Understanding the learning process, Kolb's learning styles, Assessing and interpreting learning types, Understanding the memory process, Memory retention issues, Memory enhancement techniques, Understanding emotions – experience and expression, Assessing and applying empathy, Definition and need for Design Thinking.

UNIT II: IDEATION, PRODUCT DESIGN, AND PROTOTYPING 6 Hours

Objectives of Design Thinking, Stages of Design Thinking with examples (Empathize, Define, Ideate, Prototype, Test), Understanding creative thinking, Understanding problem-solving, Testing creative problem-solving, Engineering product design process, Examples of innovative product designs, Introduction to prototyping and its purpose, Rapid prototyping and testing methods.

UNIT III: CUSTOMER-CENTRIC INNOVATION AND ITERATIVE DESIGN 6 Hours

Understanding individual uniqueness, Team activities for diversity appreciation, Real-life customer challenge examples, Applying Design Thinking to improve customer experience, Parameters of customer-centric product experience, Aligning product design with user expectations, Feedback loop and user testing, User-focused design and ergonomic considerations, Final product pitch and presentation.

UNIT IV: List of Lab Activities and Experiments (Phase-1) 6 Hours

1. Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
2. Machining of 3D geometry on soft material such as softwood or modelling wax.
3. 3D scanning of computer mouse geometry surface. 3D printing of scanned geometry using FDM or SLA printer.
4. 2D profile cutting of press fit box/casing in acrylic (3 or 6 mm thickness)/cardboard, MDF (2 mm) board using laser cutter & engraver.
5. 2D profile cutting on plywood /MDF (6-12 mm) for press fit designs.

UNIT V: List of Lab Activities and Experiments (Phase-2) **6 Hours**

6. Familiarity and use of welding equipment.
7. Familiarity and use of normal and wood lathe.
8. Embedded programming using Arduino and/or Raspberry Pi.
9. Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.
10. Discussion and implementation of a mini project.
11. Documentation of the mini project (Report and video).

Total No of Hours:30 Hours

Text Books:

1. Tim Brown, Change by Design: How Design Thinking Creates New Alternatives for Business and Society**,** Harper Business, 2009.
2. Karl T. Ulrich and Steven D. Eppinger, Product Design and Development**,** McGraw-Hill Education, 2015.
3. Don Norman, The Design of Everyday Things, Basic Books, 2013.

Reference Book s:

1. Peter G. Rowe, **Design Thinking: Understanding How Designers Think and Work**, MIT Press, 1991.
2. Don Norman, **The Design of Everyday Things**, Basic Books, 2013.
3. Tom Kelley and David Kelley, **Creative Confidence: Unleashing the Creative Potential Within Us All**, Crown Business, 2013.
4. Todd Zaki Warfel, **Prototyping: A Practitioner's Guide**, Rosenfeld Media, 2009.
5. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, **Engineering Design: A Project-Based Introduction**, Wiley, 2011.
6. Karl T. Ulrich and Steven D. Eppinger, **Product Design and Development**, McGraw-Hill Education, 2015.
7. Charles Platt, **Make: Electronics: Learning Through Discovery**, Maker Media, 2011.

Web Resources

https://onlinecourses.nptel.ac.in/noc23_mg72

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

Assessment Methodology	**Assessment Tools**	**Marks**
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	10
Attendance		10
Total		**60**

25UPCE21	COMMMUNICATION SKILLS	Category	L	T	P	C
		EEC	0	0	2	1

Prerequisite: Carrier Development Skills

Course Objective:

- Ability to plan and manage their career paths effectively.
- It focuses on developing self-assessment, goal setting, and decision-making skills.
- Students will learn to research career options and align them with personal strengths and values.

Course Outcome

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

CO1	Develop sustained motivation and enhance interpersonal skills for effective communication and teamwork.
CO2	Build active listening and conversation skills essential for collaborative and respectful team interactions
CO3	Strengthen reading comprehension and writing clarity through critical analysis and audience-focused expression.
CO4	Improve public speaking and presentation skills while fostering self-assessment through SWOT analysis.
CO5	Promote team collaboration and communication through practical activities like debates and group problem-solving

Syllabus

UNIT 1 **6 Hours**

Motivation – II: Intrinsic vs. Extrinsic Motivation- Goal Setting and Achievement - Building and Sustaining Motivation

Interpersonal skills: Effective Communication - Active Listening - Conflict Resolution - Teamwork and Collaboration

UNIT 2 **6 Hours**

Listening Skills: Roles and Responsibilities in a Team - Building Trust and Respect Among Team Members – Effective Team Communication

Conversation skills: Starting and Maintaining a Conversation - Non-Verbal Communication Cues- Active Listening and Responding.

UNIT 3 **6 Hours**

Reading Skills: Skimming and Scanning Techniques – Critical reading and Interpretation

Writing Skills: Grammar and Syntax - Clarity and Conciseness- Audience Awareness

UNIT 4 **6 Hours**

Presentation Speaking Skills: Speech Structure and Organization – Verbal Delivery Techniques

Public speaking skills: Confidence and overcoming Anxiety –Effective message Delivery

SWOT Analysis: Identifying Internal Factors – Analyzing External Factors

UNIT 5: **6 Hours**

Team Building: Roles and Responsibilities in a team – Communication and Trust – Conflict resolution and Problem Solving

Active Sessions: Debate – Picture Connector

Total No of Hours: 30 Hours

Text Book

1. Soft skills for Managers by Dr. T. kalyana chakravathi
2. Personal Development and Soft Skills by Barun K Mitra, Oxford Higher Education

Reference Book

1. The Emotionally Intelligent Workplace by Daniel Goleman.
2. Communication skills and soft skills an integrated approach by E. Suresh kumar, P. Sreehari, j savithri.
3. Top Talking in English (international communication skills) by charles t. Rajendra
4. Soft skills by Raj Lakshmi Suryavanshi, Gurucool Publishing

Mapping with Programme Outcomes

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

25UMCC21	IKS IN HUMANITIES AND SOCIAL SCIENCE	Category	L	T	P	C
		MCC	1	0	1	0

Course Prerequisite:

- Basic understanding of Indian history and culture

Course Objectives:

This course explores Indian Knowledge Systems in the context of humanities and social sciences, providing students with a deeper understanding of India's intellectual heritage. The objectives are to:

- Understand the philosophical foundations of Indian knowledge traditions
- Explore Indian contributions to social sciences, literature, and arts
- Analyze the relevance of ancient wisdom in contemporary social contexts
- Develop appreciation for cultural diversity and heritage
- Foster critical thinking about knowledge systems and their applications

Course Outcomes:

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

CO1	Understand the philosophical foundations and methodologies of Indian knowledge systems in humanities
CO2	Analyze Indian contributions to literature, arts, social organization, and governance systems
CO3	Apply principles from Indian philosophical traditions to contemporary social and ethical issues
CO4	Evaluate the relevance and adaptability of traditional knowledge in modern social contexts
CO5	Create connections between ancient wisdom and contemporary challenges in society

Syllabus

UNIT I: Philosophical Foundations of Indian Knowledge Systems **6 Hours**

Darshanas (Schools of Philosophy): Samkhya, Yoga, Nyaya, Vaisheshika, Mimamsa, Vedanta - Epistemology in Indian philosophy: Pramanas (means of knowledge) - Ethics and moral philosophy in Indian traditions - Concept of Dharma, Artha, Kama, and Moksha - Comparative study with Western philosophical traditions

UNITII: Indian Literary and Artistic Traditions **6 Hours**

Sanskrit literature: Vedas, Upanishads, Puranas, Epics (Ramayana, Mahabharata) - Classical poetry and drama: Kalidasa, Bhartrhari, Bhasa - Regional literature and folk traditions - Indian classical music and dance: Theoretical foundations - Visual arts: Sculpture, painting, and architectural styles - Aesthetics in Indian tradition: Rasa theory and Alamkara shastra.

UNIT III: Social Organization and Governance **6 Hours**

Ancient Indian social structure and organization - Varna and Ashrama systems: Historical context and evolution - Village self-governance: Panchayati Raj origins - Arthashastra: Principles of statecraft and administration - Justice system: Dharmashastra and Rajadharma - Economic systems: Trade, agriculture, and crafts

UNIT IV: Educational Systems and Knowledge Transmission **6 Hours**

Gurukula system: Teacher-student relationship - Ancient universities: Nalanda, Takshashila, Vikramshila - Oral tradition and preservation of knowledge - Women's education in ancient India - Integration of spiritual and material learning - Comparison with modern educational approaches.

UNIT V: Contemporary Relevance and Applications **6 Hours**

Indian knowledge systems in modern governance - Traditional conflict resolution mechanisms - Environmental consciousness in Indian traditions - Community-based development models - Gender studies: Women in Indian philosophical traditions - Relevance of Indian ethics in corporate governance - Cultural preservation and modernization challenges.

Total No of Hours: 30 Hours

Learning Activities

Research Projects: 1. **Philosophical Analysis Project** - Study of a specific philosophical school - Comparison with contemporary thought - Presentation of findings

2. **Literary Heritage Study**
   - Analysis of classical texts
   - Cultural significance evaluation
   - Creative interpretation through modern media
3. **Social Systems Research**
   - Historical analysis of governance models
   - Contemporary applications study
   - Policy recommendation development
4. **Case Study Analysis**
   - Traditional knowledge applications
   - Success stories and challenges

Future implementation strategies

Text Books:

1. S. Radhakrishnan, "Indian Philosophy", Oxford University Press, 2008
2. A.L. Basham, "The Wonder That Was India", Rupa Publications, 2017
3. Kapila Vatsyayan, "Traditional Indian Art and Culture", Cambridge University Press, 2015

Reference Books& Web Resources

1. Heinrich Zimmer, "Philosophies of India", Princeton University Press, 1989
2. Romila Thapar, "Early India: From the Origins to AD 1300", Penguin Books, 2015
3. K.M. Munshi, "The History and Culture of the Indian People", Bharatiya Vidya Bhavan
4. Digital Library of India: https://www.dli.gov.in
5. Sahapedia - Encyclopedia of Indian Culture: https://www.sahapedia.org
6. Indian Council of Historical Research: https://ichr.ac.in
7. Archaeological Survey of India: https://asi.nic.in

Mapping with Programme Outcomes

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

25UMCC22	HOLISTIC WELLNESS	Category	L	T	P	C
		MCC	0	0	1	0

Course Prerequisite:

- Basic physical fitness and medical clearance

Course Objectives:

This course promotes physical fitness, mental well-being, and holistic development of students. The objectives are to:

- Develop physical fitness and motor skills through sports activities
- Learn yoga techniques for stress management and mental clarity
- Understand the importance of physical activity for academic performance
- Promote teamwork, leadership, and sportsmanship
- Establish lifelong habits for health and wellness

Course Outcomes:	
On the successful completion of the course, students will be able to:	
CO1	Demonstrate improved physical fitness and coordination through regular sports participation
CO2	Apply yoga techniques for stress management and mental well-being
CO3	Exhibit teamwork, leadership, and fair play in sports activities
CO4	Analyze the relationship between physical activity and academic performance
CO5	Develop personal fitness plans for lifelong health and wellness

Syllabus

UNIT I: INTRODUCTION TO PHYSICAL FITNESS **3 Hours**

Importance of physical fitness for students - Components of fitness: strength, endurance, flexibility, coordination - Fitness assessment and goal setting - Safety guidelines and injury prevention - Warm-up and cool-down techniques

UNIT II: SPORTS ACTIVITIES **6 Hours**

Option A: Team Sports (Choose any two) - Cricket: Basic skills, rules, and match play - Football: Fundamental techniques and game strategies - Basketball: Shooting, dribbling, and team coordination - Volleyball: Serving, spiking, and court positioning - Badminton: Strokes, footwork, and doubles play

Option B: Individual Sports (Choose any two) - Athletics: Running, jumping, and throwing events - Table Tennis: Basic strokes and match play - Tennis: Forehand, backhand, and court coverage - Swimming: Basic strokes and water safety - Cycling: Technique and endurance building

UNIT III: YOGA AND MINDFULNESS **3 Hours**

Introduction to yoga philosophy and benefits - Basic yoga asanas (postures): Sun salutation, standing poses, seated poses - Pranayama (breathing techniques): Deep breathing, alternate nostril breathing - Meditation and mindfulness practices - Relaxation techniques and stress management.

Practical Activities

Sports Training Sessions: - Skill development workshops - Regular practice sessions - Inter-class tournaments - Sports day participation - Fitness challenges and competitions

Yoga Sessions: - Daily morning yoga practice - Guided meditation sessions - Breathing exercise workshops - Stress relief techniques - Mindfulness activities

Assessment Pattern

- Continuous Assessment: 100%
  - Regular participation: 40%
  - Skill demonstration: 30%
  - Sports performance/tournament participation: 20%
  - Yoga practice and improvement: 10%

Text Books:

1. "Complete Guide to Physical Fitness" - Physical Education Department Manual
2. B.K.S. Iyengar, "Light on Yoga", Harper Thorsons, 1991

Reference Book & Web Resources

1. "Sports Training Principles" by Frank W. Dick, A&C Black, 2007
2. Swami Muktibodhananda, "Hatha Yoga Pradipika", Yoga Publications Trust, 2012
3. Yoga Alliance - Professional Yoga Resources: https://www.yogaalliance.org
4. Sports Authority of India Training Materials
5. Olympic training videos and resources
6. Isha Foundation Yoga Programs: https://isha.sadhguru.org

Mapping with Programme Outcomes

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