

ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

(Anjugramam-Kanyakumari Main Road, Palkulam, Variyoor P.O.-629 401, K.K.Dist.)

Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai

Accredited with A+ Grade by NAAC



B.E. Electronics and Communication Engineering

(B.E - ECE)

Curriculum & Syllabus

(2024-2025 Admitted Students Onwards)

Vision Statement of RCET

To be an academic Institute of continuous excellence towards education and research in rural regime and provide service to nation in terms of nurturing potentially higher social, ethical and engineering companion graduands.

Mission Statement of RCET

- ❖ To foster and promote technically competent graduands by imparting the state of art Engineering education in rural regime.
- ❖ To enunciate research assisted scientific learning by dissemination of knowledge towards science, agriculture, industry and national security

Vision of the Department

To promote ethical and innovative Electronics and Communication engineers through excellence in teaching, training and research so as to contribute to the advancement of the rural society and mankind.

Mission of the Department

- ❖ To focus on quality teaching and learning that will make students to adapt to the needs of the industry and higher learning.
- ❖ To infuse a spirit of social responsibility, innovation, creativity and ethical practices through all round development activities of students

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)	
PEO1	Graduates shall be able to lead a successful career by applying the Scientific and Engineering fundamentals to formulate and solve the real-life problems
PEO2	Graduates shall be able to practice the ethics of their profession, consistent with a sense of social responsibility and aptitude for innovations as they work individually and in multi-disciplinary teams
PEO3	Graduates shall be receptive to recent technologies so as to excel in industry and accomplish professional competence through lifelong learning.

PROGRAMME OUTCOMES (POs)	
PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSO)	
PSO1	Ability to perform innovatively in the fields of Electronics and communication Engineering by utilizing the acquired knowledge and to progress in the profession by applying ethical values ultimately benefiting the rural society.
PSO2	Apply advanced engineering hardware and software tools to solve complex Electronics and Communication Engineering problems.

CREDIT INFO		
Sl.No	Category	Credits
1	Humanities and Social Science (HSS)	13
2	Basic Science Courses (BSC)	25
3	Engineering Science Courses (ESC)	25
4	Professional Core Course (PCC)	59
5	Professional Electives Courses (PEC)	18
6	Open Electives Courses (OEC)	12
7	Employability Enhancement Courses (EEC)	17
8	Mandatory Courses (MNC)	-
Total Credits		169

Humanities and Social Science (HSS)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24GE101	Heritage of Tamils	HSS	1	0	0	1
2	24EN101	English For Engineers	HSS	1	0	3	2.5
3	24GE201	Tamils and Technology	HSS	1	0	0	1
4	24EN201	Presentation And Language Skills Laboratory	HSS	0	0	3	1.5
5	24MG601	Product Innovation & Entrepreneurship	HSS	2	0	0	2
6	24GE701	Professional Ethics and Human Values	HSS	2	0	0	2
7	24MG701	Economics for Engineers	HSS	3	0	0	3
Basic Science Courses (BSC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24MA101	Matrices and Calculus	BSC	3	1	0	4
2	24PH101	Engineering Physics	BSC	3	0	2	4
3	24CY101	Engineering Chemistry	BSC	3	0	2	4
4	24MA201	Complex Variables and Transforms	BSC	3	1	0	4
5	24PH201	Physics for Electronics Engineering	BSC	3	0	0	3
6	24CY401	Environmental Science and Engineering	BSC	2	0	0	2
7	24MA301	Probability, Statistics and Random Process	BSC	3	1	0	4
Engineering Science Courses (ESC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24ME201	Engineering Graphics & Design	ESC	1	0	4	3
2	24CS201	Programming for Problem Solving using C	ESC	2	0	4	4
3	24EE202	Fundamentals of Electrical and Electronics Engineering	ESC	3	0	0	3
4	24EE203	Electric Circuit Analysis	ESC	3	0	2	4
5	24GE231	Workshop Practices	ESC	0	0	3	1.5
6	24EE301	Electromagnetic Theory	ESC	3	0	0	3
7	24CS331	Programming for Problem Solving using Python	ESC	0	0	3	1.5

8	24EE404	IoT-Sensors and Devices	ESC	3	0	2	4
Professional Core Courses(PCC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24EC302	Digital Logic Circuits and Design	PCC	3	0	2	4
2	24EC303	Signals and Systems	PCC	3	0	2	4
3	24EC304	Electronic Devices for Industrial Applications	PCC	3	0	2	4
4	24EC401	Analog Electronics Circuits	PCC	3	0	2	4
5	24CS401	Computer Networks	PCC	2	0	2	3
6	24EC402	Communication Systems	PCC	3	0	2	4
7	24EE402	Control Systems	PCC	3	0	0	3
8	24CS402	Data Structures using C++	PCC	2	0	2	3
9	24EC403	Digital Signal Processing	PCC	3	0	2	4
10	24EC501	Microprocessors, Microcontrollers and Interfacing Techniques	PCC	3	0	2	4
11	24EC502	Wireless Communication	PCC	3	0	2	4
12	24EC503	Linear Integrated Circuits	PCC	3	0	2	4
13	24EC602	Transmission Lines and Waveguides	PCC	3	0	0	3
14	24EC603	Embedded Systems	PCC	3	0	0	3
15	24EC604	VLSI Design	PCC	3	0	2	4
16	24EC701	Antenna and Microwave Engineering	PCC	3	0	2	4
Professional Electives Courses I (PEC)							
NETWORKS							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24EC571	Wireless Systems and Standards	PEC	3	0	0	3
2	24EC572	Wireless Sensor Networks	PEC	3	0	0	3
3	24EC573	Wireless Networking	PEC	3	0	0	3
4	24EC574	Network Security	PEC	3	0	0	3
5	24EC575	Software Defined Networking	PEC	3	0	0	3
6	24EC576	Long Term Evolution Technologies	PEC	3	0	0	3
Professional Electives Courses II (PEC)							
SIGNAL PROCESSING							
1	24EC581	Speech Signal Processing	PEC	3	0	0	3
2	24EC582	Multimedia Compression Techniques	PEC	3	0	0	3
3	24EC583	Wavelets and its Applications	PEC	3	0	0	3

4	24EC584	Advanced Digital Signal Processing	PEC	3	0	0	3
5	24EC585	Pattern Recognition and Machine Learning	PEC	3	0	0	3
6	24EC586	Digital Image Processing	PEC	2	0	2	3
Professional Electives Courses III (PEC)							
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING							
1	24EC671	Soft Computing	PEC	2	0	2	3
2	24EC672	Machine Learning Techniques	PEC	2	0	2	3
3	24EC673	Deep Learning Techniques	PEC	2	0	2	3
4	24EC674	Python Programming for AI And ML	PEC	2	0	2	3
5	24EC675	Introduction to Data Analytics and Visualization	PEC	2	0	2	3
6	24EC676	Architectures for Management of Large Datasets	PEC	2	0	2	3
Professional Electives Courses IV (PEC)							
INTERNET OF THINGS							
1	24EC681	IoT Protocols and Industrial Sensors	PEC	2	0	2	3
2	24EC682	IoT Processors	PEC	2	0	2	3
3	24EC683	IoT System Design	PEC	2	0	2	3
4	24EC684	IoT Communication Models	PEC	2	0	2	3
5	24EC685	Industrial IoT and Industry 4.0	PEC	2	0	2	3
6	24EC686	Python for IoT Data Analytics	PEC	2	0	2	3
Professional Electives Courses V (PEC)							
VLSI SYSTEM DESIGN							
1	24EC771	Analog VLSI Circuits	PEC	3	0	0	3
2	24EC772	Low Power VLSI Design	PEC	3	0	0	3
3	24EC773	Nano Electronics	PEC	3	0	0	3
4	24EC774	Device Modeling	PEC	3	0	0	3
5	24EC775	System-On-Chip Design	PEC	3	0	0	3
6	24EC776	FPGA Based System Design	PEC	3	0	0	3
Professional Electives Courses VI (PEC)							
RADIO FREQUENCY AND ANTENNA SYSTEMS							
1	24EC781	Microwave Circuits and Systems	PEC	3	0	0	3
2	24EC782	Microwave Integrated Circuits	PEC	3	0	0	3
3	24EC783	RF System Design	PEC	3	0	0	3

4	24EC784	Electromagnetic Interference and Compatibility	PEC	3	0	0	3
5	24EC785	Antenna Technologies for Wireless Applications	PEC	3	0	0	3
6	24EC786	Optical Communication	PEC	3	0	0	3
Open Electives Courses I (OEC)							
ARTIFICIAL INTELLIGENCE AND COMPUTER SCIENCE AND ENGINEERING							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24AI601	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3
2	24AI602	Business Intelligence and Its Applications	OEC	3	0	0	3
3	24AI603	Data Science Fundamentals	OEC	3	0	0	3
4	24CS601	Augmented Reality /Virtual Reality	OEC	3	0	0	3
5	24CS602	Full Stack Development	OEC	3	0	0	3
6	24CS603	Software Testing and Quality Assurance	OEC	3	0	0	3
7	24CS604	Cloud Computing	OEC	3	0	0	3
Open Electives Courses II (OEC)							
CIVIL AND AGRICULTURAL ENGINEERING							
1	24AG601	Principles of Crop Production	OEC	3	0	0	3
2	24AG602	Dairy and Food Engineering	OEC	3	0	0	3
3	24AG603	Post-Harvest Technology	OEC	3	0	0	3
4	24AG604	Agricultural Finance, Banking and Co-operation	OEC	3	0	0	3
5	24CI601	Rural Development	OEC	3	0	0	3
6	24CI602	Geographic Information System	OEC	3	0	0	3
7	24CI603	Water Resources management	OEC	3	0	0	3
8	24CI604	Climate Change and its Impact	OEC	3	0	0	3
Open Electives Courses III (OEC)							
BIO MEDICAL AND ELECTRICAL ENGINEERING							
1	24BM701	Wearable Devices	OEC	3	0	0	3
2	24BM702	Telemedicine and Healthcare Delivery	OEC	3	0	0	3
3	24BM703	Medical Informatics	OEC	3	0	0	3

4	24BM704	Basics of Human Anatomy and Physiology	OEC	3	0	0	3
5	24EE701	Robot Process Automation	OEC	3	0	0	3
6	24EE702	Electric vehicle Technology	OEC	3	0	0	3
7	24EE703	Smart Grid	OEC	3	0	0	3
8	24EE704	Energy Conservation and Management	OEC	3	0	0	3
Open Electives Courses IV (OEC)							
MECHANICAL AND MANAGEMENT							
1	24ME701	Additive Manufacturing	OEC	3	0	0	3
2	24ME702	Rocket Propulsion	OEC	3	0	0	3
3	24ME703	Industrial Safety	OEC	3	0	0	3
4	24ME704	Marine Vehicles	OEC	3	0	0	3
5	24MG701	Digital Marketing	OEC	3	0	0	3
6	24MG702	Industrial Psychology	OEC	3	0	0	3
7	24MG703	Logistics and Supply chain Management	OEC	3	0	0	3
8	24MG704	Corporate Social Responsibility	OEC	3	0	0	3
EMPLOYABILITY ENHANCEMENT COURSES (EEC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24EC351	Mini Project I- Design & Simulation of fundamentals in Electronics	EEC	0	0	2	1
2	24EC451	Mini Project II- Community based Project	EEC	0	0	2	1
3	24EN451	Soft Skills Development	EEC	0	0	2	1
4	24EC551	Mini Project III- Real-World Innovation Practices in Electronics and Communication Engineering	EEC	0	0	2	1
5	24EN651	Business and Managerial Communications	EEC	0	0	2	1
6	24GE551	Quantitative and Reasoning Skills-I	EEC	0	0	2	1
7	24EC651	Mini Project IV- Product Development: From Concept to Commercialization	EEC	0	0	2	1
8	24GE651	Quantitative and Reasoning Skills-II	EEC	0	0	2	1

9	24EC751	Project Work Phase I (Design and Analysis)	EEC	0	0	4	2
10	24EC752	Industrial Training/ Internship	EEC	0	0	0	2
11	24EC851	Project Work Phase II	EEC	0	0	10	5

MANDATORY COURSES (MNC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24MC101	Induction Programming	MNC	THREE WEEKS			
2	24MC201	Sports And Yoga for Youth Empowerment - I	MNC	0	0	2	0
3	24MC202	NCC Credit Course Level - I	MNC	1	0	2	1#
4	24MC301	Sports And Yoga for Youth Empowerment - II	MNC	0	0	2	0
5	24MC401	NCC Credit Course Level - II	MNC	1	0	0	1#
6	24MC601	Disaster Management	MNC	1	0	0	1#
7	24MC701	Constitution Of India	MNC	1	0	0	1#

Recommended courses for Semester I

S.no	Course code	Course Title	Category	L	T	P	C
THEORY COURSES							
1	24GE101	Heritage of Tamils	HSS	1	0	0	1
2	24MA101	Matrices and Calculus	BSC	3	1	0	4
THEORY COURSE WITH LABORATORY COMPONENT							
3	24EN101	English for Engineers	HSS	1	0	3	2.5
4	24PH101	Engineering Physics	BSC	3	0	2	4
5	24CY101	Engineering Chemistry	BSC	3	0	2	4
6	24ME201	Engineering Graphics & Design	ESC	1	0	4	3
7	24CS201	Programming for problem solving using C	ESC	2	0	4	4
MANDATORY COURSES							
8	24MC101	Induction programming	MNC	THREE WEEKS			
TOTAL				14	1	15	22.5

Recommended courses for Semester II

S.no	Course code	Course Title	Category	L	T	P	C
THEORY COURSES							
1	24GE201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSS	1	0	0	1
2	24MA201	Complex Variables and Transforms	BSC	4	0	0	4
3	24PH201	Physics for Electronics Engineering	BSC	3	0	0	3
4	24CY401	Environmental Science and Engineering	BSC	2	0	0	2
THEORY COURSE WITH LABORATORY COMPONENT							
5	24EE202	Fundamentals Of Electrical and Electronics Engineering	ESC	3	0	2	4
6	24EE203	Electric Circuit Analysis	ESC	3	0	2	4
LABORATORY COURSES							

7	24GE231	Workshop Practices	ESC	0	0	3	1.5
8	24EN201	Presentation and Language Skills Laboratory	HSS	0	0	3	1.5
9	24CS331	Programming for Problem Solving using Python	ESC	0	0	3	1.5
MANDATORY COURSES							
10	24MC201	Sports and yoga for youth empowerment - I	MNC	0	0	2	0
11	24MC202	NCC CREDIT COURSE LEVEL - I	MNC	1	0	2	1#
TOTAL				13	1	15	21.5



பாடநெறி குறியீடு:	24GE101	பாடத்தின் தலைப்பு:	தமிழர் மரபு (Common to AI&DS,AE,BME,CE,CSE, CSE(AI&ML),EEE,ECE,MECH)
கிரெடிட்	1	L – T – P	1-0-0

பாடத்திட்ட நோக்கங்கள்:

- தமிழின் மதச்சார்பற்ற தன்மை, இந்திய மொழிக் குடும்பத்தின் திராவிட மொழி, திருக்குறளின் கருத்துக்கள், சமயங்களின் தாக்கம், நவீன இலக்கிய வளர்ச்சி ஆகியவற்றை நினைவு கூர்தல்.
- தமிழர்களின் சமூக மற்றும் பொருளாதார வாழ்வில் நடுகல், சிற்பங்கள், சிலைகள் மற்றும் அழகிய கைவினைப் பொருட்கள், இசைக்கருவிகள் ஆகியவற்றின் தொடர்புடைய அறிவைக் கோடிட்டுக் காட்டுதல்.
- தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஓயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகளை மனதில் பதிய வைத்தல்.
- தமிழ்நாட்டின் தாவரங்கள் மற்றும் விலங்கினங்கள், சங்க நகரங்கள் மற்றும் துறைமுகங்கள், சங்ககாலத்தின் ஏற்றுமதி மற்றும் இறக்குமதிகளை நினைவுபடுத்துதல், வெளிநாடுகளில் சோழர் படையெடுப்பைக் கண்டறிதல்.
- இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கைக் கண்டறிதல், இந்திய மருத்துவத்தில் சித்தமருத்துவத்தின் பங்குக்கு இணையாக இந்தியாவின் பிறபகுதிகளில் தமிழ்ப்பண்பாட்டின் தாக்கத்தை அடையாளம் காணுதல்.

அலகு I மொழி மற்றும் இலக்கியம்	[3 hours]
இந்திய மொழிக்குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச் சார்பற்றதன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க்காப்பியங்கள், தமிழகத்தில் சமணபௌத்த சமயங்களின் தாக்கம்- பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.	

அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை	[3 hours]
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப்பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில்	

திருவள்ளூர் சிலை – இசைக்கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	[3 hours]
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஓயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்	[3 hours]
தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம்மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.	

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	[3 hours]
இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப்பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிக்கள் – தமிழ்ப்புத்தங்கங்களின் அச்ச வரலாறு.	

பாடநெறிமுடிவுகள் (பாழு):

பாடநெறியின்முடிவில், மாணவர்பின்வரும் திறன்களைப்பெறுவர்:

பாழு	பாடநெறிமுடிவுகள்	மிக உயர்ந்த அறிவாற்றல் நிலை
அலகு I பாழு:	தமிழின் மதச்சார்பற்ற தன்மை, திராவிட மொழியின் பங்கு, திருக்குறளின் கருத்துக்கள், சமயங்களின் தாக்கம், நவீன இலக்கிய வளர்ச்சி ஆகியவற்றையும் தெரிந்து கொள்கிறார்கள்.	கே 1
அலகு II பாழு:	தமிழர்களின் சமூக மற்றும் பொருளாதார வாழ்வில் நடுகல், சிற்பங்கள், சிலைகள் மற்றும் அழகிய கைவினைப்பொருட்கள், இசைக்கருவிகள் ஆகியவற்றை விவரிக்கும் ஆற்றலை பெறுகிறார்கள்.	கே 2
அலகு III பாழு:	தமிழர்களின் பாரம்பரிய விளையாட்டுகளை தெரிந்து கொள்ளுவதால் விளையாட வேண்டும் என்ற ஆர்வத்தை பெறுகிறார்கள்.	கே 1

அலகு IV பாழு:	தமிழ்நாட்டின் தாவரங்கள் மற்றும் விலங்கினங்கள் பற்றிய அறிவையும், சங்ககால கட்டிடக்கலை, ஏற்றுமதி மற்றும் இறக்குமதி தொழில்நுட்ப அறிவை பெறுகிறார்கள்..	கே 1
அலகு V பாழு:	இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கையும், இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு இணையாக இருப்பதையும், தெரிந்து கொள்கிறார்கள்.	கே 1

பாடநெறி முடிவுகள் மற்றும் நிரல் முடிவுகள் ஒப்பிடுதல்

பாழுகள்	மிக உயர்ந்த அறிவாற்றல் நிலை	பாடநெறி முடிவுகள்											
		1	2	3	4	5	6	7	8	9	10	11	12
பாழு1	கே 1	2	-	-	-	-	-	-	-	-	-	-	-
பாழு2	கே 2	1	-	-	-	-	-	-	-	-	-	-	-
பாழு3	கே 1	1	-	-	-	-	-	-	-	-	-	-	-
பாழு4	கே 1	1	-	-	-	-	-	-	-	-	-	-	-
பாழு5	கே 1	1	-	-	-	-	-	-	-	-	-	-	-

நிலை 3- அதிக ஒத்துப்போதல், நிலை2- மிதமாக ஒத்துப்போதல், நிலை1- குறைவாக ஒத்துப்போதல், நிலை 0- ஒத்துப்போகவில்லை

மதிப்பீட்டுத்திட்டம்:

இறுதிபருவதேர்வு: (கேள்விமுறை)

கூறுகள்	மதிப்பீட்டின்வகை	அதிகபட்ச மதிப்பெண்கள்	குறைக்கப்பட்ட மதிப்பெண்கள்	இறுதி மதிப்பெண்கள்
தொடர்ச்சியான உள்தேர்வு	தொடர்ச்சியான உள்தேர்வு – I	100	40	40
	தொடர்ச்சியான உள்தேர்வு – II	100	40	
இறுதி பருவதேர்வு	எழுத்துதேர்வு	100	60	60
மொத்தம்				100

- ஒவ்வொரு யூனிட்டும் இரண்டு 2 மதிப்பெண் வினாக்களையும் ஒரு 16 மதிப்பெண் வினாவையும் (இரண்டில் ஒன்று) கொண்டுள்ளது.
- பதினைந்து கேள்விகளுக்கும் பதிலளிக்க வேண்டும்.

மதிப்பீட்டுமுறை

பள்ளமில் வகை	தொடர்ச்சியான மதிப்பீட்டு சோதனைகள்		இறுதிதேர்வு
	1	2	
நினைவில் கொள்ளுதல்	60	50	60
புரிந்து கொள்ளுதல்	40	50	40
விண்ணப்பித்தல்	0	0	0
பகுப்பாய்வுதல்	0	0	0
மதிப்பிடுதல்	0	0	0
உருவாக்குதல்	0	0	0

Text Books:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல்துறை வெளியீடு)
4. பொருறை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறைவெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL.
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

Reference Books:

1. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
2. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
3. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Code:	24GE101	CourseTitle:	HERITAGE OF TAMILS
Credits	1	L – T – P	1-0-0
Pre-requisite			NIL

Course objectives:

- Recalling the secular nature of Tamil, the Dravidian language of the Indian language family, the ideas of Thirukkural, the influence of religions and the development of modern literature.
- To outline the relevant knowledge of Nadukal, sculptures, statues and beautiful handicrafts, musical instruments in the social and economic life of Tamils.
- Terukhoothu, Karakatam, Villuppattu, KanyanKoothu, Wailatam, DholpaVaikhuthoo, Silampattam, Valali, Puliyattam, Memorizing the games of Tamils
- Flora and fauna of Tamil Nadu, Sangam cities and ports, reminiscence of exports and imports of Sangam period, tracing Chola invasion abroad.
- Identify the role of Tamils in the Indian Liberation War and identify the influence of Tamil culture in other parts of India along with the role of Siddha medicine in Indian medicine.

UNIT I - Language and Literature	[3 hours]
Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.	

UNIT II - Heritage - Rock Art Paintings to Modern Art – Sculpture	[3 hours]
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social	

and Economic Life of Tamils.

UNIT III - Folk and Martial Arts	[3 hours]
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.	

UNIT IV - Thinai Concept of Tamils	[3 hours]
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.	

UNIT V- Contribution of Tamils to Indian National Movement and Indian Culture	[3 hours]
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.	

Course outcomes: On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Level
CO1	Know the secular nature of Tamil, the role of Dravidian language, the ideas of Thirukkural, the influence of religions and the development of modern literature.	K1
CO2	Understand the social and economic life of the Tamils and to describe sculptures, statues and beautiful handicrafts, musical instruments.	K2
CO3	Get the interest in playing Terukoothu, Karakatam, Villuppattu, Kanyan Koothu, Wailatam, Dholbaik Koothu, Silampattam, Valali, Tiger Actam, and splashing	K1
CO4	Acquire knowledge of Tamil Nadu's flora and fauna, Sangam architecture,	K1

	export and import techniques.	
CO5	Know the role of Tamils in the Indian Liberation War and the role of Siddha medicine in Indian medicine.	K1

COs and POs Mapping

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	40	40
	CIE – II	100	40	
	Model Lab Exam	25	25	
End Semester Examination (ESE)	Theory Exam	100	60	60
Total				100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	60	50	60
Understand	40	50	40
Apply	0	0	0
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2. கணினித்தமிழ் –முனைவர் இல. சுந்தரம். (விகடன்பிரசுரம்).
3. கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4. பொருநை - ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
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2. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
3. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
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5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
6. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Code:	24MA101	Course Title:	MATRICES AND CALCULUS (Common to AI&DS, AE, BME, CE, CSE, CSE(AI&ML),EEE,ECE, MECH)
Credits:	4	L – T – P	3 – 1 – 0
Pre-requisite			NIL

Course objectives:

- To provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.
- To learn the concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form.
- To learn the foundation course of Single Variable and multivariable calculus plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

Teaching-Learning Process:

These are sample strategies which teachers can use to accelerate the attainment of the various course outcomes.

- Lecture method does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation and encourage the students to come up with their own creative ways to solve them.
- Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the students' understanding.

UNIT I – Matrices	[12 hours]
Eigenvalues and Eigenvectors and their properties – Diagonalization of a matrix (Symmetric matrix) – Cayley - Hamilton theorem (without proof) – Inverse and Power of a matrix by Cayley - Hamilton	

theorem – Quadratic forms and Nature of quadratic forms.

Application: Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II – Differential Calculus

[12 hours]

Functions – Limit – Continuity – Derivatives – Differentiation rule – Product and quotient rules – Chain rules – Implicit differentiation – Logarithmic differentiation.

Application: Maxima and Minima of functions of one variable

UNIT III – Functions of Several Variables

[12 hours]

Partial differentiation – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables.

Application: Maxima and Minima of functions of two variables using MATLAB - Lagrange’s method of undetermined multipliers.

UNIT IV – Integral Calculus

[12 hours]

Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Bernoulli’s theorem (without proof) – Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

Application: Area between simple closed curves.

UNIT V – Multiple Integrals

[12 hours]

Double integrals – Double integrals in cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves – Triple integrals – Change of variables in double and triple integrals.

Application: Volume of solids, Mass of Lamina

Course outcomes:

On completion of the course, the student will have the ability to:

COs	Course Outcome	Cognitive domain
CO1	Apply the matrix algebraic techniques for eigen value related applications	K3

CO2	Understand the concepts of limit and continuity of functions	K2
CO3	Compute the derivatives and the extreme points and solve engineering problems	K3
CO4	Use the partial derivatives to find the maxima and minima of multivariable functions	K3
CO5	Use fundamental theorem of calculus to evaluate definite integrals	K3
CO6	Apply the concepts of multiple integrals to find the areas and volumes of geometrical shapes	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	1	-	2	-	-	-	-	-	-	2
CO2	2	1	1	-	-	-	-	-	-	-	-	1
CO3	3	2	1	-	2	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-
CO6	3	2	1	-	1	-	-	-	-	-	-	1

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	40		
	Skill Assessment - I	40			
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or choice).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	1	2	
Remember	20	20	20
Understand	40	20	20
Apply	40	60	60
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015.
[For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8]

Reference Books:

1. Muthusubramanian R and Salivahanan S, "Basic Electrical and Electronics Engineering," McGraw Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016
2. Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
3. Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
4. Narayanan. S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.Hill, NewDelhi, 2009.

Equivalent NPTEL/SWAYAM Courses

Sl.No.	Course Title	Course Instructor	Host Institute
1	Matrix Analysis with Applications	Prof. S. K. Gupta Prof. Sanjeev Kumar	IIT Roorkee
2	Calculus of One Real Variable	Prof. Joydeep Dutta	IIT Kanpur

Web Links and Video Lectures (E-Resources):

1. System of Linear Equations, Eigenvalues and Eigenvectors:
<https://www.nptelvideos.com/lecture.php?id=13416>
2. Concept of Domain, Limit, Continuity and Differentiability:
<https://www.nptelvideos.com/lecture.php?id=13422>
3. Matrix Diagonalization: <https://www.nptelvideos.com/lecture.php?id=13481>

Course Code:	24EN101	Course Title:	ENGLISH FOR ENGINEERS (Common to AI&DS, AE, BME, CE, CSE, CSE(AI&ML), EEE, ECE, MECH)
Credits:	2.5	L – T – P	1-0-3
Pre-requisite	NIL		

Course Objectives:

- To develop an understanding of Basic English Grammar.
- To enhance listening skills and select appropriate responses.
- To practice presentation and speaking techniques.
- To develop a quest for reading.
- To practice professional writing.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Language learning softwares / Language Lab
3. Online Resources
4. Smart Class Room
5. Flipped classrooms
6. Project based Collaborative Experiential learning
7. Expert Lecture sessions

UNIT I - BASIC GRAMMAR- VOCABULARY AND EXPRESSIONS	[8 hours]
<p>Grammar: Parts of speech - Types of sentences: Assertive - Imperative - Interrogative & Exclamatory - Affirmative - Negative - Gerunds & Infinitives - Tenses - Voices- Impersonal passives- Prepositions -Articles & Determiners- Cause and effect expressions - Vocabulary: Affixes- Synonyms & Antonyms - Homonyms - Homophones- Compound Nouns.</p>	

UNIT II - ACTIVE LISTENING - RESPONDING		[15 hours]
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	Topic	Hours
1.	Listening to Audio (Podcasts- Audiobooks- Radio Program) and Practice Exercise-Answering Cloze Test Based on Listening	3
2.	Listening to native speaker's Telephone Conversations– Analyzing a Product	3
3.	Listening to Job Interviews - Sports Commentaries /	3

	Animated stories / Anecdotes / Event narration	
4.	Video Comprehension – Brainstorming and Note-Taking	3
CLASSROOM ACTIVITIES		
1.	Listening to Statistical Information and Follow-up Exercises. - Form Filling Exercises	1
2.	Debate and reviewing the performance of each participant - Panel Discussion	2

UNIT III: SPEAKING AND PRESENTATION SKILLS		[15 hours]
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	Topic	Hours
1.	Speaking Development through English software S-net or Globarena and Online Content (Tenses- Voices- SV Agreement- Prepositions- Coherence Markers- Relative Clauses- Modals- Punctuation)	5
CLASSROOM ACTIVITIES		
1.	Self-Introduction - Sharing Childhood Experiences- Talking about Favorite Personalities	1
2.	Describing Recent Innovation in Technology	1
3.	Interviewing Celebrities and Entrepreneurs	1
4.	Situational Conversations (Meeting a friend in a cafe) - Narrating Personal Experience	1
5.	Group Communication- Discussing Social Issues- Current Affairs and Debate	1
6.	Role-Play- Picture/Movie Description	1
7.	Presentation – I (Book /Movie Review- Story Telling- General	2

	Presentations)	
8.	Presentation – II (Technical Presentations)	2

UNIT IV: READING BETWEEN LINES		[12 hours]
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	Topic	Hours
1.	Reading Comprehension - skimming - scanning (General / Technical passages	2
2.	Reading Longer Texts with Time Frame	2
3.	Reading Data using different types of Texts- Magazines and Internet Materials	2
4.	Reading Research Papers-- Editing/Proofreading	2
CLASSROOM ACTIVITIES		
1.	Job Advertisements – Manual for Product/Service – Telephone Phrases	1
2.	Reading Cause and Effect Essays-Technical Papers and Case Studies - Sorting out jumbled Sentences in a Paragraph	2
3.	Short Stories - Critical Reading	1

UNIT V- WRITING FOR ENGINEERS	[7+3 hours]
Writing - Application Letters - Resume- Product Description - Essay related to Technical / Social / current topics - Interpretation of Charts - Short Articles on everyday life - letters – Enquiry- Quotation- Order- Claim - Adjustment - Response to complaints - Statement of Purpose (SoP) -Emails - Memos -Notices - Circulars - Minutes of Meetings - Internship - Accident Report - Feasibility Report- Recommendations.	

LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	Topic	Hours
1.	Mind Mapping and Brainstorming on any Social Event/Issue	1
2.	Creating a Blog/Vlog/YouTube Channel –Uploading MP3/MP4 – Practice (Movie/Book/ Gadget Review- General/Tech Talks- Interview with Celebrities)	1
3.	Creating a Product Review Blog.	1

Course outcomes:

On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Domain
CO1	Identify various grammatical components- build vocabulary and apply expressions for error-free sentences	K3
CO2	Make use of appropriate words to respond by listening to general and technical online contents	K3
CO3	Experiment with the nuances of presentation and speaking skills	K3
CO4	Apply reading skills in various academic contexts	K3
CO5	Construct legible and flawless sentences proficiently with appropriate choice of words and structures for varied professional contexts	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	-	-	-	-	-	-	-	-	-	3	-	3
CO2	-	-	-	-	-	-	-	-	-	3	-	3
CO3	-	-	-	-	-	-	-	-	-	3	-	3
CO4	-	-	-	-	-	-	-	-	-	3	-	3
CO5	-	-	-	-	-	-	-	-	-	3	-	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max. Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	60	100	25
	CIE – II	100			
	Skill Assessment I (2 Assignments + 1 seminar)	40	40		
	Skill Assessment II (3 Assignments)	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment (Lab activities & exercises)	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
				Total	100

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	10	10	10
Understand	30	30	30
Apply	60	60	60
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Gangalakshmi- C- Rathika- B- Saranraj- L. Professional English for Engineers. New Delhi: Cengage- 2022.

2. Murphy- Raymond. English Grammar in Use Book with Answers: A Self-study Reference and Practice Book for Intermediate Learners of English. Fourth Edition: Cambridge University Press- 2012.

Reference Books:

1. Raman- Meenakshi and Sangeetha Sharma. Communication Skills. New Delhi: OUP- 2018
2. R. C. Sharma_ Krishna Mohan - Business Correspondence and Report Writing _ a Practical Approach to Business _ Technical Communication-Mc Graw Hill India (2017)

Web Links and Video Lectures (E-Resources):

MANUALS / SOFTWARE: Open Sources / British Council / Cambridge Websites

Suggested Skill Activities:

- 1) Listening tests materials [Select podcasts / radio programmes / YouTube videos / audiobooks / materials from British Council] - Cloze tests where students fill in missing words from transcripts – Yes or No Question Answers – one-word answers based on recording – summary of recording
- 2) Self-introduction / Introduce Colleague
- 3) Just a Minute talks
- 4) Extempore
- 5) Mock GDs
- 6) Mock Interviews
- 7) Note Taking of Engineering Lectures
- 8) Create videos / blogs
- 9) Present Technical Papers
- 10) Reading Comprehension Exercises
- 11) Writing letters – Leave letter – Letter for academic purposes

- 12) Writing Essays
- 13) Composing Mails
- 14) Preparing Statement of Purpose
- 15) Preparing Covering letter and Resume

Course Code:	24PH101	Course Title:	ENGINEERING PHYSICS
Credits:	4	L – T – P	3-0-2
Pre-requisite			NIL

Course Objectives:

- To make the students effectively to achieve an understanding of Mechanics
- To enable the students to gain knowledge of Elasticity.
- To enable the students to gain knowledge of Maxwell’s Equation and Electromagnetic waves.
- To introduce the basics of optics and lasers.
- Equipping the students to successfully understand the importance of quantum physics.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

UNIT I -MECHANICS	[9 hours]
<p>Multiparticle dynamics: Center of mass (CM) – Rotation of rigid bodies: Rotational kinematics – Rotational kinetic energy and moment of inertia - Theorems of M .I –M.I of Uniform rod-M.I of a diatomic molecule - Torque– Rotational energy state of a rigid diatomic molecule - Gyroscope – Torsional stress and deformation-Torsional pendulum- Double pendulum.</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. Torsional pendulum – Determination of rigidity modulus of wire and moment of inertia of disc. 2. Compound pendulum – Determination of rigidity modulus 	

UNIT II - ELASTICITY	[9 hours]
<p>Elasticity – Factors affecting Elasticity –Different types of Modulus- Moduli of elasticity and its relation -Stress - strain diagram and its applications - Bending of beams - Bending moment – Cantilever - Young’s modulus : Uniform & Non-uniform bending-theory and experiment-I Shaped Girders.</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. Determination of Young’s modulus of a given material- Non uniform bending method 2. Uniform bending – Young’s modulus determination. 	

UNIT III - MAXWELL’S EQUATIONS AND ELECTROMAGNETIC WAVES	[9 hours]
<p>The Maxwell’s equations - wave equation- Plane electromagnetic waves in vacuum - properties of electromagnetic waves - Producing electromagnetic waves - Energy and momentum in EM waves - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium vacuum interface for normal incidence..</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. Spectrometer – Determination of wavelength of Hg spectrum using grating. 2. Spectrometer – Angle of the prism 3. Spectrometer – Dispersive power of the prism 	

UNIT IV - LASERS & FIBER OPTICS	[9 hours]
Lasers:-Einstein coefficients and their relations --characteristics of laser - Types of Laser - Nd-YAG laser -semiconductor laser- Applications -Industrial, Medical, laser based military weapons	
Fiber optics: principle and classification of optical fibers – propagation of light in optical fiber - Numerical aperture and Acceptance angle– Fiber optic communication system - Applications - Displacement and pressure sensors – Endoscopy	
Practical Topics:	
<ol style="list-style-type: none"> 1. Determination the acceptance angle and numerical aperture of the given optical fiber. 2. Determination of the particle size of the given powder using laser 3. Determination of wavelength of a given laser source - Grating method 	

UNIT V - QUANTUM MECHANICS	[9 hours]
Photons and light waves - Electrons and matter waves- Dual Nature of Light --De Broglie Waves-Compton effect - The Schrodinger equation (Time dependent and time independent forms) - Physical Significance of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization-quantum computation.	
Practical Topics:	
1, Young’s Double Slit Experiment to demonstrate the wave nature of particles	

Laboratory component:

30 Hours

Any ten experiments have to be completed from the following list of Experiments

Sl.No	Name of the experiment
1.	Apply parallel axis theorem to find the resultant of system of concurrent coplanar forces.
2.	Torsional pendulum – Determination of rigidity modulus of wire and moment of inertia of disc
3.	Compound pendulum- Determination of moment of inertia of a rigid rod.

4.	Apply the concept of bending of beams to find the Young's modulus of a given material- by Non uniform bending method
5.	Apply the concept of bending of beams to find the Young's modulus of a given material- by Uniform bending method.
6.	Determination of V-I characteristics of a solar cell.
7.	Using Ohm's law verify the laws of resistances .
8.	Using optical fiber find the acceptance angle and numerical aperture.
9.	Make use of the laser source find the particle size of the given powder.
10.	Determination of wavelength of a given laser source - Grating method.
11.	Spectrometer – Determination of wavelength of Hg spectrum using grating.
12.	Spectrometer – Dispersive power of the prism.
13.	Determination of magnetic Induction due to long current carrying conductor.
14.	Make use of the Young's Double Slit Experiment, demonstrate the wave nature of particles.
15.	Spectrometer – Angle of the prism

Course outcomes: On completion of the course, the student will have the ability to:

CO No	Course Outcomes	Cognitive Domain
CO1	Apply the concepts of Mechanics in materials.	K3
CO2	Apply the concept of elasticity in beams.	K3
CO3	Apply the concept of electromagnetic waves in communication.	K3
CO4	Illustrate the applications of different lasers & Calculate the acceptance angle and numerical aperture of an optical fiber .	K2
CO5	Explain the quantum concepts and quantum computation.	K2

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	2	-	-	-	-	-	-	-	-	1
CO2	3	2	2	-	1	-	-	-	-	-	-	1
CO3	3	2	2	-	1	1	-	-	-	-	-	1
CO 4	3	1	1	-	1	1	-	-	-	-	-	1
CO 5	3	1	1	-	-	-	-	-	-	-	-	1

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	60	100	25
	CIE – II	100			
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
				Total	100

Assessment Pattern:

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	20	20	20
Understand	20	60	40
Apply	60	20	40
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

TEXT BOOKS:

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3. 2013.
4. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015

REFERENCES:

1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education(Indian Edition),2009.
2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, LaxmiPublications,(Indian Edition), 2019.
4. D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (IndianEdition), 2015.

Equivalent NPTEL/SWAYAM Courses:

Sl.No	Course Name	Course Instructor	Course Conducting Agency
1	Quantum Mechanics	Prof .P.Ramadevi	IIT -Bombay

Web links and Video Lectures (e-Resources):

1. ELASTICITY
https://youtu.be/eICv1p8WjgI?si=88hhiOw_fld7ZrBU
2. MAXWELL’S EQUATIONS AND ELECTROMAGNETIC WAVES
<https://youtu.be/3IPVZYf7C-U?si=PnP1nupcfGfr1C76>
3. LASERS &FIBER OPTICS
<https://youtu.be/Ab1nxxkgjH8?si=KR2GS8iBUFayBwdp>
4. QUANTUM MECHANICS
https://youtu.be/AEedn_NiWN0?si=Y27pAqawlwKmhNO

Skill Assessment:

1. Explain the concept behind the balance a water bottle on a edge.
2. The leaning Tower of Pisa is able to stand tilted without toppling, what is the reason behind it.
3. Apply the elasticity concept to find the fatigue change in plastic fiber and natural fiber

4. Radio antennas emit visible light, Why
5. What does an opaque substance do when light rays fall on it.
6. Illustrate the things happen when light falls on a piece of black paper.
7. Explain the dual nature of matter.
8. Optical Fiber is used in hard to reach places in mechanical inspection explain it.
9. Is quantum communication faster than the speed of light
10. Compare electron microscope & tunneling microscope.

Course Code:	24CY101	Course Title:	ENGINEERING CHEMISTRY (Common to AI&DS, AE, BME, CE, CSE, CSE(AI&ML), EEE, ECE, MECH)
Credits	4	L – T – P	3-0-2
Pre-requisite			NIL

Course objectives:

- To provide a comprehensive understanding of water quality parameters, water treatment techniques and wastewater systems.
- To use the fundamental science and engineering principles relevant to materials that includes characterization, properties and processing of engineering materials.
- To familiarize with the principles, working and applications of electrochemistry and storage devices for safe, effective and efficient operations.
- To study, measure, monitor, control and prevent corrosion processes, economically and safely.
- To classify different types of fuel and fuel analysis techniques that assists to choose most convenient fuel for a process involving combustion.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Blended Mode of Learning
3. Experiential Learning
4. NPTEL and Other Videos for theory topics
5. Flipped Class
6. Lab Experiment Videos

UNIT I - WATER TREATMENT	[9 hours]
<p>Water Sources- Water Quality parameters - Hardness of water – types-units and calcium carbonate equivalent. -Determination of hardness of water by EDTA method. Scale and sludge, caustic embrittlement, priming and foaming and boiler corrosion. Water softening methods – internal and external conditioning –zeolite process and ion exchange process. Desalination – reverse osmosis and electro dialysis- Municipal water treatment and waste water treatment process.</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. Determination of total hardness by EDTA method. 2. Estimation of alkalinity by Indicator method. 3. Estimation of chlorine content in water sample by Argentometric method. 4. Determination of BOD in water samples. 	



UNIT II - CHEMISTRY OF ENGINEERING MATERIALS	[9 hours]
<p>Adhesives: Introduction- requisites of a good adhesive-adhesive action- industrial applications of adhesives. Insulating Materials: Introduction- requirements- Glass and ceramics - preparation, properties and applications - fabrication of ceramic ware. Lubricants-Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure) - properties of lubricants: viscosity, cloud point, pour point, flash point and fire point. Electronic materials: Introduction-types, properties and applications of semiconducting materials and transistors, materials used in IC's, fibers and cables- properties and applications, organic solar cells - types and applications.</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. Determination of viscosity of oils using Oswald viscometer. 2. Determination of cloud point and pour point of oils. 	

UNIT III -ELECTROCHEMISTRY	[9 hours]
<p>Introduction – Electrode potential – Nernst equation and problems - Electrochemical series - Conductometric titrations (acid - base & precipitation titration) Electrodes: Construction, working and applications of Standard and reference electrode (Hydrogen & Calomel) – Ion selective (glass electrode) – determination of pH using glass electrode. Batteries and Fuel Cells – Types of batteries —dry cell -Lead Storage battery–Nickel- Cadmium Battery – Lithium battery – Battery hazards - Biological Batteries. Fuel Cells – Hydrogen-Oxygen FuelCell.</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. Estimation of strength of hydrochloric acid by pHmetry. 2. Determination of strength of acids in a mixture of acids using conductivity meter. 	

3. Determination of charging and discharging rate of batteries.

UNIT IV -CORROSION AND ITS CONTROL

[9 hours]

Corrosion – causes, factors, types, Chemical and Electrochemical Corrosion (Galvanic, Differential aeration) –galvanic series-factors influencing rate of corrosion-measurement of corrosion. Determination of corrosion rate by weight loss method. Control Methods-Electrochemical protection – Sacrificial Anodic method – Impressed Current Cathodic Protection – Corrosion Inhibitors – Bio corrosion Protective Coatings – Paints, Constituents, Functions- Surface coating - Surface preparation for metallic coatings, Electroplating and Electro-less Plating-ceramic coatings, thermal vaporization coating, HVOF coating

Practical Topics:

1. Estimation of the Ferrous ions in mild steel by Spectrophotometry.
2. Determination of rate of corrosion of by weight loss method

UNIT V- FUELS AND COMBUSTION

[9 hours]

Fuels: Introduction: Classification of fuels; solid fuel -Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Liquid fuels -Manufacture of synthetic petrol –hydrogenation of coal (Bergius process), Knocking – octane number, diesel oil – cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value – higher and lower calorific values, Theoretical calculation of calorific value by Dulong’s formula - Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis – ORSAT Method.

Practical Topics:

1. Determination of flash point and fire point of fuels.

Laboratory component:**30 Hours**

Any ten experiments have to be completed from the following list of experiments

SI.No.	Name of the experiment
1	Determine the total hardness of water sample by EDTA method.
2	Analyze the alkalinity of water sample by Indicator method.
3	Analyze the chlorine content in water sample by Argentometric method.
4	Determine the BOD of water samples.
5	Describe the procedure to determine the viscosity of oil using an Oswald viscometer.
6	Identify the cloud point and pour point of oils.
7	Make use of glass electrode to determine the strength of hydrochloric acid.
8	Make use of conductivity meter to determine the strength of acids in a mixture of acids.
9	Determine quantitatively the amount of Ferrous ions in mild steel by Spectrophotometry.
10	Determine the rate of corrosion of by weight loss method.
11	Describe the procedure to determine the flash point and fire point of fuels.
12	Conduct a study to find out the charging and discharging rate of batteries.

Course outcomes: On completion of the course, the student will have the ability to:

COs	Course Outcome	Cognitive domain
CO1	Analyze the water quality parameters and choose appropriate water treatment methods for use in industries and daily life.	K4
CO2	Make use of the applications of the materials in different engineering disciplines.	K3
CO3	Utilize the principles of electrochemistry and find the materials for energy conversion and storage.	K4
CO4	Determine the corrosion rate to propose suitable protection methods for environmental considerations	K3
CO5	Choose suitable fuels for engineering processes and automobile applications.	K3

COs and POs Mapping

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	-	-	-	1	-	-	-	-	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-
CO3	3	2	1	1	-	-	-	-	-	-	-	-
CO4	2	1	1	-	-	1	2	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	60	100	25
	CIE – II	100			
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	10	10	10
Understand	30	30	30
Apply	40	40	40
Analyze	20	20	20
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Jain P.C. and Jain M, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 17th Edition, 2021.
2. Dara S S and Umare S.S, A Text Book of Engineering Chemistry, S.Chand & Company Limited, 20th Edition, 2018.

Reference Books:

1. Benjamin M. M, Water Chemistry, Waveland Press, 2nd Edition, 2019.
2. Cicek V, Corrosion Engineering, Springer Publishing, 1st Edition, 2021.
3. Shahinpoor. M, Fundamentals of Smart Materials, Publisher: Royal Society of Chemistry, 1st Edition, 2020.
4. Berg H, Bernhardsson S, and Johansson P, Electric Vehicle Batteries: Moving from Research towards Innovation, Publisher: Springer, 1st Edition, 2019.
5. B.K.Sharma “Engineering chemistry” Krishna Prakasan Media (P) Ltd., Meerut (2014).

Web links and Video Lectures (e-Resources):

1. Water and wastewater treatment - https://onlinecourses.nptel.ac.in/noc23_ce12/preview
2. Semiconductor Devices and circuits. - <https://nptel.ac.in/courses/108108112>
3. Corrosion Protection Methods - https://onlinecourses.nptel.ac.in/noc23_mm01/preview
4. Elementary Electrochemistry - https://onlinecourses.nptel.ac.in/noc23_cy19/preview
5. Fuel and combustion Technology - <https://archive.nptel.ac.in/courses/103/105/103105110/>

Suggested Skill Activities:

1. Measure the TDS, PH & electrical conductivity of a home water.
2. Removal of temporary hardness of any water sample by suitable method.
3. Find the charging and discharging rate of mobile batteries when it is use or not.
4. The need of engineering material is essential in our day today life. - Justify the answer.
5. Measure the corrosion rate of iron bar when it is exposed in the environment.
6. List out the recent engineering materials used in emerging field.
7. Calculate the higher and lower calorific value of a fuel by using Dulong’s formula.

8. List out the type of coatings applied on materials which are used in our daily life.
9. Improper disposal of batteries leads to environmental hazard. Suggest the suitable disposable method.
10. Pure Iron material undergo corrosion more fast than other materials. Give reasons.

Course Code:	24ME201	Course Title:	ENGINEERING GRAPHICS & DESIGN
Credits:	3	L – T – P	1-0-4
Pre-requisite			NIL

Course objectives:

To impart knowledge on the

- To enable students to understand the standards and conventions of engineering drawing.
- To enhance the visualization skills to understand objects in the respective positions with respect to principal planes.
- To comprehend general projection theory, with emphasis on orthographic projection to represent three-dimensional objects in two-dimensional views.
- To emphasize freehand sketching and pictorial view to aid in the visualization process and to efficiently communicate ideas graphically.
- To Introduce CAD software for the creation of 3D models and 2D engineering drawings.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. NPTEL and Other Videos
3. Smart Class Room
4. Project based learning

UNIT I - DRAWING FUNDAMENTALS, GEOMETRIC CONSTRUCTION, PROJECTION OF POINTS, STRAIGHT LINES AND PLANES	[15 hours]
<p>Drawing BIS standards – Orthographic projections – First angle projection - Drawing instruments – Sheet layout – Conventions – Lines, Lettering, Numbering and Dimensioning</p> <p>Geometric construction – Construction of regular polygons – Conic sections – Ellipse, Parabola and Hyperbola by eccentricity method. Projection of points – Points situated in all four quadrants.</p> <p>Projection of straight lines – Straight lines inclined to both principal planes – Finding true length of the line and true inclinations with respect to principal planes – Rotating line method.</p> <p>Projection of planes – Introduction – Polygonal lamina and Circular lamina - Orientation of planes - Plane parallel to both principal planes, Planes perpendicular to both principal planes and Planes inclined to both principal planes – Rotating object method.</p> <p>Orthographic projection of simple engineering components.</p>	
UNIT II - PROJECTION OF SOLIDS	[15 hours]
<p>Projection of solids – Introduction – Types of solids – Polyhedra and solids of revolution - Projection with axes inclined to one of the principal planes and parallel to other – Change of Position method.</p> <p>2D drafting - Basic commands – Coordinate systems, Object section methods. Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dim style – Annotation and Layering – Object snaps - 3D modelling – Basic commands – Extraction of multiple views – Part modelling of simple components - Utensils, Hand tools & Furniture etc. - Drawing views using 3D environment.</p>	
UNIT III - DEVELOPMENT OF SURFACES AND PICTORIAL PROJECTION	[15 hours]
<p>Development of lateral surfaces of truncated Prisms, Pyramids, Cylinders and Cones– Parallel line method and Radial line method.</p> <p>Pictorial Projection – Isometric projection – Introduction – Isometric scale – Isometric view of two right regular composite solids – Isometric projection of truncated frustum of solids – Box method.</p> <p>Problems on applications of Isometric projections of simple objects / engineering components.</p>	

UNIT IV- BASIC COMPUTER AIDED DRAWING APPLICATIONS	[15 hours]
Free hand Sketching - Sketching of geometry - multiple view projection from single pictorial view of objects – Illustrative examples - True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc. Drawing Simple Mechanisms - Bicycles, Tricycles, Gear trains, Ratchets, two- wheeler cart & Four-wheeler carts to dimensions etc.	

UNIT V- MULTIDISCIPLINARY APPLICATIONS AND PRACTICE	[15 hours]
<p>Electric Wiring and lighting diagrams - Like, Automatic fire alarm, Call bell system, UPS system, Basic power distribution system using suitable software.</p> <p>Basic Building Drawing - Draw various types of lines, graphical symbols for materials, doors and windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS 962. Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges, trusses using Auto CAD or suitable software,</p> <p>Electronics Engineering Drawings - Like, Simple Electronics Circuit Drawings, practice on layers concept.</p> <p>Graphs & Charts - Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software.</p>	

Course outcomes:

On completion of the course, the student will have the ability to:

COs	Course Outcome	Cognitive domain
CO1	Apply principles of first angle projection in drafting plan and elevation of points, lines, planes, and solids.	K3
CO2	Apply change of position method in the projection of solids and determine the true shape of the section.	K3
CO3	Apply principles of orthographic projection to extract 2D views from 3D drawing using freehand sketching.	K3
CO4	Apply parallel line and radial line methods to develop lateral surfaces of solids so that students can understand applications in sheet metal design.	K3
CO5	Apply box method to develop the isometric view of simple, truncated, and composite solids.	K3

CO6	Develop simple part model in 3D and plan, elevation, and section of building using a designated CAD software.	K6
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COs and POs Mapping:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	-	-	-	-	-	-	-	2	-	-	1	2	-
CO2	3	1	-	-	-	-	-	-	-	2	-	-	1	2	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-	1	2	-
CO4	3	1	-	-	-	-	-	-	-	2	-	-	1	-	-
CO5	3	1	-	-	-	-	-	-	-	2	-	-	1	2	-
CO6	3	1	-	-	1	-	-	-	-	2	-	-	1	2	-

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	40		
	Skill Assessment - I	40			
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Lab Exam	100	50	50	50

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	0	0	0
Understand	20	20	20
Apply	40	40	40
Analyze	0	0	0
Evaluate	0	0	0
Create	40	40	40

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Text Books:

1. N.D.Bhatt, "Engineering Graphics", Charotar Publishing House, 53RD Edition 2019
2. Natrajan K.V., "A textbook of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2015)

Reference Books:

1. Venugopal K. and Prabhu Raja V., "Engineering drawing + AutoCAD", New Age International (P) Limited (2022)
2. Lakhwinder pal singh, Harwinder Singh, "Engineering Drawing Principles and Applications", Cambridge University Press, 2021.
3. Cecil Johnson, Jay D Helsel and Dennis R Short, "Engineering Drawing and Design", Seventh Edition, McGraw Hill, 2007.
4. Patil, Rajashekar, "Computer Aided Engineering Graphics", New Age International Ltd, 2018.
5. Chris Schroder, "Printed Circuit Board Design using AutoCAD", Newnes, 1997.
6. K S Sai Ram, "Design of steel structures", Third Edition by Pearson.
7. A S Pabla, "Electrical power distribution", 6th edition, Tata Mcgrawhill.
8. K. R. Gopalakrishna, & Sudhir Gopalakrishna, "Textbook of Computer Aided Engineering Drawing", 39th Edition, Subash Stores, Bangalore, 2017

Web Links and Video Lectures (E-Resources):

1. <http://nptel.ac.in/courses/112103019>
2. <https://archive.nptel.ac.in/courses/112/105/112105294/>

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

LABORATORY REQUIREMENTS

SYSTEM REQUIREMENTS (For a batch of 30 Students)

Hardware:

1. Intel i3 core due processor with 4GB ram with 500GB hard disk – 30 Nos.
2. Laser Printer – 1 No.

Software:

Drafting package – AutoCAD – Adequate license (Open source)

Suggested Skill Activities:

1. 2D drafting of plan and elevation of computer CPU.
2. 2D drafting of plan and elevation of a thermos flask.
3. 2D drafting of a plan and elevation of piston and cylinder.
4. Sketching the projections of a bicycle in freehand.
5. Sketching the projections of a stapler.
6. Cut and develop the lateral surface of a funnel.
7. Cut one edges vertically and develop the lateral surface of CPU cabin.
8. Cut and develop the lateral surfaces of elbow of a pipe.
9. Draw the isometric view of a simple bread toaster.
10. Draw the isometric view of the computer table.
11. Sketch the assembled view of the screw jack using the orthographic projections of its components.
12. Draft the plan, elevation and section of your home using CAD.
13. Draft the plan, elevation and section of 2 storey office building using CAD.
14. Develop the 3D model of the (a) and (b).

Course Code:	24CS201	Course Title:	PROGRAMMING FOR PROBLEM SOLVING USING C
Credits:	4	L – T – P	2-0-4
Pre-requisite			NIL

Course objectives:

To impart knowledge on the

- To gain knowledge on problem solving techniques
- To learn how to write simple and modular C programs
- To develop C programs using arrays and strings
- To learn the usage of pointers in accessing and manipulating memory
- To develop applications in C using structures & files

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Classroom
8. Flipped Class

UNIT I - BASICS OF C PROGRAMMING	[6 hours]
<p>Problem Solving Techniques: Introduction to Algorithm, Pseudo code, Flow Chart, Structure of 'C' program. C Tokens: Keywords, Data Types, Constants, Variables - Declaration - Qualifiers – typedef</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. Steps in Problem Solving Drawing flowchart using yEd tool/Raptor Tool programs using simple statements. 	

2. Programs to illustrate the use of user-defined data types	
UNIT II – BASIC CONSTRUCTS IN C	[6 hours]
Managing simple Input and Output operations - Operators and Expressions - Decision Making: Branching statements, looping statements - Function: Declaration, Definition - Passing arguments by value - Recursion - Storage classes	
Practical Topics:	
<ol style="list-style-type: none"> 1. Programs using decision making statements 2. Programs using looping statements 3. Programs using user defined functions and recursive functions 	
UNIT III – ARRAYS AND STRINGS IN C	[6 hours]
Arrays: Initialization - One dimensional, Two dimensional, and Multi-dimensional arrays - String: Basics, declaring and initializing strings, string handling functions: standard and user defined functions	
Practical Topics:	
<ol style="list-style-type: none"> 1. Build programs using arrays and array-based operations. 2. Programs using one dimensional and two dimensional arrays. 3. Implementations involving array usage for string operations. 	
UNIT IV – POINTERS IN C	[6 hours]
Pointers - Passing arguments by address - Dynamic Memory Allocation - Pointer arithmetic - Pointers and one dimensional array - Pointers and Multi-Dimensional Array: Array of Pointers, Pointer to Pointer, Pointer to an array - void Pointer - Pointer to function	
Practical Topics:	
<ol style="list-style-type: none"> 1. Implementations involving pointers for dynamic memory allocation 2. Implementations involving pointers for string manipulation. 	

UNIT V – STRUCTURES, UNIONS AND FILE HANDLING IN C	[6 hours]
Structure: Declaration, Definition-Array of Structures - Pointer to Structure – Nested Structures- Union: Defining union, Accessing union members. Files: File Management functions, Random access in file- Working with Text Files and Binary Files	
Practical Topics:	
<ol style="list-style-type: none"> 1. Programs to implement structures 2. Programs to implement union 3. Programs to implement various file operations. 	

Laboratory Component:**[45 hours]**

Any 12 experiments have to be completed from the following list of experiments.

S.No.	Name of the Experiment
1	Steps in Problem Solving Drawing flowchart using yEd tool/Raptor Tool programs using simple statements
2	Programs to illustrate the use of user-defined data types
3	Programs using decision making statements
4	Programs using looping statements
5	Programs using user defined functions and recursive functions
6	Build programs using arrays and array-based operations.
7	Programs using one dimensional and two dimensional arrays.
8	Implementations involving array usage for string operations.
9	Implementations involving pointers for dynamic memory allocation
10	Implementations involving pointers for string manipulation.
11	Programs to implement structures
12	Programs to implement union
13	Programs to implement various file operations

Course outcomes:

On completion of the course, the student will have the ability to:

COs	Course Outcome	Cognitive domain
CO1	Make use of problem solving techniques to solve real world problems & outline the structure of C program	K3
CO2	Identify the appropriate looping and control statements in C and develop applications using these statements	K3
CO3	Make use of arrays & strings in development of simple applications	K3
CO4	Apply the concepts of pointers and develop C programs using pointer	K3
CO5	Develop programs for storing, retrieving and processing data using structures and files.	K3

COs and POs Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3	2	-	1	-	-	-	-	-	-	1
CO2	3	3	2	-	1	-	-	-	-	-	-	1
CO3	3	3	2	1	1	-	-	-	-	-	-	1
CO4	3	3	2	1	1	-	-	-	-	-	-	1
CO5	3	3	3	1	1	-	-	-	-	-	-	1

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			

Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	15	50	50
	Lab Exam	100	35		
Total					100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	1	2	
Remember	20	20	20
Understand	20	20	20
Apply	60	60	60
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.
2. Pradip Dey, Manas Ghosh, "Programming in C", AICTE Edition, Oxford University Press, 2018

Reference Books:

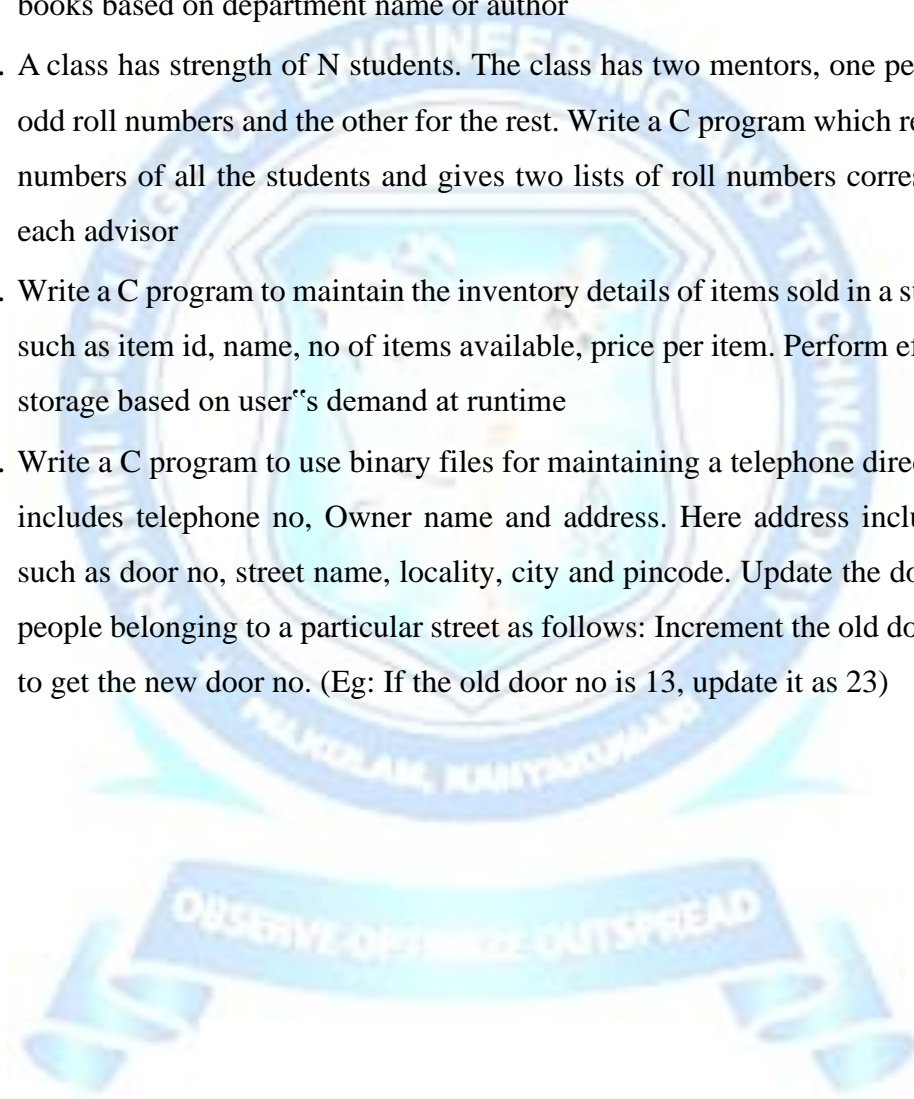
1. Yashavant P. Kanetkar, "Let Us C : Authentic guide to C programming language", Eighteenth Edition, BPB Publications, 2021
2. Ashok N Kamthane, Programming in C, Pearson, Third Edition, 2020
3. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.

4. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.
6. E.Balagurusamy, "Programming in ANSI C", seventh edition, Mc Graw Hill Education, 2017

Suggested Skill Activities:

1. Steps in Problem Solving Drawing flowchart using yEd tool/Raptor Tool
2. Write a Program to calculate and display the volume of a CUBE having its height (h=10cm), width (w=12cm) and depth (8cm).
3. Ramya has bought 50 kg of onion for Rs 40 per kg and 60 kg of potato for Rs 20 per kg. Then she sold out all the stock with the selling price of Rs 60 per kg and Rs 30 per kg for onion and potato respectively. Write a C program which computes the profit gained by her.
4. A Food delivery boy needs to walk down every street in his area in order to deliver the food. Assume that the distances between the streets along the roads are given. The food delivery boy starts at the hotel and returns back to the hotel after delivering all the foods. Implement an algorithm to help the food delivery boy to walk minimum distance for the purpose.
5. Write a program to input name, marks of 5 subjects of a student and display the name of the student, the total marks scored, percentage scored and the class of result.
6. A location in a map is represented by a pair of points as x co-ordinate and y co-ordinate. Person X wants to move towards person Y which is residing in the location L1 and L2 respectively. Write C Program to find the distance between these two person .
7. If a four-digit number is input through the keyboard, write a program to obtain the sum of the first and last digit of this number.
8. Write a program to find GCD (greatest common divisor or HCF) and LCM (least common multiple) of two numbers

9. Write a Program to multiply two 3 X 3 Matrices.
10. Write a program to create a structure named company which has name, address, phone and no Of Employee as member variables. Read name of company, its address, phone and no Of Employee. Finally display these members' value.
11. Write a program to create array of books. Collect various details of books such as topic, author, department. Collect details for N books and display the details of books based on department name or author
12. A class has strength of N students. The class has two mentors, one person for the odd roll numbers and the other for the rest. Write a C program which reads the roll numbers of all the students and gives two lists of roll numbers corresponding to each advisor
13. Write a C program to maintain the inventory details of items sold in a super market such as item id, name, no of items available, price per item. Perform efficient data storage based on user's demand at runtime
14. Write a C program to use binary files for maintaining a telephone directory which includes telephone no, Owner name and address. Here address includes details such as door no, street name, locality, city and pincode. Update the door no of all people belonging to a particular street as follows: Increment the old door no by 10 to get the new door no. (Eg: If the old door no is 13, update it as 23)



பாடநெறி குறியீடு:	24GE201	பாடத்தின் தலைப்பு:	தமிழரும் தொழில்நுட்பமும்
கிரெடிட்	1	L – T – P	1-0-0

பாடத்திட்டநோக்கங்கள்:

- சங்ககாலத்து நெசவுத்தொழிலை விவரிப்பதற்கும் மட்பாண்டத்தொழில் நுட்பத்தைக் கண்டறிவதற்கும்.
- சங்ககால கட்டுமானம், மேடை அமைப்பு, சிற்பங்கள், கோவில்கள், அம்மன்கோவில், ிருமலைநாயக்கர் மஹால், செட்டிநாட்டு வடுகள், இந்தோ - சாரோசெனிக் கட்டிடக்கலை ஆகியவற்றைக் கண்டறிந்து மேற்கோள் காட்ட.
- கப்பல் கட்டுதல் மற்றும் இரும்புத் தொழிலைக் கண்டறிதல், சிலப்பதிகாரத்தில் நாணயங்கள், மணி தயாரிக்கும் தொழிற்சாலைகள், மணிகளின் வகைகள் ஆகியவற்றைப் படிக்க.
- நர்நிலைகளின் முக்கியத்துவத்தைகாட்ட, கால்நடை வளர்ப்பு மற்றும் கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகளை கண்காணிக்க, விவசாயம், மன்பிடி, முத்து மற்றும் முத்துகலாச்சாரம் மற்றும் கடல் பற்றிய பண்டைய அறிவை அங்ககரிக்க.
- அறிவியல் தமிழின் வளர்ச்சி மற்றும் தமிழ்க்கணிப்பொறியின் வளர்ச்சியைக் கவனிக்க, இணையத்தில் தமிழ்மென்பொருள் மேம்பாடு, தமிழ் அகராதிகளை மேற்கோள் காட்ட.

அலகு I நெசவு மற்றும் பானைத்தொழில்நுட்பம்:	[3 hours]
சங்ககாலத்தில் நெசவுத்தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்புபாண்டங்கள் - பாண்டங்களில் கறல் குறியீடுகள்.	

அலகு II வடிவமைப்பு மற்றும் கட்டிடத்தொழில்நுட்பம்:	[3 hours]
சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வட்டுப்பொருட்களில் வடிவமைப்பு - சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடைஅமைப்பு பற்றியவிவரங்கள் - மாமல்லபுரச்சிற்பங்களும், கோவில்களும் -	

சோழர்காலத்துப் பெருங்கோவில்கள் மற்றும் வழிபாட்டுத்தலங்கள் -
நாயக்கர்காலக்கோயில்கள் மாதிரி கட்டமைப்பு பற்றி அறிதல், மதுரைமீனாட்சி அம்மன்
ஆலயம் மற்றும் திருமலைநாயக்கர்மஹால் - செட்டி நாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில்
சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை.

அலகு III உற்பத்தித் தொழில்நுட்பம்	[3 hours]
<p>கப்பல் கட்டும் கலை - உலோகவியல் - இரும்பு தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்கநாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.</p>	

அலகு IV வேளாண்மை மற்றும் நீர்பாசனத்தொழில்நுட்பம்	[3 hours]
<p>அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக்கு குமுழித்தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச்சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன் வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.</p>	

அலகு V அறிவியல் தமிழ் மற்றும் கணிதத்தமிழ்:	[3 hours]
<p>அறிவியல் தமிழின் வளர்ச்சி - கணிதத்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ்மென்பொருள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.</p>	

பாடநெறி முடிவுகள் (பாமு):

பாடநெறியின் முடிவில், மாணவர் பின்வரும் திறன்களைப் பெறுவார்:

பாமு	பாடநெறி முடிவுகள்	மிக உயர்ந்த அறிவாற்றல் நிலை
அலகு I பாமு:	சங்க கால ஜவுளி தொழில் மற்றும் மட்பாண்ட தொழில்நுட்பம் பற்றி அறிவார்கள்.	கே 1
அலகு II பாமு:	சங்க கால கட்டுமானம், மேடை அமைப்பு, சிற்பங்கள், கோவில்கள், அம்மன் கோவில், திருமலை நாயக்கர் மஹால், செட்டிநாட்டு வீடுகள், இந்தோ-சராசனிக் கட்டிடக்கலை ஆகியவற்றை விவரிக்க இயலும்.	கே 2
அலகு III பாமு:	கப்பல் கட்டுதல், இரும்புத் தொழில், நாணயம் தயாரித்தல் மற்றும் மணி தயாரிக்கும் தொழில்கள் பற்றி அறிந்து கொள்கிறார்கள்.	கே 1
அலகு IV பாமு:	நீர்நிலைகளின் முக்கியத்துவம், கால்நடை வளர்ப்பு, கிணறு, விவசாயம், மீன்பிடி, முத்து மற்றும் முத்து கலாச்சாரம் மற்றும் கடல் பற்றிய போதுமான அறிவை பெற்றுகொள்கிறார்கள் .	கே 1
அலகு V பாமு:	அறிவியல் தமிழின் வளர்ச்சி, தமிழ்க் கணிப்பொறியின் வளர்ச்சி, இணையத்தில் தமிழ் மென்பொருள் மேம்பாடு, தமிழ் அகராதிகளை சந்தேகம் இன்றி முழுமையாக தெரிந்து கொள்கிறார்கள்.	கே 1

பாடநெறி முடிவுகள் மற்றும் நிரல் முடிவுகள் ஒப்பிடுதல்

நிலை 3- அதிக ஒத்துப்போதல், நிலை 2- மிதமாக ஒத்துப்போதல், நிலை 1- குறைவாக

ஒத்துப்போதல், நிலை 0- ஒத்துப்போகவில்லை

பாமுக்கள்	பாடநெறி முடிவுகள்											
	1	2	3	4	5	6	7	8	9	10	11	12
பாமு1	2	-	-	-	-	-	-	-	-	-	-	-
பாமு2	1	-	-	-	-	-	-	-	-	-	-	-
பாமு3	1	-	-	-	-	-	-	-	-	-	-	-
பாமு4	1	-	-	-	-	-	-	-	-	-	-	-
பாமு5	1	-	-	-	-	-	-	-	-	-	-	-

மதிப்பீட்டுத் திட்டம்:

கூறுகள்	மதிப்பீட்டின் வகை	அதிகபட்ச மதிப்பெண்கள்	குறைக்கப்பட்ட மதிப்பெண்கள்	இறுதி மதிப்பெண்கள்
தொடர்ச்சியான உள் தேர்வு	தொடர்ச்சியான உள் தேர்வு - I	100	40	40
	தொடர்ச்சியான உள் தேர்வு - II	100	40	
	எழுத்து தேர்வு	25	25	
கூறுகள்	தொடர்ச்சியான உள் தேர்வு - I	100	60	60
மொத்தம்				100

இறுதி பருவ தேர்வு: (கேள்வி முறை)

- ஒவ்வொரு யூனிட்டும் இரண்டு 2 மதிப்பெண் வினாக்களையும் ஒரு 16 மதிப்பெண் வினாவையும் (இரண்டில் ஒன்று) கொண்டுள்ளது.
- பதினைந்து கேள்விகளுக்கும் பதிலளிக்க வேண்டும்

மதிப்பீட்டு முறை

ப்ரூமின் வகை	தொடர்ச்சியான மதிப்பீட்டு சோதனைகள்		இறுதி தேர்வு
	1	2	
நினைவில் கொள்ளுதல்	60	100	60
புரிந்து கொள்ளுதல்	40	0	40
விண்ணப்பித்தல்	0	0	0
பகுப்பாய்வுதல்	0	0	0
மதிப்பீடுதல்	0	0	0
உருவாக்குதல்	0	0	0

Text Books:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ் நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருளை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies)

Reference Books:

1. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
2. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
3. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
6. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Code:	24GE201	CourseTitle:	Tamils and Technology
Credits	1	L – T – P	1-0-0
Pre-requisite	NIL		

Course objectives:

- To describe the textile industry of the Sangam period and trace the pottery technique.
- To identify and quote Construction in the Sangam period, platform structure, sculptures, temples, Amman temple, ThirumalaiNayakar Mahal, Chettinad houses, Indo-Saracenic architecture.
- Finding Shipbuilding and iron industry, to read minting of coins, bell making factories, types of bells in Silapathikaram.
- To show the Importance of water bodies, to observe Cattle rearing and Wells designed for cattle, to recognize Agriculture, Fisheries, Pearl and pearl culture and Ancient knowledge of the sea.

- To observe Development of Scientific Tamil and Development of Tamil computing, to quote Tamil Software Development, Tamil Dictionaries on the Internet.

UNIT I - Weaving and Ceramic Technology	[3 hours]
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.	

UNIT II - Design and Construction Technology	[3 hours]
Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.	

UNIT III - Manufacturing Technology	[3 hours]
Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel -Copper and gold - Coins as source of history – Minting of Coins – Beads making - industries Stone beads -Glass beads – Terracotta beads -Shell beads/ bone beats – Archeological evidences – Gem stone types described in Silappathikaram	

UNIT IV - Agriculture and Irrigation Technology	[3 hours]
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.	

UNIT V- Scientific Tamil & Tamil Computing	[3 hours]
Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.	

Course outcomes: On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Level
CO1	Know about Sangam period textile industry and pottery technology.	K1
CO2	Able to describe Sangam period construction, platform structure, sculptures, temples, Amman temple, Tirumala Nayakkar Mahal, Chettinad houses, Indo-Saracenic architecture.	K2
CO3	Learn about the shipbuilding, iron industry, coinage and bell making industries	K1
CO4	Acquire adequate knowledge about the importance of water bodies, animal husbandry, wells, agriculture, fishing, pearl and pearl culture and the sea	K1
CO5	Learn Scientific Tamil Development, Tamil Computer Development, Tamil Software Development on the Internet, Tamil Dictionaries without a doubt.	K1

COs and POs Mapping

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	40	40
	CIE – II	100	40	
	Model Lab Exam	25	25	
End Semester Examination (ESE)	Theory Exam	100	60	60
Total				100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	60	50	60
Understand	40	50	40
Apply	0	0	0
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ் நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன்பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருளை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies)

Reference Books:

1. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
2. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
3. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Code:	24MA201	CourseTitle:	COMPLEX VARIABLES AND TRANSFORMS (Common to Common to AI&DS, AE, BME, CE, CSE, CSE(AI&ML), EEE, ECE, MECH)
Credits	1	L – T – P	1-0-0
Pre-requisite	24MA101- Matrices and Calculus		

Course objectives:

- To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.
- To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.

Teaching-Learning Process:

These are sample strategies which teachers can use to accelerate the attainment of the various course outcomes.

- Lecture method does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation and encourage the students to come up with their own creative ways to solve them.
- Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the students' understanding.

UNIT I – Complex Differentiation**[12 hours]**

Function of a complex variable – Analytic functions – Necessary conditions and sufficient conditions (excluding proof) – Cauchy – Riemann equations – Properties of analytic function – Harmonic conjugate – Construction of Analytic functions - Conformal mapping: $w = z+a$, az , $1/z$, and bilinear transformation.

UNIT II – Complex Integration**[12 hours]**

Statement and application of Cauchy's integral theorem and integral formula – Taylor and Laurent expansions – Isolated singularities – Residues - Cauchy's residue theorem.
Applications: Contour integration over unit circle and semicircular contours (excluding poles on axis).

UNIT III – Laplace Transforms**[12 hours]**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and Final Value Theorem – Inverse Laplace Transform – Convolution Theorem (Statement only) – Solution of linear second order Ordinary differential equations with constant coefficients using Laplace transforms.

UNIT IV – Fourier Series and Fourier Transforms**[12 hours]**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range series – Harmonic analysis - Statement of Fourier integral theorem – Fourier transform pair – Parseval's identity.

UNIT V – Partial Differential Equation	[12 hours]
Formation of partial differential equations - Classification of partial differential equations - Solutions of one dimensional wave equation, One dimensional heat equation (excluding insulated ends) – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).	

Course outcomes:

On completion of the course, the student will have the ability to:

COs	Course Outcome	Cognitive domain
CO1	Construct analytic functions and use their conformal mapping property in Engineering problems.	K3
CO2	Solve real and complex integrals using the Cauchy’s integral formula and residue theorem.	K3
CO3	Apply Laplace transforms techniques in system modelling, digital signal processing, process control, solving boundary value problems	K3
CO4	Apply Fourier series to solve the steady state two-dimensional heat equation in cartesian coordinates.	K3
CO5	Apply the effective mathematical tools for solutions of partial differential equations that model physical phenomena and engineering problems.	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	1
CO5	3	2	1	-	-	-	-	-	-	-	-	-

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern:

Bloom's Category	Continuous Internal Examination		End Semester Examination
	1	2	
Remember	20	20	20
Understand	20	20	20
Apply	60	60	60
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012
4. Kandasamy. P., Thilagavathy. K, and Gunavathy. K, Engineering Mathematics Volume I & II, S. Chand & Co, New Delhi, 2005.

Equivalent NPTEL/SWAYAM Courses

S. No.	Course Title	Course Instructor	Host Institute
1	Partial Differential Equations	Prof. Sivaji Ganesh	IIT Bombay
2	Introduction to Fourier Analysis	Prof. Parasar Mohanty	IIT Kanpur
3	Complex Analysis	Prof. Pranav Haridas	IIT Madras

Web Links and Video Lectures (E-Resources):

1. Analytic Functions, C-R Equations:
<https://www.nptelvideos.com/lecture.php?id=13416>
2. Laplace Transform and its Existence: <https://www.nptelvideos.com/lecture.php?id=13433>
3. Taylor's, Laurent Series of $f(z)$ and Singularities:
<https://www.nptelvideos.com/lecture.php?id=13431>
4. Applications of Fourier Transform to PDEs:
<https://www.nptelvideos.com/lecture.php?id=13442>

Course Code	24PH201	Course Title:	PHYSICS FOR ELECTRONICS ENGINEERING (ECE & EEE)
Credits:	3	L – T – P	3-0-0
Pre-requisite:			NIL

Course objectives:

- To study the electrical properties of materials including electron theory of metals.
- To familiarize with the properties of semiconductors, determination of charge carriers and device applications.
- Equipping the students to understand the applications of magnetic materials and dielectric materials.
- To establish a sound, grasp of knowledge on different optical properties of materials, optical displays and applications.
- To inculcate an idea of significance of Nano structures, quantum confinement and the preparation of Nano materials.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

UNIT I CONDUCTING MATERIALS	[9 hours]
Classical free electron theory - Expression for electrical conductivity - Thermal conductivity, Wiede Mann Franz law, Merits & Demerits of classical free Electron Theory - Quantum free electron theory - Electron in a metal – degenerate and non-degenerate states – Fermi- Dirac statistics– Density of energy states – Energy bands in solids – Electron effective mass.	
UNIT II SEMICONDUCTING MATERIALS	[9 hours]
Direct and indirect band gap semiconductors – Intrinsic Semiconductors - Carrier concentration in intrinsic semiconductors - Variation of Fermi level with temperature – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of Fermi level with temperature – Hall effect and devices- Ohmic contacts– Schottky diode.	
UNIT III MAGNETIC AND DIELECTRIC MATERIALS	[9 hours]
Magnetic materials – Classification (Dia , Para & Ferro) – Hysteresis – Ferrites - BaTiO ₃ – Application of Nd-FeB magnets. Electric polarization – Different types of polarization – Temperature and frequency dependence –Dielectric loss and dielectric breakdown – dielectric materials applications - capacitors and transformers.	

UNIT IV MATERIALS FOR ELECTRONICS	[9 hours]
<p>Classification of optical materials –Optical process in Semiconductors-Optical absorption and emission-carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - LCD-Photo Transistor- photo current in a P-N diode – Laser diodes -solar cell - LED – Organic LED.</p>	

UNIT-V NANO MATERIALS	[9 hours]
<p>Nanomaterials-Quantum Confinement-Quantum Structures-Density of states for quantum well-Wire-Dots-Preparation of Nano Materials- Ball Milling - Pulsed Laser Deposition-Sol -Gel Method-Electro Deposition Method- Plasma arc method.</p>	

Course outcomes: On completion of the course, the student will have the ability to:

COs	Course Outcome	Cognitive domain
CO1	Explain the electrical properties of materials.	K2
CO2	Apply semiconducting properties of materials in electronics.	K3
CO3	Infer the properties of magnetic and dielectric materials for relevant electrical and electronics engineering applications	K2
CO4	Apply the optical properties of materials in opto electronic devices.	K3
CO5	Apply the concept of Nano materials for Nano devices.	K3

COs and POs Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	1	2	-	-	-	-	-	-	-	-	1
CO2	2	1	2	-	-	-	-	-	-	-	-	1
CO3	2	1	1	-	-	-	-	-	-	-	-	1
CO4	3	1	1	-	-	-	-	-	-	-	-	1
CO5	3	2	1	-	-	-	-	-	-	-	-	1

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- NotMapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

Assessment Pattern:

Bloom's Category	Continuous Internal Examination		End Semester Examination
	1	2	
Remember	30	30	30
Understand	30	30	30
Apply	40	40	40
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

End Semester Examination: (QP PATTERN)

1. Each unit consists of two 2 marks questions and one 16 marks question (either or).
2. All the fifteen questions have to be answered.

TEXT BOOKS:

- 1.S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
- 2 .R.F. Pierret. Semiconductor Device Fundamentals. Pearson (Indian Edition), 2006.
3. G.W. Hanson. Fundamentals of Nano electronics. Pearson Education (Indian Edition), 2009.

REFERENCE BOOKS:

1. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Education (Indian Edition), 2019.
2. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
3. Mark Fox, Optical Properties of Solids, Oxford Univ.Press, 2001.

NPTEL COURSE:

Sl.No	Course Name	Course Instructor	Course Conducting Agency
1	Solid state Physics	Prof. Amal Kumar Das	IIT Kharagpur

WEB LINKS AND VIDEO LECTURES (E-RESOURCES):

1. Electrical Conductivity: <https://www.youtube.com/watch?v=QvPSVwzU-8A>
2. Band Theory of solids: https://www.youtube.com/watch?v=qcE2Wcpm05k&ab_channel=npTELhrd
3. Intrinsic semiconductor: <https://www.youtube.com/watch?v=JZN3DAaeOB8>

Suggested Skill Activities:

- 1.As you look at materials and objects around your house Which do you think are conductors and insulators?
2. Identify the change when you connect a light bulb to battery using conductive materials?
3. What will happen if you connect a light bulb to battery using insulating materials?
4. List the usage of alphanumeric displays in day to life.
5. Compute the size variation and efficiency of the nano materials.
6. Illustrate the role of semiconductors in renewable energy technologies.
7. Explain the reason for using smart materials like SMA in retractable roofs.
8. List out 10 uses of magnetic materials in house.
9. Explain the role of nanomaterials in Electronics
10. Discuss about the role of semiconductor in temperature sensors which is air conditioner.

Course Code:	24CY401	Course Title:	ENVIRONMENTAL SCIENCE AND ENGINEERING
Credits:	2	L – T – P	2-0-0
Pre-requisite:			NIL

Course objectives:

To impart knowledge on the

- To gain in-depth knowledge on natural processes and resources that sustain life and govern economy.
- To know the importance of water resources which are important socially, economically viable and environmentally sustainable.
- To impart the Knowledge of pollution and its control methods.
- To mitigate the environmental and health risks associated with indiscriminate waste and find the suitable methodologies for waste management.
- To balance ecological, economic and social goals, such as reducing carbon emissions, promoting renewable energy and ensuring equitable resource access.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. NPTEL and Other Videos
3. Smart Class Room
4. Field visit
5. Project based learning
6. Industrial Visit

UNIT I - Ecology and Biodiversity	[6 hours]
Definition, scope and importance of environment – need for public awareness – concept of an ecosystem - Biodiversity and its values- Biodiversity at global, national and local level- India as a mega-diversity nation – hotspots of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	
UNIT II - Water resources and Environment microbiology	[6 hours]
Water resources: Use and over- utilization of surface and groundwater – dams benefits and problems, conflicts over water – Water availability at global level, surface level, ground level- Sources- Hydroponics - Classification of microorganism – Role of microorganism in waste water treatment- Bacterial nutrition and growth.	

UNIT III -Air and Noise pollution	[6 hours]
Sources and classification of air pollutants and their effect on human health-Ambient airquality and emission standards-Air pollutants-Particulate matters-Control equipments- Gravity separator- Centrifugal separator-fabric filter-Electrostatic separator, Catalytic convertors– Noise pollution-causes – Consequences-Control measures- modern tools used in pollution mitigation measures-sustainable activity of pollution control- recent case studies - Environmental Protection Act.	

UNIT IV- Solid waste and Hazardous waste management	[6 hours]
Soil contaminants–sources and management methods of -Solid Waste Hazardous waste – Plastic waste- -Biomedical waste- Hazardous waste& E-waste management -Case studies on Occupational Health and Safety Management system (OHASMS).	

UNIT V-Environmental management and Sustainable development	[6 hours]
Renewable and non-renewable energy Sources- Energy Polices- Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment-Sustainable goals -Sustainable habitat- Green buildings, Green materials, Energy efficiency, Sustainable transports. Carbon emission-Carbon footprint-Carbon Sequestration.	

Course outcomes:

On completion of the course, the student will have the ability to:

COs	Course Outcome	Cognitive domain
CO1	Illustrate the important features of environment and its conservation.	K2
CO2	Explain the need of water resources and its application to meet the modern requirements and the necessity of its conservation.	K2
CO3	Identify the causes, effects of environmental pollution and explain the control techniques for particulate, gaseous emissions and contribute to the preventive measures in the society.	K3
CO4	Identify the different management methods of solid and hazardous waste.	K3
CO5	Explain the sustainability practices and identify green materials for sustainable development.	K2

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	1	-	-	-	-	1	1	-	-	-	-	-
CO2	2	1	-	-	-	1	1	-	-	-	-	-
CO3	2	-	-	-	-	1	2	1	-	-	-	-
CO4	1	-	-	-	-	2	2	1	-	-	-	-
CO5	1	-	-	-	-	1	2	1	-	-	-	-

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	60	100	40
	CIE – II	100			
	Skill Assessment – I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	20	20	20
Understand	60	40	40
Apply	20	40	40
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Text Books:

1. Benny Joseph, Environmental Science and Engineering ‘, Tata McGraw-Hill, NewDelhi, (2014).
2. Miguel Fischer, “Environmental Management: Ecosystems, Competitiveness and Waste Management” Nova Science Publishers, (2021)

Reference Books:

1. Dharmendra S.Sengar, ‘Environmental law ‘, Prentice hall of India Pvt Ltd, NewDelhi, (2007).
2. Erach Bharucha, “Textbook of Environmental Studies”, Universities Press (I) Pvt, Ltd, Hydrabad, (2015).
3. G.Tyler Miller, Scott E.Spoolman, “Environmental Science”, Cengage Learning India Pvt.Ltd, Delhi, (2014).
4. Mahuabasu, Xavier saverimuthu, “Fundamentals of Environmental Studies”, Cambridge university press, (2017)
5. Anubha Kaushik , C.P. Kaushik, “Perspectives in Environmental Studies”, New Age International Pvt. Ltd, New Delhi, (2004). 6. Frank R. Spellman, “Handbook of Environmental Engineering”, CRC Press, (2015).

Web Links and Video Lectures (E-Resources):

1. Ecology and Society: https://onlinecourses.nptel.ac.in/noc24_hs149/preview
2. Sustainable Power Generation Systems: https://onlinecourses.nptel.ac.in/noc24_ge54/preview
3. Environment and Development: https://onlinecourses.nptel.ac.in/noc24_hs150/preview

Suggested Skill Activities:

1. Why is it beneficial to follow a student centered and participatory process for environmental education?
2. Identify the endemic species of flora and fauna found nearest to your locality.
3. List the major arguments cited against the construction of dams.
4. Discuss how the symbiotic relationship between algae and bacteria is useful in the treatment of sewage in an oxidation pond.
5. List the various ways in which an individual can contribute towards pollution prevention in the society.
6. Mention any four hazardous wastes originating from households and explain their management strategies.

7. Conduct a survey and find out how chemicals and various material are distributed /cycled in your campus.
8. List the common organic materials that are suitable and unsuitable for composting.
9. List the advantages of recycling of MSW with examples.
10. What are the major obstacles in the implementation of incineration technology in developing countries.

Course Code:	24EE202	Course Title:	Fundamentals of Electrical and Electronics Engineering
Credits:	4	L – T – P	3-0-2
Pre-requisite			NIL

Course objectives:

To impart knowledge on the

- Basics of DC electric circuits and its analysis
- Analysis of AC circuits and magnetic circuits
- Working principles and application of DC machines and transformers
- Digital devices and their characteristics
- Functional elements and working of sensors and actuators used for smart systems.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

UNIT I –DC Circuits	[9 hours]
Introduction to DC Circuits – Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm’s Law - Kirchhoff’s Laws –Nodal Analysis, Mesh analysis with independent sources only – Appliances.	

Practical Topics:

1. Model an electrical circuit and simulate it to verify Ohms Law.
2. Model an electrical circuit and simulate it to verify Kirchhoff's Voltage Law.
3. Model an electrical circuit and simulate it to verify Kirchhoff's Current Law.

UNIT II – AC Circuits and Magnetic Circuits**[9 hours]**

Introduction to poly-phase circuits - Representation of sinusoidal waveform – peak and rms values, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations – Converters: rectifiers and inverters; Basics of magnetic circuits – Flux – Flux density – Magnetic resonance – Self-inductance – mutual-inductance – Coupling.

Practical Topics:

1. Demonstrate the measurement of power in an RLC circuit using wattmeter method.
2. Interpret the DC output of an RLC circuit using half wave rectifier.
3. Interpret the DC output of an RLC circuit using full wave rectifier.

UNIT III – DC Machines and Transformers**[9 hours]**

Construction, principle of operation, characteristic and application – DC Motor and DC Generator, Types of DC motors and generators – Application: Electric Vehicle – Structure of electric power system – Introduction to single phase transformers –Construction, principle of operation, characteristics and application.

Practical Topics:

1. Conduct the load test on DC shunt motor to outline its characteristics.
2. Outline the study on the starting methods of DC series motor.
3. Conduct a study on transformer construction for real-time applications.

UNIT IV – Digital Electronics**[9 hours]**

Introduction to digital systems – Number system – Boolean Algebra – POS and SOP – Logic gates – K-map simplification – Flip Flops – Combinational logic circuits: adders – subtractors.

Practical Topics:

1. Experiment with the logic gates to verify its truth table.
2. Make use of the logic gates to verify the functioning of half and full adders.
3. Make use of the logic gates to verify the functioning of half and full subtractors.

UNIT V – Sensors and its Applications	[9 hours]
Sensors in IoT – Mobile based sensors, Resistance Temperature sensor, Humidity sensor –Medical sensor – Neural sensor – Motion sensor – PIR sensor, Piezoelectric sensor, Air quality sensor – CO ₂ Sensor, RFID sensor, Water leakage detection sensor, Light sensors - Introduction to actuators in automation – Applications: smart homes – smart cities – smart parking system.	
Practical Topics:	
<ol style="list-style-type: none"> 1. Utilize Arduino and Bluetooth module for automating home appliances. 2. Utilize ESP8266 processor for automating home appliances. 3. Construct an Arduino based solar tracker for solar irradiation measurement. 	

Laboratory Component:**[30 hours]**

Any 12experiments have to be completed from the following list of experiments.

S.No	Name of the Experiment
1	Model an electrical circuit and simulate it to verify Ohms Law.
2	Model an electrical circuit and simulate it to verify Kirchhoff's Voltage Law.
3	Model an electrical circuit and simulate it to verify Kirchhoff's Current Law.
4	Demonstrate the measurement of power in an RLC circuit using wattmeter method.
5	Interpret the DC output of an RLC circuit using half wave rectifier.
6	Interpret the DC output of an RLC circuit using full wave rectifier.
7	Conduct the load test on DC shunt motor to outline its characteristics.
8	Outline the study on the starting methods of DC series motor.
9	Conduct a study on transformer construction for real-time applications.
10	Experiment with the logic gates to verify its truth table.
11	Make use of the logic gates to verify the functioning of half and full adders.
12	Make use of the logic gates to verify the functioning of half and full subtractors.
13	Utilize Arduino and Bluetooth module for automating home appliances.
14	UtilizeESP8266 processor for automating home appliances.
15	Construct an Arduino based solar tracker for solar irradiation measurement.

Course outcomes:

On completion of the course, the student will have the ability to:

COs	Course Outcome	Cognitive domain
CO1	Apply the circuit laws and theorems to compute the electrical parameters of domestic and industrial appliances.	K3
CO2	Compare the behavior of AC circuits & magnetic circuits for a given input.	K2
CO3	Explain the construction, working, and application of electrical machine and transformer to infer its characteristics.	K2
CO4	Utilize logic gates, Demorgan's theorem and k-map in logical circuits to solve practical engineering problems.	K3
CO5	Identify the sensors for applications in Engineering.	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	1	1	2	-	-	-	2	-	-	1
CO2	2	1	1	-	2	-	-	-	2	-	-	1
CO3	2	1	1	-	2	-	-	-	2	-	-	1
CO4	3	2	1	1	2	-	-	-	2	-	-	1
CO5	3	2	1	1	2	-	-	-	2	-	-	1

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			

Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	10 0	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
Total					100

Assessment Pattern

Bloom's Category	Internal Assessment Tests		Terminal Examination
	1	2	
Remember	20	20	20
Understand	60	40	40
Apply	20	40	40
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Text Books:

1. D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering," McGraw Hill Education (India) Private Limited, Second Edition, 2020
2. A.K.Sawhney and Puneet Sawhney, "A Course in Electrical & Electronic Measurements & Instrumentation," Dhanpat Rai and Co, 2015.

Reference Books:

1. John Bird, "Electrical Circuit theory and technology", Routledge; 2017.
2. Muthusubramanian R and Salivahanan S, "Basic Electrical and Electronics Engineering," McGraw Hill, New Delhi, 2009.
3. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering," Oxford University press, 2012.
4. V K Mehta, Rohit Mehta "Principles of Electronics," S.Chand & Company Ltd, 2015.
5. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits," Schaum' Outline Series, McGraw Hill, 2009.
6. H.S. Kalsi, "Electronic Instrumentation," Tata McGraw-Hill, New Delhi, 2010.

7. Ian Sinclair, “Sensors and Transducers,” Elsevier Science, 3rd Edition, 2000.
8. Perry Lea, “Internet of things for architects,” Packt, 2018.
9. V N Mittle and Arvind Mittle “Basic Electrical Engineering,” McGraw Hill, New Delhi, 2005.
10. R.S. Sedha, “A Textbook of Applied Electronics,” S. Chand & Co., 2008.
11. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry and Gonzalo Salgueiro, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, CISCO Press, 2017.

Web Links and Video Lectures (E-Resources):

1. A Basic Course on Electric and Magnetic Circuits :
https://onlinecourses.nptel.ac.in/noc24_ee125/preview
2. Basic Electrical Circuits: https://onlinecourses.nptel.ac.in/noc24_ee112/preview
3. Digital Circuits: https://onlinecourses.nptel.ac.in/noc24_ee147/preview
4. Electrical Machines – I: https://onlinecourses.nptel.ac.in/noc24_ee103/preview
5. Sensor Technologies: Physics, Fabrication and Circuits:
https://onlinecourses.nptel.ac.in/noc24_ee83/preview
6. Semiconductor Devices and Circuits: https://onlinecourses.nptel.ac.in/noc24_ee143/preview

Suggested Skill Activities:

1. List the different electrical loads available in home, college and prepare their rating chart.
2. Design the residential house wiring using fuse, switch, indicator, lamp, circuit breaker, energy meter and apply Thevenin’s theorem to find the current in particular branch.
3. Take a room in your home and replace the fluorescent lamp to LED lamp to calculate the monthly electrical charge and compare with the previous month.
4. Write the parts of the fan and electric mixer in home and draw the wiring diagram for fan and electric mixer.
5. Visit the nearby substation and list out the details of safety measures followed by electrical engineers.
6. List out the rating of electrical machines used in home appliances.
7. Identify the semiconductor devices in electronic appliances.
8. Develop IOT based solutions for engineering applications.
9. Draw the wiring diagram of EV and mentions its parts.
10. Visit nearby power plant and demonstrate the various components, working, power generation and distribution in power plant as a report.

Course Code:	24EE203	Course Title:	Electric Circuit Analysis (Common to ECE and Bio)
Credits:	4	L – T – P	3-0-2
Pre-requisite			NIL

Course objectives:

To impart knowledge on the

- To apply the basic concepts and behavior of DC and AC circuits.
- To identify the knowledge on solving circuit equations using network theorems
- To interpret the transient and steady state response of the circuits subjected to DC excitations and AC with sinusoidal excitations.
- To learn the concept of coupling in circuits and topologies

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Blended Mode of Learning
3. Experiential Learning
4. NPTEL and Other Videos for theory topics
5. Flipped Class
6. Lab Experiment Videos

UNIT I Basic Circuits Analysis	[9 hours]
Fundamentals concepts of R, L and C elements - Energy Sources - Ohm's Law -Kirchhoff 's Laws - DC Circuits - Resistors in series and parallel circuits - Mesh current and node voltage methods of analysis D.C and A.C Circuits.	
Practical Topics:	
<ol style="list-style-type: none"> 1. Simulation and experimental verification of KCL in series and parallel electrical circuit using fundamental laws. 2. Simulation and experimental verification of KVL in series and parallel electrical circuit using fundamental laws. 	

UNIT II – Network Theorems	[9 hours]
Network reduction: voltage and current division, source transformation - star delta conversion. Theorems - Superposition, Thevenin's and Norton's Theorem - Maximum power transfer theorem - Reciprocity Theorem - Statement, application to DC and AC Circuits.	

Practical Topics:

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.

UNIT III – Sinusoidal Steady State Analysis**[9 hours]**

Sinusoidal Steady - State analysis, The Complex Forcing Function, The Phasor, Phasor relationship for R, L, and C, impedance and Admittance - Nodal and Mesh Analysis, Phasor Diagrams, AC Circuit Power Analysis, Instantaneous Power, Average Power, apparent Power and Power Factor, Complex Power.

Practical Topics:

1. Simulation of three phase balanced star,delta networks circuit (Power and Power factor calculations).
2. Simulation of three phase unbalanced star,delta networks circuit (Power and Power factor calculations).

UNIT IV – Transient and Resonance In RLC Circuits**[9 hours]**

Basic RL and RC Circuits, The Source - Free RL Circuit, The Source - Free RC Circuit, The Unit Step Function, Driven RL Circuits, Driven RC Circuits, RLC Circuits, Frequency Response, Parallel Resonance, Series Resonance, Quality Factor.

Practical Topics:

1. Simulation and Experimental validation of R-L electric circuit transients
2. Simulation and Experimental validation of R-C electric circuit transients

UNIT V – Coupled Circuits and Topology**[9 hours]**

Magnetically Coupled Circuits, mutual Inductance - the Ideal Transformer - An introduction to Network Topology, Trees and General Nodal analysis, Links and Loop analysis.

Practical Topics:

1. Design and implementation of series resonance circuit.
2. Design and implementation parallel resonance circuit.

Laboratory Component:**[30 hours]**

Any ten experiments have to be completed from the following list of experiments.

S.No.	Name of the Experiment
1	Simulation and experimental verification of KCL in series and parallel electrical circuit using fundamental laws.
2	Simulation and experimental verification of KVL in series and parallel electrical circuit using fundamental laws.
3	Simulation and experimental verification of electrical circuit problems using Thevenin's, theorem.
4	Simulation and experimental verification of electrical circuit problems using Norton's theorem.
5	Simulation and experimental verification of electrical circuit problems using Superposition theorem.
6	Simulation and Experimental validation of R-L electric circuit transients
7	Simulation and Experimental validation of R-C electric circuit transients
8	Design and implementation of series resonance circuit.
9	Design and implementation parallel resonance circuit.
10	Simulation of three phase balanced star,delta networks circuit (Power and Power factor calculations).
11	Simulation of three phase unbalanced star,delta networks circuit (Power and Power factor calculations).

Course outcomes:

On completion of the course, the student will have the ability to:

COs	Course Outcome	Cognitive domain
CO1	Apply the concept of Kirchhoff's laws for measuring current and voltage in electrical circuits.	K3
CO2	Identify the different types of network theorems for solving AC and DC circuits	K2
CO3	Interpret the steady state response of R, L and C circuits .	K2
CO4	Identify the transient response for RC, RL and RLC circuits and frequency response of parallel and series resonance circuits.	K2
CO5	Illustrate the coupled circuits for inferring the functioning of transformers.	K3

COs and POs Mapping:

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	1	-	2	-	-	-	-	-	-	-
CO2	3	2	1	-	2	-	-	-	-	-	-	-
CO3	2	1	-	-	2	-	-	-	-	-	-	-
CO4	3	2	-	-	2	-	-	-	-	-	-	-
CO5	2	1	-	-	2	-	-	-	-	-	-	-

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	40		
	Skill Assessment - I	40			
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
Total					100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	10	10	10
Understand	50	50	50
Apply	40	40	40
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuits Analysis”, McGraw Hill publishers, 9th edition, New Delhi, 2020.
2. Chakrabarti A, “Circuits Theory (Analysis and synthesis), Dhanpat Rai & Sons, New Delhi, 2020.
3. Allan H. Robbins, Wilhelm C. Miller, “Circuit Analysis Theory and Practice”, Cengage Learning India, 2013.

Reference Books:

1. Charles K. Alexander, Mathew N.O. Sadiku, “Fundamentals of Electric Circuits”, Second Edition, McGraw Hill, 2019.
2. Sudhakar A and Shyam Mohan SP, “Circuits and Networks Analysis and Synthesis”, McGrawHill, 2015.
3. Joseph A. Edminister, Mahmood Nahvi, “Electric circuits”, Schaum’s series, McGraw-Hill, First Edition, 2019.
4. Richard C. Dorf and James A. Svoboda, “Introduction to Electric Circuits”, 7th Edition, John Wiley Sons, Inc. 2018.

Web Links and Video Lectures (E-Resources):

1. Basic Electrical Circuits : https://onlinecourses.nptel.ac.in/noc24_ee112/preview
2. Semiconductor Devices and Circuits: https://onlinecourses.nptel.ac.in/noc24_ee143/preview
3. Basic Course on Electric and Magnetic circuits :
https://onlinecourses.nptel.ac.in/noc24_ee125/preview
4. Electrical Equipment and Machines : https://onlinecourses.nptel.ac.in/noc24_ee91/preview

Suggested Skill Activities:

1. List of different loads available in home & college and prepare the power rating chart.
2. Measurement of Energy consumption in home.
3. Find the current through particular element using Thevenin’s theorem in a practical circuit.
4. Find the voltage across particular element using Norton’s theorem in a practical circuit.
5. Analyze the transient response of R & RL load in a practical circuit.
6. Analyze the transient response of RLC circuit using PSPICE.
7. Experiment verification of series RLC circuit in Induction Heating.
8. Experiment verification of parallel RLC circuit.
9. Experimental verification of balanced three phase circuit.
10. Experimental verification of unbalanced three phase circuits.

Course Code:	24GE231	Course Title:	WORKSHOP PRACTICES
Credits:	1.5	L – T – P	0-0-3
Pre-requisite			NIL

Course objectives:

To provide hands on training to the students in:

- Applying basic techniques to measure a field, infer masonry work and install plumbing design.
- Fabricating carpentry, foundry, sheet metal and welding works to practice on workshop trades and making end products.
- Utilizing machining processes like turning, drilling, tapping in parts and 3D printing for performing the jobs.
- Designing electrical wiring layout with MCBs and RCCBs, developing staircase wiring and illumination design circuits for buildings.
- Assembling simple electronic components on PCB by soldering and desoldering and testing with IoT based interfaces.
- Developing blogs and website design for the complete access over the network.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Project based learning
2. Industrial Visit

GROUP – A (Civil and Mechanical)

PART I - CIVIL ENGINEERING PRACTICES	[5 hours]
<ol style="list-style-type: none"> 1. FIELD MEASUREMENT, MASONRY WORK AND PLUMBING <ol style="list-style-type: none"> a. Calculate the area of a built-up space and a small parcel of land-use standard measuring tape and digital distance measuring devices. b. Visit a nearby site where construction is at initial stage and observe for following (if necessary, visit two/three times with a gap of a week). If drawings are available relate/match activities with the drawings. <ol style="list-style-type: none"> i. Digging and filling. ii. Foundation preparations. 	

<ul style="list-style-type: none"> iii. Brick/stone masonry. iv. Concrete laying and curing. v. Laying of sewerage/sanitary lines. vi. Bar bending and bar laying for columns, beams and ceiling. vii. Onsite testing for quality. viii. Onsite preparation for construction work. ix. Erection and removal of form work, scaffolding, centering/shuttering. Prepare a brief report on the construction activities, methods, tools, equipments and materials being used. <p>c. Installation of water lines for wash basin and showers faucet.</p>
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PART II MECHANICAL ENGINEERING PRACTICES	[5 hours]
<p>2. CARPENTRY, FOUNDRY, WELDING AND SHEET METAL</p> <ul style="list-style-type: none"> a. Carpentry: Prepare T/L/Lap Joint from given wooden work piece and make a Box/Tray out of plywood using modern power tools. b. Welding: Make a Butt/Lap of MS plate using Arc welding process. c. Casting: Demonstration of Pattern making by sand moulding. d. Sheet Metal: Fabrication of Sheet Metal Tray and Funnels. <p>3. LATHE, DRILLING MACHINE AND 3D PRINTER</p> <ul style="list-style-type: none"> a. Designing a driller component using radial machine. b. Perform a job using facing and turning in lathe. c. Printing simple 3D geometric shapes using SLA printer. 	

GROUP – B (Electrical, Electronics and IT)

PART III ELECTRICAL ENGINEERING PRACTICES	[3 hours]
<p>4. ELECTRICAL WIRING</p> <ul style="list-style-type: none"> a. Design a wiring circuit integrating energy meter, MCBs and RCCBs. b. Develop fluorescent lamp wiring, staircase wiring and electric fan wiring circuits. 	

PART IV ELECTRONICS ENGINEERING PRACTICES	[4 hours]
<p>5. IOT BASED SOLUTIONS AND PCB</p> <ul style="list-style-type: none"> a. Design a single layer PCB layout structure. b. Fabricate single layer PCB printing. c. Assembling, soldering and desoldering practice on single layer PCB. d. GPIO programming in ESP8266, sensor and actuator interfacing with internet enabled microcontroller device. e. Integration of microcontroller-based system with Cloud platform. 	

PART V COMPUTER SCIENCE AND ENGINEERING PRACTICES	[3 hours]
<p style="text-align: center;">6. INTERACTIVE DYNAMIC WEBSITE</p> <p>a. Design a website for an application using HTML and CSS.</p> <p>b. Convert the designed website into responsive website using Bootstrap.</p> <p>c. Add dynamism to the website by using JavaScript and embed the social media components to the website.</p> <p>d. Incorporate the database interaction with the website.</p> <p>e. Deploy the developed website in the server.</p>	

Course outcomes:

On completion of the course, the student will have the ability to:

COs	Course Outcomes	Cognitive domain
CO1	Apply basic techniques for field measurements, masonry work and plumbing.	K3
CO2	Make use of workshop trades like carpentry, foundry, sheet metal and welding for practicing on manufacturing of components.	K3
CO3	Develop simple components using Lathe, Drilling Machine and 3D Printer.	K3
CO4	Construct the electrical wiring circuits for buildings based on their requirement.	K3
CO5	Develop IoT based solutions and PCB for real world use cases.	K3
CO6	Build and host an interactive dynamic website.	K3

COs and POs Mapping:

COs	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1	2	-	-	-	1	1	-	1	3	2	1
CO2	3	2	1	1	2	-	-	-	1	1	-	1	-	-	-
CO3	3	2	1	1	2	-	-	-	1	1	-	1	-	-	-
CO4	3	2	1	1	2	-	-	-	1	1	-	1	1	-	-
CO5	3	2	1	1	2	-	-	-	1	1	-	1	-	-	-
CO6	3	2	1	1	2	-	-	-	1	1	-	1	-	1	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

The weightage of Continuous Internal Evaluation (CIE) is 60% and for End Semester Examination (ESE) is 40%.

S.No	Component	Type of Assessment	Max Marks	Reduced Marks	Total	Final Marks
1.	Continuous Internal Examination(CIE)- Laboratory	Continuous Assessment	75	75	100	60
2.		Model Lab Exam	25	25		
3.	End Semester Examination (ESE)	Lab Exam	100	40	40	40
					Total	100

Text Books:

1. AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual)
ISBN: 978-93-91505-332
2. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

Reference Books:

1. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
2. Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008.
3. Roy A. Lindberg, "Processes and Materials of Manufacture", 4 th edition, Prentice Hall India, 1998.
4. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Course Code:	24EN201	Course Title:	Presentation and Language Skills Laboratory (Common to AI&DS, AE, BME, CE, CSE, CSE(AI&ML),EEE, ECE,MECH)
Credits:	1.5	L – T – P	0-0-3
Pre-requisite			24EN101 English for Engineers

Course Objectives:

- To apply critical listening skills.
- To make use of critical thinking skills.
- To apply stress as well as tonal variation.
- Make use of language skills to produce error free sentences
- To experiment with presentation skills.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Lab experiment videos
2. Blended Mode of Learning
3. Project based Learning
4. Smart Classroom
5. Flipped Class

UNIT I		[12 hours]
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	Topics	Hours
1.	Listening to audios (online platforms) and making a critical appreciation of audio content	3
2.	Listening to breaking news	2
3.	Listening to British council / Cambridge English (Selected topics)	2
CLASSROOM ACTIVITIES		
1	Speaking current issues (selected topics)	2
2	Making conversations at work place, Public Speaking (based on festivals and celebrations)	3

UNIT II		[12 hours]
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	Topic	Hours
1	English Movie clips and software in the Lab C (Globarena)	3

2	Vocabulary Development through movies/ short films/ Documentaries	3
CLASSROOM ACTIVITIES		
1	Speaking - Just a minute talk and expressions for plans and decisions	3
2	Describing a product	3

UNIT III		[12 hours]
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	Topic	Hours
1.	Listening to TED talks, scientific lectures.	3
2.	Reading Comprehension strategies	2
3.	Reading- Editorials	2
CLASSROOM ACTIVITIES		
1.	Speaking- Introduction to Phonetics- Speech sounds- Vowels and Consonants- Stress- Rising/ Falling Tone	2
2.	Writing- A day in my life	2
3.	Writing- Situational Dialogues	1

UNIT IV		[12 hours]
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl.No.	Topic	Hours
1.	Reading Popular Blogs Listening Editorials	3
2.	Creating a Blog	2
CLASSROOM ACTIVITIES		
1.	Errors in Pronunciation. Error detection	3
2.	Writing - Terminology for Engineers. Writing Articles and preparing day to day scripts.	2 2

UNIT V		[12 hours]
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	Topic	Hours
1.	Prepare PowerPoint presentation (topics selected by students)	3
2.	Reading newspaper articles	2

CLASSROOM ACTIVITIES		
1.	Present the selected topic.	3
2.	Making a short speech / Extempore	2
3.	Writing - Expanding a Proverb Writing Instructions	2

Course Outcomes:

S.No.	Name of the Experiments
1	Making conversation at workplace
2	Writing articles
3	Making expressions for plans and decisions
4	Describing a product
5	Day in my life
6	Writing Terminology for engineers
7	Spotting errors
8	Expansion of proverbs
9	Instructions
10	Reading comprehension

On completion of the course, the student will have the ability to:

COs	Course Outcome	Cognitive domain
CO1	Build communicative competence through critical listening skills.	K3
CO2	Make use of critical thinking skills to express plans and opinions.	K3
CO3	Apply stress as well as tonal variations for effective communication.	K3
CO4	Make use of language skills to produce error free sentences.	K3
CO5	Experiment with presentation skills to address confidently.	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	-	-	-	-	-	-	-	-	-	3	-	3
CO2	-	-	-	-	-	-	-	-	-	3	-	3
CO3	-	-	-	-	-	-	-	-	-	3	-	3
CO4	-	-	-	-	-	-	-	-	-	-	-	3
CO5	-	-	-	-	-	-	-	-	-	3	-	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Assessment Pattern:

Name of the Test	Marks	Total	Reduced to
Continuous Assessment (Experiments 1-10)	50	100	50
Model Examination	50		
End Semester Lab Exam	100	100	50
TOTAL			100 MARKS

Textbooks:

1. Raman, Meenakshi and Sangeetha Sharma. Professional Communication. Oxford University Press, Oxford, 2014.
2. Dr. Chellammal. V. Learning to Communicate. Allied Publishers, New Delhi, 2003.
3. Mohan, Krishna. And Meera Bannerjee. Developing Communication Skills. Macmillan India Ltd. 1990.

Reference Books:

Murphy – Raymond. English Grammar in Use BOOK with Answers: A Self-Study. Reference and Practice Book for Intermediate Learners of English. Fourth edition: Cambridge University Press – 2012.

MANUALS/ SOFTWARE: Open Sources / Websites

Course Code:	24CS331	Course Title:	PROGRAMMING FOR PROBLEM SOLVING USING PYTHON
Credits:	1.5	L – T – P	0-0-3
Pre-requisite			24CS201 PROGRAMMING FOR PROBLEM SOLVING USING C

Course objectives:

To impart knowledge on the

- To explain basic concepts in Python
- To implement programs using functions, loops, and conditional statements.
- To demonstrate the concepts of data structures
- To make use of strings and exception handling in Python
- To demonstrate file handling and python modules

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Lab experiment videos
2. Project based Learning

Laboratory Component:**[20 hours]**

Sl.No	Name of the Experiment
1	Develop simple python programs using basic data types
2	Develop simple python programs using operators and expressions
3	Develop Python programs using conditional statements
4	Develop Python programs using various Loops
5	Develop python programs using Functions.
6	Develop programs to demonstrate the use of List, and Tuples
7	Develop programs to demonstrate the use of Dictionaries
8	Demonstrate the various string manipulation functions
9	Develop programs to show Exception Handling in tasks
10	Execute programs using Numpy in Jupiter notebook
11	Python program using File I/O, random access file handling methods and Zipping and Unzipping of files
12	Develop Python programs using packages

Course outcomes:

On completion of the course, the student will have the ability to:

COs	Course Outcome	Cognitive domain
CO1	Develop basic programs using fundamental data types	K3
CO2	Solve the given problem statement using programming concepts such as operators, conditional and looping statements and functions.	K3
CO3	Make use of data structures such as lists, tuples, and dictionaries to manage and manipulate data in development of simple applications	K3
CO4	Create programs using string handling functions and apply exception handling, and make use of NumPy to solve problems	K3
CO5	Make use of file operations and packages in development of simple applications	K3

COs and POs Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3	3	-	1	-	-	-		-	-	1
CO2	3	3	3	-	1	-	-	-		-	-	1
CO3	3	2	2	1	1	-	-	-		-	-	1
CO4	3	2	2	1	1	-	-	-		-	-	1
CO5	3	3	3	1	1	-	-	-		-	-	1

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

The weightage of Continuous Internal Evaluation (CIE) is 60% and for End Semester Examination (ESE) is 40%.

S.No	Component	Type of Assessment	Max Marks	Reduced Marks	Total	Final Marks
1.	Continuous Internal Examination (CIE)- Laboratory	Continuous Assessment	75	75	100	60
2.		Model Lab Exam	25	25		
3.	End Semester Examination (ESE)	Lab Exam	100	40	40	40
					Total	100

Course Code:	24MC201	Course Title:	SPORTS & YOGA FOR YOUTH EMPOWERMENT – I
Credits:	0	L – T – P	0-0-2

Course Objectives:

- Provide value based holistic education to learners
- Create an understanding of yogic life and Character building
- Provide an appreciation of youthfulness

UNIT I – INTRODUCTION	[6 hours]
Aim, Objectives and Importance of Physical Education, Sports -Brief concept of Education in relation to Physical Education, Sports and Yoga.	

UNIT II – LIFE STYLE & PHYSICAL FITNESS	[6 hours]
Meaning and Definitions of Physical Fitness and Life Style-Need and Benefits -Health Related Fitness Components-Skill Related Physical Fitness Components.	

UNIT III – YOGA - TRULY INDIAN	[6 hours]
Origin of Yoga- Fundamental Principles–Guidelines of yoga Practice-Types of Practices - Asanas, Pranayama and Meditation.	

UNIT IV – PRACTICE YOGA	[6 hours]
Need & importance of yoga in day today life-Surya namaskar and its benefits –Types of Bandhas-details of Kriyas and Asanas.	

UNIT V – DIET, FITNESS, WELLNESS & LIFE STYLE MANAGEMENT	[6 hours]
Meaning and Definitions of Fitness ,Wellness and Lifestyle management -Relationship between Diet and Fitness-Components of Balance Diet and its importance -Healthy Lifestyle through Diet and Fitness.	

Course Outcomes:

On completion of the course, the student will have the ability to:

COs	Course Outcomes	Highest Cognitive Level
CO1	Compare physical education , sports and yoga	K2
CO2	Relate yoga and physical fitness to life style	K2
CO3	Summarize Asanas, Pranayama and Meditation	K2
CO4	Demonstrate Surya Namaskar	K2
CO5	Explain the importance of Diet, Fitness, Wellness & Life style management	K2

Reference Books:

1. Introduction to Physical Education, Fitness and Sport, 5th Edition, DarySidentop, Mc Graw Hill 007-123271-0ISBN
2. Fitness and Wellness, Werner. W.K. Hoegar, Sharon.A. Hoegar, 1990,Morton Publishing Company, Englewood, Colorado.

Recommended courses for Semester III

S.no	Course code	Course Title	Category	L	T	P	C
THEORY COURSES							
1.	24MA301	Probability, Random Process and Statistics	BSC	3	1	0	4
2.	24EE301	Electromagnetic Theory	ESC	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENT							
3.	24EC302	Digital Logic Circuits and Design	PCC	3	0	2	4
4.	24EC303	Signals and Systems	PCC	3	0	2	4
5.	24EC304	Electronic Devices for Industrial Applications	PCC	3	0	2	4
6.	24EE404	IoT-Sensors and Devices	ESC	3	0	2	4
LABORATORY COURSES							
7.	24EC351	Mini Project I - Design & Simulation of fundamentals in Electronics	EEC	0	0	2	1
MANDATORY COURSES							
8.	24MC301	Sports and Yoga for Youth Empowerment - II	MNC	0	0	2	0
TOTAL				18	1	10	24

Recommended courses for Semester IV

S.no	Course code	Course Title	Category	L	T	P	C
THEORY COURSES							
1.	24EE402	Control Systems	PCC	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENT							
2.	24EC401	Analog Electronic Circuits	PCC	3	0	2	4
3.	24EC402	Communication Systems	PCC	3	0	2	4
4.	24EC403	Digital Signal Processing	PCC	3	0	2	4
5.	24CS401	Computer Networks	PCC	2	0	2	3
6.	24CS402	Data Structures using C++	PCC	2	0	2	3
LABORATORY COURSES							
7.	24EC451	Mini Project II - Community Service Project	EEC	0	0	2	1
8.	24EN451	Soft Skills Development	EEC	0	0	2	1
MANDATORY COURSES							
9.	24MC401	NCC Credit Course Level - II	MNC	1	0	2	0
TOTAL				16	0	14	23

Course Code:	24MA301	Course Title:	PROBABILITY, RANDOM PROCESS AND STATISTICS (AI & DS/ AI & ML/ BME/ CSE/ ECE)
Credits	4	L – T – P	3-1-0
Pre-requisite			NIL

Course objectives:

- To understand the concepts of probability, one- and two-dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To familiarize the students with basic concepts of random processes which are widely used in many industries.
- To introduce the concepts of testing of hypothesis and design of experiments which plays an important role in real life problems.

Teaching-Learning Process:

These are sample strategies which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
2. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
3. Topics will be introduced in a multiple representation and encourage the students to come up with their own creative ways to solve them.
4. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the students' understanding.

UNIT I –PROBABILITY AND ONE-DIMENSIONAL RANDOM VARIABLE**[12 hours]**

Axioms of Probability - Conditional Probability - Bayes Theorem. - Random Variable and Distributions: Introduction to Random Variable - Discrete and Continuous Random Variables and its Distribution Functions – Moments - Moment Generating Function - Binomial, Poisson, Geometric, Uniform, Exponential and Normal Distribution Functions.

UNIT II – TWO-DIMENSIONAL RANDOM VARIABLE	[12 hours]
Joint Distributions – Marginal and Conditional Distributions – Covariance – Correlation and Linear Regression – Transformation of Random Variables.	
UNIT III – RANDOM PROCESS AND POWER SPECTRAL DENSITY	[12 hours]
Classification - Stationary Process: Strict Sense Stationary and Wide Sense Stationary Process - Poisson Process – Markov Process - Markov Chain – TPM, Steady State, Classification - Auto Correlation – Cross Correlation – Power Spectral Density and Cross Power Spectral Density.	
UNIT IV – TESTING OF HYPOTHESIS	[12 hours]
Testing of Hypothesis for Means - Large, Small Samples and Difference of Mean - Testing of Hypothesis for Proportions - Chi Square Test for Goodness of Fit and Independence of Attributes – Testing of Hypothesis of Variance.	
UNIT V – DESIGN OF EXPERIMENTS	[12 hours]
Analysis of Variance: One way and two-way classifications-Completely randomized design - randomized block design – Latin Square Design – 2^2 Factorial Design.	

45 Periods**Course outcomes:**

On completion of the course, the student will have the ability to:

COs	Course Outcomes	Cognitive Level
CO1	Apply the concept of probability to solve discrete and continuous probability distributions	K3
CO2	Understand the basic concepts of two-dimensional random variables and apply in solving Engineering Problems.	K3
CO3	Apply the concept of random processes in engineering disciplines.	K3
CO4	Apply the various statistical methods in hypothesis testing for mean and variances of large and small samples	K3
CO5	Apply various ANOVA techniques like CRD, RBD, LSD etc... to obtain the variances.	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	2	-	-	-	-	-	-	-	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-
CO4	3	3	-	2	-	-	-	-	-	-	-	1
CO5	3	3	-	2	-	-	-	-	-	-	-	1

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,
Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern:

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	20	20	20
Understand	40	40	40
Apply	40	40	40
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Johnson. R.A., Miller. I.R and Freund. J.E, " Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2016.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata Mc Graw Hill, 4th Edition, 2007.
3. Gupta.S.C., and Kapoor, V.K., "Fundamentals of Mathematical Statistics", 12th Edition, Sultan Chand and Sons, 2020.

Equivalent NPTEL/SWAYAM Courses

S. No.	Course Title	Course Instructor	Host Institute
1	Probability and Statistics	Prof. Somesh Kumar	IIT Kanpur
2	Statistical Methods for Scientists and Engineers	Prof. Somesh Kumar	IIT Kharagpur

Web Links and Video Lectures (E-Resources):

1. Probability Distribution of a Random Variable
<https://www.nptelvideos.com/lecture.php?id=14218>
2. Testing of Hypothesis: <https://www.nptelvideos.com/lecture.php?id=14425>

Suggested Skill Activities:

1. Suppose an antivirus system can detect malware with a 0.98 probability. If 100 files are scanned, what is the expected number of malware files detected?
2. A spam filter correctly identifies 95% of spam and 90% of non-spam emails. 70% of incoming emails are spam. What is the probability that a mail marked as spam is actually spam? (Bayes' Theorem)
3. A biometric system has a false positive rate of 1% and a false negative rate of 2%. Given that an access is granted, what is the probability that the person is genuine?
4. In a seed germination experiment, out of 100 seeds, 85 germinate. What is the probability that a randomly selected seed germinates? Which probability axiom does this situation demonstrate?
5. Define a random variable representing: The number of vehicles crossing a bridge per minute (discrete). The height of concrete poured in a column (continuous).
6. Given two discrete random variables X and Y, representing real-world system measurements, construct their joint probability distribution table using either simulated

- or collected data. Identify and interpret whether the variables appear to be dependent or independent.
7. From a known joint distribution of two random variables X and Y , compute the marginal distributions of each variable. Use integration (for continuous) or summation (for discrete) to derive the marginal.
 8. Given a dataset of two variables that are believed to be linearly related (e.g., input voltage vs. output current), perform linear regression to find the best-fit line. Derive the regression equation
 9. Simulate a time-series dataset (e.g., temperature, sensor signal). Check whether it is WSS using statistical properties like mean and autocorrelation.
 10. Design a MATLAB simulation that shows how autocorrelation changes for non-stationary vs. stationary processes.
 11. Build a Poisson regression model to predict the number of calls arriving at a call center per hour.
 12. Compute the steady-state probabilities for a Markov Chain with a 3×3 transition matrix. Interpret results in context.
 13. Apply cross-correlation to a pair of audio signals to find time delay between them
 14. A coffee shop claims that the average wait time for customers is no more than 5 minutes. A customer believes it's more than 5 minutes. State the null and alternative hypotheses.
 15. A pharmaceutical company tests a new drug believed to reduce blood pressure. Explain what a Type I and a Type II error would mean in this context.
 16. A 95% confidence interval for the average delivery time of a service is (42.1, 46.5) minutes. The company advertises that the average time is 45 minutes. Based on the interval, can the company's claim be disputed?
 17. A battery manufacturer wants to prove their batteries last longer than 300 hours. Should they use a one-tailed or two-tailed test? Why?
 18. A sample of 18 students' test scores is used to estimate the population mean. Population standard deviation is unknown.
 - a) Should you use a z-test or a t-test?
 - b) Justify your answer
 19. An electronics engineer measures the signal strength (in dBm) for two antenna types (A_1 , A_2) across three frequency bands (F_1 , F_2 , F_3):

Frequency Band	A1	A2
F1	-65	-67
F2	-62	-64
F3	-63	-66

Conduct a two-way ANOVA to analyze the effects of antenna type and frequency band on signal strength, including their interaction.

20. A communication system engineer tests 4 modulation schemes (M1, M2, M3, M4) on 4 bandwidth levels and 4 receiver types. The recorded bit error rates (BER) are arranged in a Latin square as:

	Receiver 1	Receiver 2	Receiver 3	Receiver 4
Bandwidth 1	0.02 (M1)	0.03 (M2)	0.05 (M3)	0.04 (M4)
Bandwidth 2	0.04 (M4)	0.02 (M1)	0.03 (M2)	0.05 (M3)
Bandwidth 3	0.05 (M3)	0.04 (M4)	0.02 (M1)	0.03 (M2)
Bandwidth 4	0.03 (M2)	0.05 (M3)	0.04 (M4)	0.02 (M1)

Perform an analysis using the Latin Square Design to determine if the modulation schemes have significantly different BERs.

Course Code:	24EE301	Course Title:	ELECTROMAGNETIC THEORY
Credits	3	L – T – P	3-0-0
Pre-requisite		Engineering Mathematics, Engineering Physics	

Course objectives:

The students will try to learn:

- The behavior of charge under rest with static electric field in terms of electric field intensity, electric displacement and electric potential.
- The charge distribution in conductors, dielectrics and condensers.
- The sources to develop constant and variable magnetic field to study effect of these fields in terms of magnetic field intensity, magnetic displacement, and magnetic potential.
- The nature of electromagnetic wave propagation in free space, conductors, and dielectric materials.

Teaching-Learning Process:

- Lectures with Visual Aids
- Simulation and Modeling
- Project-Based Learning
- NPTEL and Other Videos for theory topics
- Laboratory Experiments

UNIT-I: ELECTROSTATICS**[9 hours]**

Introduction to Cartesian, cylindrical and spherical co-ordinates. Conversion of one type of co-ordinates to another; Electrostatic fields: Coulomb's law, electric field intensity due to line and surface charges, work done in moving a point charge in an electrostatic field, electric potential, potential gradient, Gauss's law, application of Gauss's law, Laplace's and Poisson's equations, Applications: Capacitor configurations and field estimation in engineering systems

UNIT- II: CONDUCTORS AND DIELECTRICS**[9 hours]**

Electric Dipole: Field and potential; Torque on a dipole in an electric field, Conductors in electrostatic fields: Properties and surface charge behavior, Dielectrics: Polarization, Electric Field inside Dielectrics, Bound charges, Dielectric Boundary Conditions, Energy Stored in Electrostatic Fields and Energy Density Introduction to Linear and Nonlinear Dielectrics, Applications in Capacitive Sensors

UNIT-III: MAGNETOSTATICS	[9 hours]
Biot–Savart Law, Magnetic Field Intensity due to Current-Carrying Elements, Field Due to Long Straight Wire, Circular and Square Loop, Solenoid, Magnetic Flux and Magnetic Flux Density, Relationship Between B, H, and μ (Permeability), Ampere’s Circuital Law (Integral and Differential Forms) and Applications, Magnetic Field of Infinite Sheet and Filament, Introduction to Vector Magnetic Potential.	
UNIT-IV: FORCE IN MAGNETIC FIELD AND MAGNETISM	[9 hours]
Moving charges in a magnetic field, Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors. Nature of Magnetic materials, Magnetic Boundary conditions, Magnetic Circuits, Inductance and mutual inductance, Coupled Coils and Applications.	
UNIT-V: TIME-VARYING FIELDS AND MAXWELL'S EQUATIONS	[9 hours]
Faraday's law, Transformer and Motional Electromotive Forces, Displacement current, Maxwell's equations in integral and differential form, Wave equations and their solutions: Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in loss dielectrics, Skin effect. Time-Varying Potentials, Time-harmonic fields, Poynting theorem and Electromagnetic power flow, Applications in EM Shielding, Wireless Power Transfer, and Antenna Design	

Course outcomes:

On completion of the course, the student will have the ability to:

CO. No.	Course Outcomes	Cognitive Level
CO1	Apply vector calculus and coordinate systems to model and analyze electrostatic fields.	K3
CO2	Apply the principles of electrostatics to analyze the behavior of conductors and dielectrics in electric fields and calculate the energy stored in the field.	K3
CO3	Understand the concept of Biot-Savart law and Ampere circuital law for derivation of magnetic field intensity due to different current carrying conductors.	K2
CO4	Apply the concepts of magnetostatics to determine the force on moving charges or current-carrying conductors and calculate inductance and energy stored for various wire configurations.	K3
CO5	Apply Maxwell’s equations to study time-varying fields and solve wave equations for different media.	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	1	-	-	-	-	-	-	-	-	2
CO2	3	2	1	-	-	-	-	-	-	-	-	2
CO3	2	1	1	-	-	-	-	-	-	-	-	2
CO4	3	2	1	-	-	-	-	-	-	-	-	2
CO5	3	2	1	-	-	-	-	-	-	-	-	2

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,
Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN):

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern:

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	20	10	10
Understand	80	30	30
Apply	0	60	60
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. K.B. MadhuSahu, “Eelectromagnetic Fields”, Scitech Ltd., 2nd edition, 2014
2. David J Griffiths, “Introduction to Electrodynamics” Pearson Education Ltd., 4th edition, 2014.
3. Sunil Bhooshan, “Fundamentals of Engineering Electromagnetics”, Oxford University Press, 1st edition, 2012.
4. E Kuffel, W S Zaengl, J Kuffel, “High Voltage Engineering Fundamentals”, Newnes, 2nd edition, 2000.

Reference Books:

1. Matthew N O Sadiku, S V Kulkarni, “Principles of Electromagnetics”, Oxford University Press, 6th edition, 2015.
2. AS Mahajan, AA Rangwala “Electricity and Magnetism”, McGraw Hill Publications, 1st edition, 2000.
3. MS Naidu, V Kamaraju “High Voltage Engineering”, McGraw Hill Publications, 3rd edition, 2013.
4. William H Hayt, John A Buck, “Problems and Solutions in Electromagnetics”, McGraw Hill Publications, 1st edition, 2010.

Web links and Video Lectures (e-Resources):

1. https://www.calvin.edu/~pribeiro/courses/engr315/EMFT_Book.pdf
2. <https://www.web.mit.edu/viz/EM/visualizations/coursenotes/modules/guide02.pdf>
3. <https://www.nptel.ac.in/courses/108106073/>
4. <https://www.iare.ac.in>

Suggested Skill Activities:

1. Mini Project: Construct a small-scale electromagnetic brake for a rotating disc using coils and magnets.
2. Model a Paper Speaker using electromagnetism principle
3. Model a Homopolar Motor
4. Build a Reed Switch for operating the motor
5. Solving Laplace/Poisson's Equation Numerically for Capacitor Configurations
6. Practical Setup: Magnetic Field Around a Wire Using Compass or Sensor
7. Electromagnetic Induction Demonstration (Coils and Magnets)
8. Mini Project: Design a kit or simulation using sensors or software (Python/MATLAB) to visualize electric field lines and equipotential for various charge configurations.
9. Create a simple maglev system using current-carrying conductors and magnets to levitate small objects.
10. Mini Project: Design a working prototype that transfers power wirelessly between two coils.

Course Code:	24EC302	Course Title:	DIGITAL LOGIC CIRCUITS AND DESIGN
Credits	4	L – T – P	3-0-2
Pre-requisite		Matrices and Calculus, Engineering Physics	

Course objectives:

To impart knowledge on the

- To Study the fundamentals of Boolean Algebra and simplification of logic gates.
- To Study the design of various combinational circuits and logic family.
- To study the design procedure of Sequential circuits
- To study the design procedures for State Machines
- To learn the programmable logic and Memory devices

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Project based Learning
3. Experiential Learning
4. NPTEL and Other Videos
5. Smart Class Room
6. Flipped Class
7. Experimental Learning
8. NPTEL and Other Videos

UNIT I - BOOLEAN ALGEBRA AND LOGIC GATES [9 hours]

Basic gates and truth table, De-Morgan's theorem, SOP and POS, K Map up to five variables, Two bits and three bits binary addition and Subtraction.

Practical Topics:

1. To verify the truth tables of various logic gates.
2. To Implement the Given Boolean Function using Logic Gates.
3. To Verify and Study NAND and NOR gate as Universal Gates.

UNIT II - COMBINATIONAL CIRCUITS AND LOGIC FAMILY	[9 hours]
Code converters, Magnitude comparator, Multiplexers and DE multiplexers, Decoders, Encoders, Priority Encoder, Combinational Circuits design-RTL, DTL, TTL & CMOS logic families	
Practical Topics:	
<ol style="list-style-type: none"> 1. To study binary to gray and gray to binary converter and verify it for all possible combinations. 2. To implement and verify the truth table of 4x1 Multiplexer and 1x4 De multiplexer. 3. To implement and verify the truth table of Encoders and Decoders. 	
UNIT III - SEQUENTIAL LOGIC	[9 hours]
74xx series Integrated Circuits, Flip-Flops, Triggering of Flip-Flops, Design of Clocked Sequential Circuits Moore and Melay model- Flip-Flop Excitation Tables, Master Slave Flip-flop, Shift Registers and Counters.	
Practical Topics:	
<ol style="list-style-type: none"> 1. Flip-flop: assemble, test and investigate operation of SR, D and JK Flip-flops 2. Shift Register: Design and investigate the operation of all type of shift registers with parallel load. 3. Counters: Design, assemble and test various ripple and synchronous counters-decimal counter, Binary counter with parallel load. 	
UNIT IV - STATE MACHINE DESIGN	[9 hours]
ASM Chart, State table, State condition and Diagrams, State minimization and hazards – analysis of asynchronous sequential logic circuits	
Practical Topics:	
<ol style="list-style-type: none"> 1. Clock-pulse generator: design, implement and test. 2. Develop an Health track monitor App to measure any 3 parameters heart rate, pressure and temperature monitoring system. 	
UNIT V- PROGRAMMABLE LOGIC AND MEMORY DEVICES	[9 hours]
Introduction PLA and PAL, CPLDs and FPGA - Memory Devices - ROM, RAM- Volatile and Non Volatile RAM, SDRAM, DRAM, PROM, EPROM, EEPROM, FRAM, ASIC	
Practical Topics:	
<ol style="list-style-type: none"> 1. Investigate the behavior of RAM unit and its storage capacity -16 X 4 RAM: testing, simulating and memory expansion. 	

Laboratory component:**30 Hours**

Sl.No.	Name of the experiment
1	To Verify the truth tables of various logic gates.
2	To Implement the Given Boolean Function using Logic Gates.
3	To Verify and Study NAND and NOR gate as Universal Gates.
4	To study binary to gray and gray to binary converter and verify it for all possible Combinations
5	To implement and verify the truth table of 4x1 Multiplexer and 1x4 Demultiplexer.
6	To implement and verify the truth table of Encoders and Decoders.
7	Flip-flop: assemble, test and investigate operation of SR, D and JK Flip-flop.
8	Shift Register: Design and investigate the operation of all type of shift registers with parallel load.
9	Counters: Design, assemble and test various ripple and synchronous counters with parallel load.
10	Clock-pulse generator: design, implement and test.
11	Develop a Health track monitor App to measure any 3 parameters heart rate, pressure and temperature monitoring system
12	Investigate the behavior of RAM unit and its storage capacity -16 X 4 RAM: testing, simulating and memory expansion Using HDL/VHDL/ Pspice Simulators

Course outcomes:

On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Level
CO1	Illustrate the concepts of Boolean Algebra and its Simplification procedures relevant to digital logic gates.	K2
CO2	Construct combinational logic circuits to perform various operations on Data	K3
CO3	Apply the concepts of sequential logic circuit to make state Machines	K3
CO4	Construct an ASM chart to describe the sequential operations of a digital circuit.	K3
CO5	Interpret the concepts of Programmable Logic and Memory Devices to build digital circuits.	K2

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	1	-	-	-	-	-	2	-	-	1
CO2	3	2	1	1	-	-	-	-	2	-	-	1
CO3	3	2	1	-	1	-	-	-	2	-	-	1
CO4	3	2	1	1	1	-	-	-	2	-	-	1
CO5	3	2	1	1	1	-	-	-	2	-	-	1

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,
Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	40		
	Skill Assessment - I	40			
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
Total					100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern:

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	20	20	20
Understand	40	40	40
Apply	40	40	40
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. M. Morris Mano and Michael D. Ciletti, 'Digital Design', Pearson, 6th Edition, 2018.

Reference Books:

1. Charles H. Roth, Jr, 'Fundamentals of Logic Design', Jaico Books, 4th Edition, 2002'
2. William I. Fletcher, "An Engineering Approach to Digital Design", Prentice- Hall of India, 1980.
3. Floyd T.L., "Digital Fundamentals", Charles E. Merrill publishing company, 1982.
4. John. F. Wakerly, "Digital Design Principles and Practices", Pearson Education, 4th Edition, 2007.
5. Donald D. Givone (2002), Digital Principles and Design, Tata McGraw Hill, India

Web links and Video Lectures (e-Resources):

1. Introduction to Digital Circuits: <https://nptel.ac.in/courses/117106086/>
2. Combinational Circuits <https://nptel.ac.in/courses/117106086/>
3. Code Converters: <https://nptel.ac.in/courses/117106086/>
4. SR, JK, D Flip Flops: <https://nptel.ac.in/courses/117106086/>
5. Design of Synchronous Sequential Circuits: https://nptel.ac.in/courses/117106086
6. Programmable Logic Devices: https://nptel.ac.in/courses/117106086

Suggested Skill Activities:

1. Design a fingerprint attendance system circuit, using a Fingerprint Sensor module to authenticate a true person or employee by taking their finger input in the system. Employ 4 push buttons to enroll, Delete, UP/Down. ENROLL and DEL key has triple features.
2. Design a Touchless heart rate, pulse rate monitoring and image recognition app to detect changes in face's reflectivity for automobilist safety, based on cutting-edge research and science conducted at the MIT Media Lab and thereby allowing the app to calculate a person's heart rate.
3. Design an Obstacle Avoiding Robot Car Using an Ultrasonic Sensor by interfacing three ultrasonic sensors with Arduino UNO. Run an algorithm according to which you are going to manipulate your desired distance for obstacle detection then you are going to control your motor rotation direction for movement of your bot. 50cm (Front), 15cm (Each Side).

4. Design and implement a Digital code lock System using Arduino. Employ a LCD display which is used to interface with the project to output lock status to be used in places where we need more security.
5. Design a Luggage Security System using GSM to inform about the status of the luggage to the owner, by making of an integrated IR Transmitter Receiver circuit and IR diodes which sense any object about certain range. Make the algorithm tailor-made to the specific requirements of the user.



Course Code:	24EC303	Course Title:	SIGNALS AND SYSTEMS
Credits	4	L – T – P	3-0-2
Pre-requisite			Matrices and Calculus, Complex Variables and Transforms

Course objectives:

- To understand the basic properties of signal & systems
- To know the methods of characterization of LTI systems in time domain
- To analyze continuous time signals and system in the Fourier and Laplace domain
- To analyze discrete time signals and system in the Fourier and Z transform domain

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Blended Mode of Learning
3. Experiential Learning
4. NPTEL and Other Videos for theory topics
5. Flipped Class
6. Lab Experiment Videos

UNIT I - CLASSIFICATION OF SIGNALS AND SYSTEMS	[9 hours]
Signals- Classification of Signals- Transformation of independent/ dependent variables - Basic Elementary signals- System- Classification of systems- Linearity, time invariance, stability, causality and memory systems.	
Practical Topics:	
<ol style="list-style-type: none"> 1. Generation of Continuous -time (CT) and Discrete-time (DT) signals 2. Perform Operations on Signals and Sequences 3. Verification of linearity properties of a given continuous /discrete system. 	
UNIT II - FOURIER ANALYSIS OF CONTINUOUS TIME SIGNALS	[9 hours]
Representation of CT periodic signals by Continuous Time Fourier Series, Convergence, Representation of CT aperiodic and periodic signals by Continuous Time Fourier Transform, Frequency response of systems characterized by differential equations	

Practical Topics:

1. Analyze and Synthesize of continuous time signals using Fourier Series
2. Find the Fourier Transform of a Given Signal and Plot its Magnitude and Phase Spectrum
3. To compute frequency response of LTI system from impulse response.

UNIT III – FOURIER ANALYSIS OF DISCRETE TIME SIGNALS**[9 hours]**

Representation of DT periodic signals by Discrete Time Fourier Series, Properties, Representation of DT aperiodic and periodic signals by Discrete Time Fourier Transform Convergence Properties, Frequency response of systems characterized by difference equations.

Practical Topics:

1. Analyze and Synthesize of discrete time signals using Fourier Series
2. To evaluate discrete time Fourier transform (DTFT) of a signal.
3. To compute frequency response of LTI system by difference equation

UNIT IV - LAPLACE TRANSFORM**[9 hours]**

Relation between CTFT and LT, Region of Convergence of CT signals, Properties, Response of LTI-CT systems, Impulse response, Step response, Inverse Laplace Transform- Convolution Integral

Practical Topics:

1. Estimation of Laplace transform of an arbitrary function
2. To evaluate convolution integral of a given signal.

UNIT V- Z-TRANSFORM**[9 hours]**

Relation between DTFT and ZT - Region of Convergence- ZT of DT signals- Properties - Response of LTI-DT systems- Impulse response- Step response- Inverse Z-transform using partial fraction and residue method - Sampling, Nyquist Interval- Convolution Sum -Realization of DT systems using direct form I and II.

Practical Topics:

1. Write a MATLAB program to find the impulse response and step response of a system from its difference equation.
2. Pole-zero plot on z-plane and determination of magnitude response.

Laboratory component:**30 Hours**

SI.No.	Name of the experiment
1	Generation of Continuous -time (CT) and Discrete-time (DT) signals
2	Perform Operations on Signals and Sequence
3	Verification of linearity properties of a given continuous /discrete system
4	Analyze and Synthesize of continuous time signals using Fourier Series
5	Find the Fourier Transform of a Given Signal and Plot its Magnitude and Phase Spectrum
6	To compute frequency response of LTI system from impulse response
7	Analyze and Synthesize of discrete time signals using Fourier Series
8	To evaluate discrete time Fourier transform (DTFT) of a signal.
9	To compute frequency response of LTI system by difference equation
10	Estimation of Laplace transform of an arbitrary function
11	To evaluate convolution integral of a given signal.
12	Write a MATLAB program to find the impulse response and step response of a system from its difference equation.
13	Pole-zero plot on z-plane and determination of magnitude response.

Course outcomes:

On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Level
CO1	Classify different types of signals and systems based on their properties.	K2
CO2	Apply the Continuous-Time Fourier Transform (CTFT) to determine the frequency response of continuous-time systems characterized by differential equations.	K3
CO3	Apply the Discrete-Time Fourier Transform (DTFT) to determine the frequency response of discrete-time systems characterized by difference equations.	K3
CO4	Apply Laplace Transform techniques to analyze the behavior of continuous-time LTI systems using their impulse and step responses.	K3
CO5	Apply Z-transform properties to compute the impulse and step responses of Linear Time-Invariant Discrete-Time (LTI-DT) systems.	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	1
CO5	3	3	2	2	-	-	-	-	-	-	-	-

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,
Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	40		
	Skill Assessment - I	40			
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern:

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	10	10	10
Understand	30	30	30
Apply	60	60	60
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Oppenheim, Willsky and Hamid, “Signals and Systems”, 2nd Edition, Pearson Education, New Delhi, 2015 (Units I – V).
2. Simon Haykin, Barry Van Veen, “Signals and Systems”, 2nd Edition, Wiley, 2002.

Reference Books:

1. B. P. Lathi, “Principles of Linear Systems and Signals”, 2nd Edition, Oxford, 2009.
2. M. J. Roberts, “Signals and Systems Analysis using Transform methods and MATLAB”, McGraw-Hill Education, 2018.
3. John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.
4. Alan V Oppenheim, Alan S Willsky, S Hamid Nawab, "Signals and Systems", second Edition, PHI Learning Private Limited, New Delhi, 2015

Web links and Video Lectures (e-Resources):

1. Classification of signals –https://www.youtube.com/watch?v=3vnI_o_B3tg
2. Classification of systems- <https://www.youtube.com/watch?v=JVX-dMzqzZ4>
3. Fourier Transform- <https://www.youtube.com/watch?v=6spPyJH6dkQ>
4. Laplace Transforms- <https://www.youtube.com/watch?v=M-dy4MJAnN0>
5. Fourier transforms in Analysis of CT systems
<https://www.youtube.com/watch?v=Nt7Gqt5sVKA>
6. Fourier Transform of discrete time signals -
<https://www.youtube.com/watch?v=Q8wuqYsdnSs>
7. Z Transform - <https://www.youtube.com/watch?v=gkC7cXa8ewk>
8. Inverse Z transform- <https://www.youtube.com/watch?v=gkC7cXa8ewk>

Suggested Skill Activities:

1. Record voice and display the waveform.
2. Add noise to the signal and display the frequency spectrum.
3. Do Simple project using MATLAB

Course Code:	24EC304	Course Title:	ELECTRONIC DEVICES FOR INDUSTRIAL APPLICATIONS
Credits	4	L – T – P	3-0-2
Pre-requisite			NIL

Course objectives:

- To impart the basics of semiconductor physics and electronic devices.
- To demonstrate flow of current through the p-n junction of BJT and develop its hybrid equivalent circuit.
- To understand the characteristics of FET and construct its equivalent circuit.
- To learn the behavior of special semiconductor Devices.
- To understand the characteristics of power devices and display devices.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Hands-on Laboratory Work
3. Demonstrations & Simulations
4. Application-Based Learning
5. Interactive and Peer Learning

UNIT I - FUNDAMENTALS OF SEMICONDUCTORS AND DIODES**[9 hours]**

Semiconductor Fundamentals: Energy bands, intrinsic and extrinsic semiconductors, doping, conductivity, Types of Semiconductors: Silicon, germanium, compound semiconductors - Carrier Transport: Diffusion, drift, mobility, and conductivity. Diode Theory: PN junction, forward and - reverse biasing, ideal vs. real diodes. Junction Diodes: Zener diode, light-emitting diode (LED), photodiode, Schottky diode. Applications of Semiconductor Materials in Domestic and Industrial Devices

Practical Topics:

1. (i) Forward and Reverse Bias Characteristics of PN junction Diode
(ii) Switching Characteristics of PN junction Diode
2. V-I Characteristics of Zener Diode.
3. Construct Zener diode as Voltage Regulator and to find Line and Load Regulation.

UNIT II- DIODES IN POWER CONVERSION SYSTEMS	[9 hours]
<p>Rectification: Half-wave and full-wave rectification, peak detection, Filters and Regulators: Capacitor filters, voltage regulation using Zener diodes, Rectifier Circuits: Bridge rectifiers, center-tapped transformer circuits, Applications of Diodes in Power Supplies: Power supply circuits for home appliances, battery chargers, Applications in Industrial Systems: Diode rectifiers in DC motor drives, welding machines</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. Construct a Full wave rectifier 2. Construct a bridge rectifier circuit using PN diode. 3. Construct a simple RC filter and verify it's working. 	

UNIT III - TRANSISTORS AND INDUSTRIAL SWITCHING APPLICATIONS	[9 hours]
<p>Field Effect Transistor (FET): Operation, MOSFET types (NMOS, PMOS), characteristics, Applications of BJTs and MOSFETs -Amplifiers: Audio and RF amplifiers for consumer electronics- Switching Circuits: DC-DC converters, relays, industrial switching circuits- Signal Processing: Amplification and filtering in industrial sensors and control systems-Transistor Amplifier Circuits: Common-emitter, common-collector, common-base configurations- Transistor in Power Electronics: High-efficiency switching power supplies, motor control systems.</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. Input and Output Characteristics of Common Emitter configuration. Determine gain, Input and Output Impedance 2. Drain and Transfer characteristics of JFET. 3. Drain and Transfer characteristics of MOSFET. 	

UNIT IV- POWER CONTROL DEVICES AND INDUSTRIAL CIRCUIT PROTECTION	[9 hours]
<p>Power diodes, SCR: construction and working, TRIAC and DIAC: industrial AC control, Basic applications: lamp dimmer, speed control, heater control, Gate triggering and commutation circuits, Rectifiers with filter circuits, Voltage regulators: linear (78XX, 79XX), zener-based Switched Mode Power Supplies (SMPS) - concept only, Fuses, circuit breakers, surge protection</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. Determine the Switching Characteristics of Triac. 2. Design and develop SMPS circuit to obtain 5 V. 	

UNIT V- INTERFACE ELECTRONICS AND SMART INDUSTRIAL APPLICATIONS	[9 hours]
Timer IC 555: monostable and astable operations, comparators, level detection Basic motor control circuit (relay/solid-state relay interface), Introduction to temperature sensors and control circuits, Role of electronic devices in automation and control, Overview of PLC interfacing with sensors and devices; Basics of industrial IoT and smart sensing, Safety and standards (EMI, isolation, fault handling).	
Practical Topics:	
1. Design and observe timing behavior.	
2. Control relay using BJT/MOSFET and sensor.	

Laboratory component:**30 Hours**

Sl.No.	Name of the experiment
1	i) Forward and Reverse Bias Characteristics of PN junction Diode ii) Switching Characteristics of PN junction Diode
2	Determine V-I Characteristics of Zener Diode.
3	Construct Zener diode as Voltage Regulator and to find Line and Load Regulation.
4	Construct a Full wave rectifier
5	Construct a bridge rectifier circuit using PN diode.
6	Construct a simple RC filter and verify it's working.
7	Input and Output Characteristics of Common Emitter configuration. Determine gain, Input and Output Impedance
8	Drain and Transfer characteristics of JFET.
9	Drain and Transfer characteristics of MOSFET.
10	Determine the Switching Characteristics of TRIAC.
11	Identify and test key blocks in an SMPS circuit.
12	Design and observe timing behavior.
13	Control relay using BJT/MOSFET and sensor.

Course outcomes:

On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Level
CO1	Apply semiconductor principles to test and use different types of diodes in basic circuits.	K3
CO2	Construct and test rectifier circuits using diodes for AC to DC conversion.	K3
CO3	Use BJTs and FETs in amplifier and switching applications.	K3
CO4	Apply power electronic devices like SCR, TRIAC, and voltage regulators in control and protection circuits.	K3
CO5	Construct and test simple control and interface circuits using timers, sensors, and relays.	K3

COs and POs Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	-	-	-	-	-	-	3	-	-	-
CO2	3	2	-	-	-	-	-	-	3	-	-	-
CO3	3	2	-	-	-	-	-	-	3	-	-	-
CO4	3	1	-	-	-	-	-	-	3	-	-	-
CO5	3	1	-	-	-	-	-	-	3	-	-	-

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,
Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	40		
	Skill Assessment - I	40			
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
Total					100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern:

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	10	10	10
Understand	30	30	30
Apply	60	60	60
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. J. Millman, Christos C. Halkias (2010), Electronic Devices and Circuits, Tata McGraw Hill, New Delhi.
2. R.L. Boylestad and Louis Nashelsky (2006), Electronic Devices and Circuits, 9th edition, Prentice Hall of India, New Delhi.

Reference Books:

1. S. M. Sze, Kwok K. Ng, "Physics of Semiconductor Devices", 3rd Edition, Wiley, 2018.
2. Rober T. Paynter (2003), Introduction to Electronic Devices and Circuits, 6th edition, Pearson Education, New Delhi, India.
3. S. Salivahanan, N. Suresh Kumar, A. Vallavaraj (2008), Electronic Devices and Circuits, 2nd Edition, Tata McGraw Hill, New Delhi.

Web links and Video Lectures (e-Resources):

1. Basics of Semiconductor Diode <http://youtube.com/watch?v=PoMwywRKLgY>
2. Early effect in BJT <https://www.youtube.com/watch?v=B0k501WULQs>
3. Pinch off Voltage <https://www.youtube.com/watch?v=-o39YVNMYVs>
4. Charge Coupled Devices <https://www.youtube.com/watch?v=wsdmt0De8Hw>
5. Carbon Nano tubes -<https://www.youtube.com/watch?v=SIif11QOsRI>

Online Courses:

1. <http://nptel.ac.in>
2. <https://swayam.gov.in>

Suggested Skill Activities:

1. Identify types of diodes and explain real-life use (LEDs, photodiodes, Zeners)
2. Demonstrate understanding of energy band diagrams
3. Troubleshoot a diode-based circuit using multimeter and oscilloscope
4. Calculate ripple factor and efficiency of rectifiers
5. Identify diode-based circuits in household appliances
6. Simulate rectifier circuits using software tools (Multisim/LTSpice)
7. Compare performance of BJTs, FETs, and MOSFETs for switching
8. Build a simple amplifier circuit and test with signal generator
9. Identify industrial applications for each transistor type (e.g., DC-DC converter, relay drivers)
10. Identify and test fuses, MOVs, circuit breakers used in industrial panels
11. Explain thermal management in power electronics (heatsinks, derating)
12. Analyze an SMPS block diagram for a consumer appliance
13. Interface a sensor with a microcontroller or logic circuit (e.g., LM35 + comparator)
14. Design a simple control system using a relay or SSR
15. Simulate PLC input/output operations for a basic motor control
16. Temperature-controlled fan using thermistor and relay
17. Light-activated switch using LDR and transistor
18. Battery level indicator using comparators and LEDs
19. Basic line follower or object detector using photodiodes

Course Code:	24EE404	Course Title:	IOT-SENSORS AND DEVICES
Credits	4	L – T – P	3-0-2
Pre-requisite			NIL

Course objectives:

To impart knowledge on the

1. Basic electronic components and Sensors.
2. Fundamental concepts of Microcontrollers
3. Different types of Microcontrollers
4. Different protocols for communication
5. Interfacing of Arduino microcontrollers with different applications.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. PowerPoint presentation
3. Interactive Simulations
4. Lab Experiment Videos
5. Blended Mode of Learning
6. Project based Learning
7. Experiential Learning
8. NPTEL and Other Videos
9. Smart Class Room
10. Flipped Class

UNIT I - SENSORS FOR IOT	[9 hours]
Active and Passive Sensors, Different Types of Sensors such as Capacitive, Resistive, and Surface Acoustic Wave Sensors for Pressure, Humidity, Toxic Gas; Sensors for Water (pH) quality, Accelerometer, Gyroscope, Moisture, Hall effect and Humidity.	

Practical Topics:

1. Building basic circuit diagrams using breadboard and Working of a Multimeter.
2. Simple circuit using IC on breadboard.
3. Simple Relay circuit design for ON-OFF condition.

UNIT II – MICROCONTROLLER**[9 hours]**

Introduction to microcontrollers and microprocessors, Different microcontrollers, Arduino: Types, UNO Architecture, ADC, DAC, Data acquisition

Practical Topics:

1. Switch on an LED if a button is pressed.
2. Changing brightness of LED using potentiometer.

UNIT III - ARDUINO PROGRAMMING**[9 hours]**

Digital Pins as Input and Output, Reading Analog Quantities, PWM Pin- Arduino's Serial Port and Serial Communication. Interfacing of DC Motor and Relay.

Practical Topics:

1. Change the brightness of LED (Fade in/ Fade out) using PWM
2. DC motor speed control using serial communication.

UNIT IV - IOT SYSTEM**[9 hours]**

Basics of IoT, IoT Levels, Things and Connections, Building Blocks of IoT connectivity (Client-Server, Web Interface, and API: Qualitative Analysis only), Protocols and Communication (Zigbee, Bluetooth, Wi-Fi, MQTT: Qualitative Analysis only), Bluetooth and Wi-Fi Modules for Arduino

Practical Topics:

1. Interfacing Wi-Fi module with Arduino
2. Design a simple circuit to measure the pH value of wastewater.
3. Design a simple circuit to apply Hall effect sensor

UNIT V- IOT APPLICATIONS**[9 hours]**

Application of IoT in the industry, buildings, smart city, logistics, environment, health care, agriculture, and lifestyle product

Practical Topics:

1. Sending information about the patient in home to the doctor's PC/mobile.
2. Develop an IoT System for smart home applications

Laboratory component:**30 Hours**

Sl.No.	Name of the experiment
1	Building basic circuit diagrams using breadboard and Working of a Multimeter
2	Simple circuit using IC on breadboard
3	Simple Relay circuit design for ON-OFF condition.
4	Switch on an LED if a button is pressed.
5	Changing brightness of LED using potentiometer.
6	Change the brightness of LED (Fade in/ Fade out) using PWM
7	DC motor speed control using serial communication.
8	Interfacing Wi-Fi module with Arduino.
9	Design a simple circuit to measure the pH value of wastewater.
10	Design a simple circuit to apply Hall effect sensor
11	Sending information about the patient in home to the doctor's PC/mobile.
12	Develop an IoT System for real time applications.

Course outcomes:

On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Level
CO1	Illustrate the working principles of different types of sensors.	K2
CO2	Describe the basic concepts of the different types of Microcontrollers.	K2
CO3	Apply the knowledge of PWM and Serial communication in different circuits.	K3
CO4	Explain the working of Wi-Fi module and different protocols for communication for usage in IoT.	K2
CO5	Apply the sensor to build an IoT System for Real time applications.	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	1	2	2	-	-	-	-	-	-	-	-
CO2	2	1	2	3	-	-	-	-	-	-	-	-
CO3	3	1	3	3	1	-	-	-	1	-	-	-
CO4	2	2	1	2	1	-	-	-	1	-	-	-
CO5	3	2	1	2	1	-	-	-	1	-	-	-

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,
Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) – Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	40		
	Skill Assessment - I	40			
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) – Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	20	20	20
Understand	60	40	40
Apply	20	40	40
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Peter Dalmaris, “Basic Electronics for Arduino Makers”, Packt Publishing, 2017.
2. Tim Pulver, “Hands-On Internet of Things with MQTT: Build Connected IoT Devices with Arduino and MQ Telemetry Transport (MQTT)”, Packt Publishing, 2019.
3. Marco Schwartz, “Internet of Things with Arduino Cookbook”, Packt Publishing, 2016.

Reference Books:

1. Jody Culkin, Eric Hagan, “Learn Electronics with Arduino: An Illustrated Beginner's Guide to Physical Computing” Make Community, LLC, 2017.
2. Michael Margolis, "Arduino Cookbook" O'Reilly, 2011.
3. Julien Bayle, “C Programming for Arduino”, Packt Publishing Ltd., 2013.

Web links and Video Lectures (e-Resources):

1. Sensors for IoT- <https://youtube.com/watch?v=njgixrZOT1E>
2. Microcontroller- <https://www.youtube.com/watch?v=l9DC9ZpQ5yo>
3. Arduino Programming- https://www.youtube.com/watch?v=QO_Jlz1qpDw
4. IoT System- <https://www.youtube.com/watch?v=9KIHDeW6bO4>
5. IoT Applications- <https://www.youtube.com/watch?v=91aXs9E0qAI>

Online Courses:

1. <http://nptel.ac.in>
2. <https://swayam.gov.in>

Suggested Skill Activities:

1. How to control multiple LEDs / Traffic LEDs using tinker cad software
2. Sending Data to LCD Display using tinker cad software
3. Design a simple circuit to Measure Heart Rate and SpO2
4. Design a simple circuit to maintain the CO2 level inside the room
5. Rainfall Monitoring Using Arduino

Course Code:	24EC351	Course Title:	MINI PROJECT I - DESIGN & SIMULATIONS OF FUNDAMENTALS IN ELECTRONICS
Credits	1	L – T – P	0-0-2
Pre-requisite			NIL

Course objectives:

- Introduce basic circuit/system design skills.
- Apply theoretical concepts using simulation tools.
- Familiarize students with prototyping platforms like Multisim, Proteus, Tinker CAD.

MODULE I - DESIGN THINKING & PROJECT PLANNING	[5 hours]
Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) Problem identification and requirement analysis. Literature survey and idea validation.	

MODULE II - BASIC TOOLS AND PLATFORMS	[10 hours]
Introduction to circuit simulation tools (Multisim, Proteus, KiCAD, TinkerCAD)- Design of basic analog circuits – amplifiers, oscillators, rectifiers- Digital circuit design – counters, adders, multiplexers, FSMs -Small integration project combining analog and digital blocks- PCB layout and basic fabrication principles	

MODULE III - DEVELOPMENT PHASE	[10 hours]
Simple analog/digital circuit projects -Basic embedded projects using sensors or actuators -Embedded C or Arduino programming	

MODULE IV - DOCUMENTATION & PRESENTATION	[5 hours]
Project report writing (formatting, content, citations) -Oral presentation skills and project demo.	

Course outcomes: On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	
CO1	Apply Design Thinking stages to identify problems, analyze requirements, survey literature, and validate ideas through brainstorming.	K3
CO2	Design and simulate basic analog and digital circuits and create a PCB layout for a small integrated circuit project.	K4
CO3	Design and implement simple analog/digital circuit projects using Embedded C and Arduino programming.	K4
CO4	Write a formatted project report with proper content and citations and deliver an effective oral presentation.	K2

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Assessment	Evaluation of Different modules of work and Mini project 1 Report	100	75	100	100
End Semester Examination (ESE)	Exam	100	25		
				Total	100

Course Code:	24MC301	Course Title:	SPORTS & YOGA FOR YOUTH EMPOWERMENT – II
Credits:	0	L – T – P	0-0-2

Course Objectives:

- To create an awareness about sports, asanas and health benefits
- To practice asanas for meditation, relaxation and physical well-being.

UNIT I – BENEFITS OF SPORTS & PHYSICAL ACTIVITY**[6 hours]**

Introduction to Sports Training-Meaning, Definition, Scientific Principles of Sports Training, effect of exercise in a body-Strength and its types.

UNIT II – SPORTS PSYCHOLOGY**[6 hours]**

Introduction – Sports Psychology-Sports performance-sports participation in Psychological Development-aggression –Building of self-confidence and sports performance.

UNIT III – YOGA FOR POSITIVITY**[6 hours]**

Details of Indian yogic system, Power of Mind- benefits of positive thinking-drug awareness-personality development - Need of value education

UNIT IV – MINDFUL LIVING**[6 hours]**

Difference between yoga and physical education- verbal & nonverbal communication -power of youth reduction of obesity- reduction of hyper tension -Meditation

UNIT V – CAREER OPPORTUNITIES IN PHYSICAL EDUCATION, SPORTS AND YOGA**[6 hours]**

Physical Education, Sports and Yoga professionals at various levels of educational institutions. Sports Trainers, Yoga Instructors, Coach, Managers, Technical Officials, Entrepreneurs and others Physical Education, Sports and Yoga Trainer for Police and Paramilitary forces at State and Central organizations.

Course Outcomes:

On completion of the course, the student will have the ability to:

COs	Course Outcomes	Highest Cognitive Level
CO1	Explain the basic principles and practices of physical Education.	K2
CO2	Outline Sports Psychology.	K2
CO3	Infer the role of yoga in positivity.	K2
CO4	Illustrate the behavior changes needed to ensure a good quality life.	K2
CO5	Summarize various professional opportunities in physical education, sports and yoga.	K2

Reference Books:

1. Fit to be Well, Alton L.Thygerson, Karl L.Larson, Jones and BartlettPublishers, Sudbury
2. Fitness Education, Teaching Concepts – Based Fitness in Schools, 1997,Garsuch scaris brick Publishers, Arizona

Course Code:	24EE402	Course Title:	CONTROL SYSTEMS
Credits	3	L – T – P	3-0-0
Pre-requisite			Electric Circuits, Matrices & Calculus, Complex variables and Transforms

Course objectives:

To impart knowledge on the

- Linear time invariant system representation as transfer function model.
- Stability of linear systems in the time domain.
- Stability of linear systems in the frequency domain.
- Linear time varying system representation as state variable model.
- Design of compensator based on frequency domain specifications.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Blended Mode of Learning
3. Project based Learning
4. Experiential Learning
5. NPTEL and Other Videos
6. Smart Class Room
7. Flipped Class

UNIT I –MODELING OF LINEAR TIME INVARIANT SYSTEM (LTIV)**[9 hours]**

Basic elements in control systems: Open loop and closed loop systems with practical examples: Automatic temperature control in HVAC systems, Cruise control in automobiles, Industrial process control (chemical reactors, conveyor belts), Role of feedback in improving system accuracy, stability, and disturbance rejection with case studies such as robotic arm positioning and autopilot systems, First principle modeling: Mechanical, Electrical and Electromechanical systems – Transfer function representations: Block diagram and Signal flow graph.

UNIT II – TIME DOMAIN ANALYSIS**[9 hours]**

Standard test inputs – Time response – Time domain specifications – Steady state error – Stability analysis: Concept of stability – Routh Hurwitz stability criterion – Root locus: Construction and Interpretation – Effect of adding poles and zeros.

UNIT III – FREQUENCY DOMAIN ANALYSIS	[9 hours]
Frequency domain specifications – Bode plot – Polar plot – Introduction to closed loop frequency response – Effect of adding lag and lead compensators.	
UNIT IV – STATE VARIABLE ANALYSIS	[9 hours]
State variable formulation – Non-uniqueness of state space model – State transition matrix – Eigenvalues – Eigen vectors - Free and forced responses for Time Invariant and Time Varying Systems –Controllability – Observability.	
UNIT V – DESIGN OF FEED BACK CONTROL SYSTEM	[9 hours]
Design specifications – Lead, Lag and Lag-lead compensators using Bode plot –PID controller design using reaction curve and Ziegler-Nichols technique – PID control in State Feedback form.	

Course outcomes:

On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Level
CO1	Make use of block diagram reduction and signal flow graph techniques to represent the transfer function model of armature-controlled and field-controlled DC motors.	K3
CO2	Utilize the time domain specifications to interpret the transient and steady state characteristics of converter switches in its transfer function model.	K3
CO3	Utilize the frequency domain specifications to interpret the margins of communication, geological and remote sensing systems in its transfer function model.	K3
CO4	Apply the concept of system behavior to evaluate the controllability and observability of dynamic system.	K3
CO5	Apply the state feedback methods to design controllers and compensators for any engineering system.	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	1	-	1	-	-	-	1	-	-	1
CO2	3	2	1	-	1	-	-	-	1	-	-	1
CO3	3	2	1	-	1	-	-	-	1	-	-	1
CO4	3	2	1	-	1	-	-	-	1	-	-	1
CO5	3	2	1	-	1	-	-	-	1	-	-	1

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,
Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) – Theory	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	40		
	Skill Assessment - I	40			
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern:

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	10	10	10
Understand	20	20	20
Apply	70	70	70
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Benjamin C. Kuo, “Automatic Control Systems”, 10th edition PHI Learning Private Ltd, 2017.
2. Nagarath, I.J. and Gopal, M., “Control Systems Engineering”, New Age International Publishers 2021.

Reference Books:

1. Richard C. Dorf and Bishop, R.H., “Modern Control Systems”, Education Pearson, 3 Impression 2022.
2. John J.D., Azzo Constantine, H. and Houpis Sttuart, N Sheldon, “Linear Control System Analysis and Design with MATLAB”, CRC Taylor& Francis Reprint 2009.
3. Katsuhiko Ogata, “Modern Control Engineering”, PHI Learning Private Ltd, 5thEdition, 2015
4. Rames C.Panda and T. Thyagarajan, “An Introduction to Process Modelling Identification and Control of Engineers”, Narosa Publishing House, 2017.
5. M.Gopal, “Control System: Principle and design”, McGraw Hill Education, 2017.

Web Links and Video Lectures (E-Resources):

1. Control Engineering, Prof. Ramkrishna Pasumarthy, IIT Madras:
https://onlinecourses.nptel.ac.in/noc25_ee15/preview
2. Automatic Control, Prof. Anil Kumar, IIT Roorkee:
https://onlinecourses.nptel.ac.in/noc25_me07/preview
3. Dynamics and Control of Mechanical Systems, Prof. Ashitava Ghosal, Ahmedabad University: https://onlinecourses.nptel.ac.in/noc25_me17/preview
4. Industrial Automation and Control, Prof. Alokanti Deb, IIT Kharagpur:
https://onlinecourses.nptel.ac.in/noc25_ee42/preview
5. State space Approach to Control System Analysis and Design, Prof. A P Tiwari, IIT Mandi:
https://onlinecourses.nptel.ac.in/noc25_ee81/preview

Suggested Skill Activities:

1. Robotic arm control: Design a control system to precisely move a robotic arm using feedback from position sensors.
2. Home Automation System: Create a home automation system that controls lighting, heating, cooling, and security using a central control system.

3. Autonomous vehicle control: Implement control algorithms for steering and speed regulation in a simulated or real-world vehicle.
4. Temperature control system: Design a feedback loop to maintain a desired temperature in a chamber using a heater and temperature sensor.
5. Motor control system: Control the speed and position of a DC motor using a PID controller.
6. Biomedical control system: Develop a control system for an infusion pump to deliver precise medication dosages.
7. Quadcopter Stabilization: Build and program a quadcopter to maintain stable flight using a control system. This project involves sensors, motors, and control algorithms.
8. Line Following Robot: Create a robot that can follow a line on the ground using infrared sensors for line detection and a PID controller for precise control.
9. Automated Greenhouse Control: Design a control system for a greenhouse that regulates temperature, humidity, and light to create an optimal environment for plant growth.
10. Traffic Light Control System: Simulate or implement a traffic light control system that manages traffic flow at a crossroad, optimizing traffic flow and minimizing wait times.
11. Water Level Control System: Design a system to control the water level in a tank using sensors and pumps. This can be used in water management applications.
12. Solar Tracking System: Create a solar panel tracking system that adjusts the angle of solar panels to maximize energy collection throughout the day.
13. Car Cruise Control: Implement a cruise control system in a remote-controlled car that can maintain a set speed and adapt to changes in the terrain.
14. Wireless Control System: Develop a wireless remote-control system for appliances or devices, utilizing technologies like Bluetooth or Wi-Fi for communication.
15. Inverted Pendulum: Build a physical or simulated inverted pendulum system and design a control algorithm to keep it balanced.

Case Study:

1. Case Study: Automate temperature control in industrial furnaces to reduce fluctuations, save energy, and improve product quality.

Course Code:	24EC401	Course Title:	ANALOG ELECTRONIC CIRCUITS
Credits	4	L – T – P	3-0-2
Pre-requisite			Basic Electrical Engineering, Engineering Physics , Electronic Devices for Industrial Applications, Mathematics – Calculus and Differential Equations

Course objectives:

To impart knowledge on the

- Various types of BJT and FET amplifier circuits and the development of small signal equivalent circuits.
- Narrow band and wide band amplifiers with good stability
- Different types of Feedback amplifiers, oscillators and tuned circuits

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. PowerPoint presentation
3. Interactive Simulations
4. Lab experiment videos
5. Blended Mode of Learning
6. Project based Learning
7. Experiential Learning
8. NPTEL and Other Videos
9. Smart Class Room
10. Flipped Class

UNIT I - INTRODUCTION TO ANALOG ELECTRONICS**[9 hours]**

Basic Components: Resistors, capacitors, inductors, diodes, transistors, and operational amplifiers. Circuit Analysis Techniques: Node voltage method, mesh current method, Thevenin's and Norton's theorems. Signal Behavior: AC vs. DC signals, sinusoidal and non-sinusoidal waveforms, impedance, and reactance. Applications Overview: Analog circuits in commercial electronics, communication systems, power systems, and audio systems.

Practical Topics:

1. PCB design guidelines for analog circuits
2. Reduce Near-field EMI on PCBs using op-AMP

UNIT II: BIASING OF BJT & MOSFET AMPLIFIERS**[9 hours]**

Small signal model of diode, DC Load line, AC Load line, Operating point, various biasing methods for BJT-Design Stability with self-bias -Bias compensation, Thermal stability, small signal Analysis - General shape of frequency response of amplifiers, Biasing for MOSFET, Small signal analysis of MOSFET, Common source amplifier, Source follower and Common Gate amplifiers - Low frequency analysis of MOSFET, Frequency response of CS amplifier, Bandwidth of multistage amplifiers, gain and bandwidth of CS, CG and CD amplifier

Practical Topics:

1. Simulation of Common Emitter amplifiers
2. Analysis of Frequency Response of BJT- CE, CB and CC amplifiers
3. Analysis of FET, MOSFET with fixed bias, self-bias and voltage divider bias using simulation software
4. Frequency Response of CS, CG and CD amplifiers,
5. Determination of bandwidth of single stage and multistage amplifiers,

UNIT III: FEEDBACK AMPLIFIERS**[9 hours]**

General Feedback Structure – Properties of positive and negative feedback – Basic Feedback Topologies –, Determining the Loop Gain – Stability Problem – Nyquist Plot – Effect of feedback on amplifier poles – Frequency Compensation

Practical Topics:

1. Design and test the current-series and voltage shunt feedback amplifier and to calculate the parameters with and without feedback.

UNIT IV – OSCILLATORS AND TUNED AMPLIFIERS**[9 hours]**

Classification, Barkhausen Criterion - Mechanism for start of oscillation and stabilization, RC Phase shift oscillator and Wien Bridge Oscillator - Hartley Oscillator and Colpitts Oscillator –Tuned Collector Oscillator - Twin -T Oscillator, Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers – Analysis of capacitor coupled single tuned amplifier – double tuned amplifier

Practical Topics:

1. Single tuned amplifier, Simulation of Single Tuned, Double Tuned and Staggered Tuned Amplifier

UNIT V – POWER AMPLIFIERS AND DC/DC CONVERTERS**[9 hours]**

Power amplifiers- class A-Class B- class B complementary symmetry push pull amplifier- Class AB- Class C- -Temperature Effect- Class AB Power amplifier using MOSFET –DC/DC convertors – Buck, Boost, Buck-Boost analysis and design.

Practical Topics:

1. Class A Transformer Coupled Power Amplifier
2. Simulation study of basic power converters like buck-boost converter using Simulink

Laboratory component:**30 Hours**

SI.No.	Name of the experiment
1	(i) PCB design guidelines for analog circuits- (ii) Reduce Near-field EMI on PCBs Using Op-amps
2	Analysis of BJT with self-bias
3	Simulation of Common Emitter amplifiers
4	Analysis of Frequency Response of BJT- CE, CB and CG amplifiers
5	Determination of bandwidth of single stage and multistage amplifiers
6	Analysis of FET, MOSFET with fixed bias, self-bias and voltage divider bias using simulation software
7	Frequency Response of CS, CG and CD amplifiers
8	Determination of bandwidth of single stage and multistage amplifiers,
9	Hartley and Colpitts's Oscillators, RC Phase Shift and Wien Bridge Oscillator
10	Simulation of Tuned Collector and Twin T Oscillator
11	Single tuned amplifier, Simulation of Single Tuned, Double Tuned and Staggered Tuned Amplifier
12	Class A Transformer Coupled Power Amplifier
13	Simulation study of basic power converters like buck-boost converter using Simulink

Course outcomes:

On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Level
CO1	Apply basic circuit components and laws to analyze analog signal behavior.	K3
CO2	Design and analyze biasing circuits for BJTs and MOSFETs in amplifier applications.	K3
CO3	Construct and evaluate feedback amplifiers for stability and gain control.	K3
CO4	Design and simulate oscillators and tuned circuits	K3
CO5	Analyze the performance of power amplifiers.	K4

COs and POs Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	2	2	1	--	--	--	--	--	--	--
CO2	3	2	2	3	1	--	--	--	--	--	--	--
CO3	3	2	3	3	1	--	--	--	1	--	--	--
CO4	3	2	1	2	1	--	--	--	1	--	--	--
CO5	3	2	1	2	1	--	--	--	1	--	--	--

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,

Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) – Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) – Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
Total					100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern:

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	10	10	10
Understand	30	30	30
Apply	60	40	40
Analyze	0	20	20
Evaluate	0	0	0
Create	0	0	0

TEXTBOOKS

1. Millman J.and Halkias C.C, "Electronic Devices and Circuits" Tata Mc Graw Hill, 2017
2. G.K.Mithal, "Electronic Devices and Circuits", 23rd Edition, Khanna Publishers,2012.

REFERENCES

1. David A.Bell, "Electronic Devices and Circuits", Oxford Higher Education Press, 5th Edition,2010.
2. Sedra and Smith, "Micro Electronic Circuits"; Sixth Edition, Oxford University Press, 2011.
3. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 11th Edition, Pearson Education / PHI, 2017.
4. Millman and Halkias. C., "Integrated Electronics", TMH, 2007.
5. Muhammad H.Rashid, "Power Electronics", Pearson Education / PHI, 2004

Web Links and Video Lectures (E-Resources):

1. BIASING OF DIODE AND BJT-

https://www.youtube.com/watch?v=7s4jZV4UOgc&ab_channel=STEM

2. BJT AMPLIFIERS-

https://www.youtube.com/watch?v=0O6PEIDZKoQ&ab_channel=Technifyi

3. MOSFET AMPLIFIERS-

https://www.youtube.com/watch?v=cfxXMapFyzU&ab_channel=DMEexplains

4. FEEDBACK AMPLIFIERS

https://www.youtube.com/watch?v=z2RTQ0TjrSY&ab_channel=

5. OSCILLATORS & TUNED AMPLIFIERS

https://www.youtube.com/watch?v=jZZni05GtwA&ab_channel=Ekeeda

Online Courses:

1. <http://nptel.ac.in>
2. <https://swayam.gov.in>

Suggested Skill Activities:

1. Identify and label analog circuit components on a PCB.
2. Simulation study of different biasing circuits using BJT
3. Simulate small-signal amplifiers using LTspice or Multisim.
4. Build working models of DC-DC converters for practical applications.
5. Mini Project: Automatic Night Lamp Using LDR
6. Audio Amplifier Using BJT or Op-Amp
7. Design and build a low-frequency function generator using op-amps and RC circuits.
8. Build a basic FM transmitter using tuned LC oscillators and audio modulation.
9. Use a small solar panel with a buck converter and regulator circuit to charge mobile devices



Course Code:	24EC402	Course Title:	COMMUNICATION SYSTEMS
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Credits	4	L – T – P	3-0-2
Pre-requisite		Matrices and Calculus, Engineering Physics, Digital System Design	

Course objectives:

- Introduce the fundamental principles of analog and digital communication systems and their components.
- Explain the role of modulation, multiplexing, and encoding techniques in transmitting and receiving information efficiently.
- Develop an understanding of signal behavior, noise effects, and performance metrics like bandwidth and signal-to-noise ratio (SNR).
- Familiarize students with digital modulation schemes (e.g., BPSK, QPSK, QAM) and their practical use in industrial automation and wireless systems.
- Explore synchronization, error detection, and correction mechanisms used in modern digital communication.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Demonstrations and Simulations
2. Project based Learning
3. Hands-on Laboratory Experiments
4. Group Discussions and Case Studies
5. Flipped Class
6. Use of Multimedia and Online Resources

UNIT I – INTRODUCTION TO COMMUNICATION SYSTEMS	[9 hours]
<p>Overview of communication systems: Analog vs. digital communication, Components of a communication system: Transmitter, channel, receiver, Noise and its effect on communication systems, Industrial communication applications overview: Process control, remote monitoring, automation systems</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. To Generate and Detect Amplitude Modulated (AM) Signals 2. To Generate and Detect Frequency Modulated (FM) Signals. 3. Analysis of Pre-Emphasis and De-Emphasis in FM Communication Systems 	

UNIT II – ANALOG COMMUNICATION SYSTEMS	[9 hours]
<p>Continuous-time signals: Types, properties, and representation of analog signals - Amplitude Modulation (AM): Theory, time-domain representation, bandwidth considerations, and applications in industrial communication, Frequency Modulation (FM): Theory, frequency spectrum, advantages of FM, and its industrial applications, Phase Modulation (PM): Basics and application in communication systems, Modulation Techniques for Industrial Applications: Radio frequency communication for remote control and monitoring in industrial environments, Receiver Design for AM, FM, and PM</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. Implementation of Sampling using Sample-and-Hold Circuits 2. To Generate and Detect PAM Signals. 3. To Generate and Detect PWM Signals 4. To Generate and Detect PPM Signals 	
UNIT III – DIGITAL COMMUNICATION SYSTEMS	[9 hours]
<p>Discrete-time signals: Sampling theorem, quantization, and digital signal representation- Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM), and Delta Modulation (DM): Theory, characteristics, and applications, Digital Modulation Techniques: ASK, FSK, PSK, QAM - their applications in industrial communication systems, Error Detection and Correction: Parity bits, Hamming code, CRC (Cyclic Redundancy Check), Inter-symbol Interference (ISI) and its mitigation techniques</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. To Generate and Detect PCM Signal 2. To Generate and Detect DPCM Signal. 	
UNIT IV – SIGNAL TRANSMISSION AND RECEPTION	[9 hours]

<p>Bandwidth: Calculation and considerations in industrial communication systems - Noise in Communication Channels: Types of noise (thermal noise, shot noise, impulse noise) and their effect on analog and digital signals, Signal-to-Noise Ratio (SNR): Relationship with data rates and error probability, Channel Capacity: Shannon-Hartley theorem for capacity estimation, Error Analysis in Digital Communication: Bit Error Rate (BER) and its measurement.</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. To Simulate ASK, FSK, and BPSK Generation and Detection Schemes. 2. To Simulate DPSK, QPSK and QAM Generation and Detection Schemes. 3. To Simulate of Linear Block and Cyclic Error Control coding Schemes. 	
<p>UNIT V – DIGITAL COMMUNICATION SYSTEMS IN INDUSTRY</p>	<p>[9 hours]</p>
<p>Data Encoding and Decoding: Manchester encoding, differential encoding, and their application in industrial systems - Multiplexing: Time Division Multiplexing (TDM), Frequency Division Multiplexing (FDM), and Statistical Multiplexing - Digital Modulation Schemes: Application of BPSK, QPSK, QAM, FSK, and PSK in industrial automation systems - Synchronization: Clock synchronization techniques for industrial communication systems - Advanced Digital Communication Techniques: Orthogonal Frequency Division Multiplexing (OFDM), CDMA (Code Division Multiple Access), Industrial Communication Protocols, Case Study About Designing a wireless communication system for an industrial automation system</p>	
<p>Practical Topics:</p> <ol style="list-style-type: none"> 1. To Optimize Demodulation of Digital Signals in Band-Limited Channels 2. To Design and Implementation of Baseband Pulse Transmission 	

Laboratory component:

30 Hours

SI.No.	Name of the experiment
1	To Generate and Detect Amplitude Modulated (AM) signals
2	To Generate and Detect Frequency Modulated (FM) Signals.
3	Implementation of Sampling using Sample-and-Hold Circuits
4	To Generate and Detect PAM Signals.
5	To Generate and Detect PWM Signals
6	To Generate and Detect PPM Signals
7	To Generate and Detect PCM Signal
8	To Generate and Detect DPCM Signal.
9	To Simulate ASK, FSK, and BPSK Generation and Detection Schemes.
10	To Simulate DPSK, QPSK and QAM Generation and Detection Schemes.

11	To Simulate of Linear Block and Cyclic Error Control Coding Schemes.
12	To Optimize Demodulation of Digital Signals in Band-Limited Channels
13	To Design and Implementation of Baseband Pulse Transmission

Course outcomes:

On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Level
CO1	Identify the parts of a communication system and explain how noise affects signal transmission in industries	K2
CO2	Apply modulation techniques (AM, FM, and PM) to design the communication systems for industrial applications, such as remote control and monitoring	K3
CO3	Apply digital modulation and error correction techniques to transmit digital signals reliably.	K3
CO4	Use SNR, bandwidth, and error rate to assess the performance of communication systems	K3
CO5	Apply data encoding, multiplexing, and digital modulation techniques in industrial communication systems	K3

COs and POs Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	1	1			-	-	-		-	-	-
CO2	3	2	2	1		-	-	-		-	-	2
CO3	3	2	2	-	1	-	-	-		-	-	-
CO4	3	1	2	1	1	-	-	-		-	-	-
CO5	3	1	-	1	1	-	-	-		-	-	-

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,
Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
Total					100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern:

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	20	20	20
Understand	40	40	40
Apply	60	60	60
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

TEXT BOOKS

1. Simon Haykin, Communication Systems, 2019, 5th Edition, Wiley, India. .(Unit I - V)
2. George Kennedy, Bernard Davis, Electronic Communication Systems, 2017, 6th Edition, Mc Graw Hill Education, New Delhi, India.

REFERENCE BOOKS

1. P. Ramakrishna Rao, Analog Communication, 2017, Tata McGraw Hill Education Pvt Ltd., India.
2. Herbert Taub and Donald Schilling, Principles of Communication Systems, 2017, 4th Edition, Mc Graw Hill Education, India.

WEB LINKS AND VIDEO LECTURES (E-RESOURCES):

1. <https://nptel.ac.in/courses/117106086/>
2. <http://www.sp4comm.org/docs/chapter12.pdf>
3. <http://www.talkingelectronics.com/Download%20eBooks/Principles%20of%20electron>
4. <ics/CH-16.pdf>
5. <https://www.youtube.com/watch?v=QEubAxBfqKU>
6. <https://youtu.be/kVQ7mr2TU2U>
7. [An A-Weighted Analog Filter that Mimics the Response of the Human Ear](#)
8. <https://youtu.be/uf-X7zuFo5A>
9. http://www.csun.edu/~skatz/katzpage/sdr_project/sdr/FM_and_PM.pdf

Suggested Skill Activities:

1. Use MATLAB or Python to visualize digital modulation schemes.
2. Prepare a case study on wireless communication protocols used in industrial automation (e.g., LoRa, Zigbee, Wi-Fi).
3. In what ways does a "Digital Car Turning and Braking Indicator" enhance road safety and improve communication between drivers and pedestrians?
4. Build a simple radio receiver circuit (AM or FM) and detect real signals.
5. Develop a "Low-Cost LPG Leakage Detector" effectively enhance safety and prevent accidents in residential and industrial settings?
6. Analyze BER vs. SNR for different modulation schemes using simulation tools.
7. Group Project: Design and Implementation of a Low-Power FM Radio Transmission System for Campus Announcement.

Course Code:	24EC403	Course Title:	DIGITAL SIGNAL PROCESSING
Credits	4	L – T – P	3-0-2
Pre-requisite			Signal and systems, Complex Variables and Transforms

Course objectives:

1. To learn discrete fourier transform, properties of DFT and its application to linear filtering
2. To understand the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands
3. To understand the effects of finite precision representation on digital filters
4. To understand the fundamental concepts of multi rate signal processing and its applications
5. To introduce the concepts of adaptive filters and its application to communication engineering

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Blended Mode of Learning
3. Experiential Learning
4. NPTEL and Other Videos for theory topics
5. Flipped Class
6. Lab Experiment Videos

UNIT I - FREQUENCY DOMAIN ANALYSIS AND FAST FOURIER TRANSFORM (FFT)	[9 hours]
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Sampling Theorem, concept of frequency in discrete-time signals, summary of analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) - deriving DFT from DTFT, properties of DFT - periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT). Linear filtering using FFT

Practical Topics:

1. Frequency Analysis using DFT
2. Perform Decimation in Time FFT Algorithm.
3. Perform Decimation in Frequency FFT Algorithm.

UNIT II - INFINITE IMPULSE RESPONSE FILTERS	[9 hours]
Characteristics of practical frequency selective filters. characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRFF) – Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations	
Practical Topics: <ol style="list-style-type: none"> 1. Design of Butterworth IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations 2. Design of Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations 	
UNIT III - FINITE IMPULSE RESPONSE FILTERS	[9 hours]
Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form Realizations	
Practical Topics: <ol style="list-style-type: none"> 1. Design of FIR filters (LPF/HPF) and demonstrates the filtering operation 2. Design of FIR filters (BPF/BSF) and demonstrates the filtering operation 	
UNIT IV - FINITE WORD LENGTH EFFECTS	[9 hours]
Fixed point and floating-point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.	
Practical Topics: <ol style="list-style-type: none"> 1. Using the function Ones Complement, obtain one's-complement format representation of integers 2. Using the function Twos Complement, obtain the two's-complement format representation of integers 	

UNIT V- DSP APPLICATIONS	[9 hours]
Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization-DSP Architecture- Fixed- and Floating-point architecture principles	

Practical Topics:

1. Study of architecture of Digital Signal Processor
2. Perform MAC operation using various addressing modes
3. Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering
4. Implement an Up-sampling and Down-sampling operation in DSP Processor

Laboratory component:**30 Hours**

SI.No.	Name of the experiment
1	Frequency Analysis using DFT
2	Perform Decimation in Time FFT Algorithm.
3	Perform Decimation in Frequency FFT Algorithm
4	Design of Butterworth IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations
5	Design of Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations
6	Design of FIR filters (LPF/HPF) and demonstrates the filtering operation
7	Design of FIR filters (BPF/BSF) and demonstrates the filtering operation
8	Using the function Ones Complement, obtain one's-complement format representation of integers
9	Using the function Twos Complement, obtain the two's-complement format representation of integers
10	Study of architecture of Digital Signal Processor
11	Perform MAC operation using various addressing modes
12	Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering
13	Implement an Up-sampling and Down-sampling operation in DSP Processor

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Course outcomes:

On completion of the course, the student will have the ability to

CO No.	Course Outcomes	Cognitive Level
CO1	Explain the concepts of DFT for Digital signals	K2
CO2	Develop IIR Digital filters using Butterworth and Chebyshev filters.	K3
CO3	Realize FIR filters using windows and sampling techniques.	K3
CO4	Illustrate the effects of finite precision representation on digital filters	K2
CO5	Summarize the concepts of multirate filters, architecture of DSP processor and Adaptive filters.	K2

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	1	2	-	2	-	-	-	-	-	-	2
CO2	3	3	3	-	2	-	-	-	-	-	-	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2
CO4	2	1	-	2	2	-	-	-	-	-	-	2
CO5	2	-	-	-	-	-	-	-	-	-	-	2

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,
Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	40		
	Skill Assessment - I	40			
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern:

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	10	10	10
Understand	30	30	30
Apply	60	60	60
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. John G. Proakis and Dimitris G. Manolakis, Digital Signal Processing – Principles, Algorithms and Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007.
2. A. V. Oppenheim, R.W. Schaffer and J.R. Buck, —Discrete-Time Signal Processing”, 8th Indian Reprint, Pearson, 2004.

Reference Books:

1. Emmanuel C. Ifeakor & Barrie. W. Jervis, “Digital Signal Processing”, Second Edition, Pearson Education / Prentice Hall, 2002.
2. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata Mc Graw Hill, 2007.
3. Andreas Antoniou, “Digital Signal Processing”, Tata Mc Graw Hill, 2006.

Web links and Video Lectures (e-Resources):

1. Review of Signals and Systems-
https://www.youtube.com/watch?v=Eknlx7zHBVo&ab_channel=nptelhrd
2. Design of IIR filters from analog filters-
https://www.youtube.com/watch?v=3QWvi8EC_DI&ab_channel=nptelhrd
3. Design of FIR filters-
https://www.youtube.com/watch?v=nsK7mmRSTDY&ab_channel=nptelhrd
4. Fixed point and floating point number representation-
https://www.youtube.com/watch?v=0oygBSKlwT4&ab_channel=IITKharagpurJuly2018
5. DSP architecture- https://www.youtube.com/watch?v=04UvJkki0Ig&ab_channel=nptelhrd

Suggested Skill Activities:

1. Apply the Sampling Theorem to analyze discrete-time signals.
2. Record voice and display the waveform
3. Add noise to the signal and display the frequency spectrum
4. Analyze and compare characteristics of practical frequency selective analog filters (Butterworth, Chebyshev).
5. Design low-pass, high-pass, band-pass, and band-reject IIR filters using analog prototype transformations.
6. Design a digital filter to approximate the derivative of a signal and verify the response.
7. Compare FIR filter designs based on passband ripple, stopband attenuation, and transition width.
8. Design and simulate rational factor sampling rate converters combining interpolation and decimation.
9. Mini Project: Design and Implementation of a Real-Time Audio Noise Canceller Using Adaptive Filtering and Multirate Signal Processing



Course Code:	24CS401	Course Title:	Computer Networks
Credits:	3	L – T – P	2-0-2
Pre-requisite			Computer Architecture

Course objectives:

- To understand the Fundamentals of Data Communication Systems and explore Network Topologies and models.
- To identify Error Detection and Correction Techniques thereby describe about the Medium Access Control (MAC) and Channel Allocation.
- To learn about Routing Algorithms and Congestion Control Algorithms
- To understand & use the services of Internet transport layer protocols.
- To get knowledge about Application Layer Protocols and WWW.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. PowerPoint presentation
3. Interactive session
4. Lab experiment videos
5. Project based Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

UNIT I – FOUNDATIONS OF COMPUTER NETWORKS**[9 hours]**

Introduction to Computer Networks – Types, Topologies, Uses in use cases in homes, offices, data centers, Use in: IoT, cloud services, industrial automation OSI & TCP/IP Models – Layered Architecture, Transmission Media – Wired & Wireless, Switching Techniques, Core Network Protocols – IP, TCP, UDP, ICMP, P Addressing – IPv4, IPv6, Subnetting, DNS, DHCP, Network Communication Flow , Applications: Smart homes, industrial IoT (e.g., SCADA), DNS in browser communications, IP addressing in 5G & cloud, DHCP in enterprise Wi-Fi networks.

UNIT II – PHYSICAL LAYER AND DATA LINK LAYER	[9 hours]
Introduction to Data Transmission, Guided Media: Twisted Pair, Coaxial Cable, Fiber Optic, Unguided (RF, Microwave, Satellite), NRZ, RZ, Clock Synchronization, Encoding Techniques – Manchester, Framing & Error Detection, MAC Protocols & Ethernet Standards, Applications: Ethernet in LAN/WAN setups, encoding in RFID readers, Wi-Fi MAC in homes and airports, CRC in packet verification, fiber media in ISP backbones.	
UNIT III – THE NETWORK LAYER	[9 hours]
Functions of the Network Layer: Logical addressing, routing, and forwarding. IP addressing: IPv4 and IPv6. Routing algorithms: Distance vector, link state, and path vector. Routers and their role in packet forwarding and routing., Applications: BGP in global internet routing, OSPF in ISPs, IPv6 in IoT, routers in enterprise edge networks, dynamic routing in disaster response networks.	
UNIT IV – THE TRANSPORT LAYER	[9 hours]
Overview of Transport Layer Protocols – TCP, UDP Comparison, Flow Control and Congestion Control Mechanisms, Constraints – Delay, Jitter, Packet Loss, RTP, RTCP, SCTP – Protocols for Real-Time Data, VoIP Architecture and Protocol Stack (SIP, RTP), Application View: VoIP and video conferencing (e.g., Zoom, WebRTC), multiplayer gaming,	
UNIT V – THE APPLICATION LAYER & NETWORK SECURITY	[9 hours]
Application layer protocols: HTTP, FTP, SMTP, DNS . Overview of client-server communication and peer-to-peer models .DNS operation and the role of web servers. Security concerns at the network layer: Attacks (DoS, DDoS, MITM).Introduction to Firewalls: Types (packet filtering, stateful inspection, proxy firewalls).VPNs and network security protocols (IPSec, SSL/TLS)., Applications: E-commerce (SSL/TLS), VPNs for remote work, DNS in URL resolution, firewalls in banks and enterprises, cybersecurity practices in web apps.	

Laboratory Component:**[30 hours]**

S.No	Name of the Experiment
1	To explore network diagnostic tools and understand host-to-host communication
2	To calculate and assign IP addresses for a given network topology
3	To create and test Ethernet cables using straight and crossover connections
4	To configure LAN topology with switches and PCs
5	To implement basic client-server message communication using TCP sockets
6	To implement real-time communication using UDP
7	To simulate automatic IP allocation and domain resolution in a network
8	To simulate and analyze routing algorithms in multi-router networks
9	To capture and analyze real-time packets for protocols like ARP, ICMP, TCP, HTTP.
10	To simulate and test file transfer and web communication between nodes

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Understand different types of computer networks and topologies used in real-time communication systems	K2
CO2	Illustrate the layered architecture of OSI and TCP/IP models and map protocols to their layers.	K2
CO3	Apply suitable transmission media (guided and unguided) to design connectivity solutions for real-world applications like IoT devices and cloud infrastructure	K3
CO4	Apply switching techniques such as circuit, packet, and message switching to real-time networking scenarios, and select the appropriate method based on application requirements	K3
CO5	Apply IP addressing, subnetting, and understand DHCP/DNS operations in dynamic networks.	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	1	1	-	-	-	-	-	-	-	-	1
CO2	2	1	1	-	-	-	-	-	-	-	-	1
CO3	3	2	1	1	1	-	-	-	-	-	-	1
CO4	3	2	1	-	1	-	-	-	-	-	-	1
CO5	3	2	1	1	1	-	-	-	-	-	-	1

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,

Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Text Books:

1. Computer Networks-A Systems Approach, Larry L. Peterson, Bruce S.Davie, 6th Edition.
2. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education.
3. W. Stallings, "Data and Computer Communication", 8th Edition, Pearson Education, 2007

Reference Books:

1. An Engineering Approach to Computer Networks-S. Keshav, 3rd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Fifth Edition TMH.
3. Kurose, Ross (2010), Computer Networking: A top down approach, Pearson Education, India.

Web Links and Video Lectures (E-Resources):

1. The Bits and Bytes of Computer Networking: <https://www.coursera.org/learn/computer-networking>
2. Computer Network course: <https://nptel.ac.in/courses/106105081>
3. JAVA Programming: <https://www.tutorialspoint.com/java/index.htm>
4. JAVA Tutorial: <https://www.geeksforgeeks.org/java/?ref=outind>
5. Computer Networks: https://onlinecourses.swayam2.ac.in/ntr25_ed44/preview
6. Java: <https://www.tpointtech.com/java-tutorial>

Activity-Based Learning /Practical-Based Learning:

1. <http://nptel.ac.in>
2. <https://swayam.gov.in>

Suggested skill activities:

1. Develop a text-based chat app that uses TCP (for reliability) or UDP (for speed) between client-server
2. Build a mini Wireshark-like tool that captures and analyzes packet headers and content
3. Simulate a smart home network (lights, sensors, thermostat) and show communication using MQTT/TCP/IP
4. Design a LAN with automated IP assignment and domain name resolution using simulated DNS/DHCP servers
5. Set up a simulated network with IP phones and VoIP protocol support (SIP, RTP)
6. Simulate multiple web servers behind a load balancer and monitor traffic distribution
7. Group project to design an industrial network for a specific application (e.g., factory automation, smart grid, healthcare).

Course Code:	24CS402	Course Title:	DATA STRUCTURES USING C++
Credits	3	L – T – P	2-0-2
Pre-requisite			NIL

Course objectives:

To impart knowledge on the

1. To understand the basic concepts of C++.
2. To learn and apply linear data structures – lists, stacks, and queues for problem solving.
3. To make use of non-linear data structure – trees for practical applications.
4. To understand & use non-linear data structure – Graphs for real life problems.
5. To identify the sorting, searching and hashing algorithms for solving problems.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Hands-on Coding Labs
3. Simulation & Visualization
4. Case Studies & Application Demos
5. Mini Projects

UNIT I – FUNDAMENTALS OF C++**[6 hours]**

An Overview of C++ - Object Oriented Programming Paradigm – Tokens, Expressions and Control Structures – Arrays – Pointers - Functions – Call by Reference – Return by Reference. Relevance to firmware design and system modeling

UNIT II – LIST, STACK AND QUEUE**[6 hours]**

Data Structures - Abstract Data Types (ADT) - List ADT and Array Implementation - Linked List - Doubly Linked List - Circular Linked List - Array and Linked List implementation of Stack - Application: Infix to Postfix Conversion - Postfix Expression Evaluation – Array and Linked List implementation of Queues –Applications in signal processing pipelines, interrupt handling, UART buffer design.

UNIT III – TREES	[6 hours]
Trees - Tree Terminology – Binary Trees –Binary Tree Traversals – Expression Tree - Binary Search Trees – Priority Queues (Binary Heap). Use cases in biomedical imaging, power grid modeling, circuit routing	

UNIT IV – GRAPHS	[6 hours]
Graphs – Definitions – Traversals – BFS, DFS – Shortest-Path Algorithms – Dijkstra’s Algorithm – Minimum Spanning Tree: Prim’s Algorithm- Kruskal’s Algorithm – Applications: Biconnectivity.	

UNIT V – SEARCHING, SORTING AND HASHING	[6 hours]
Searching – Linear Search – Binary Search. Sorting – Selection sort – Insertion sort – Quick sort – Merge Sort – Hashing – Hash Functions – Separate Chaining – Open Addressing. Case Study: Pacemaker data buffering, Data structures in firmware for wearable health devices, DSP filter coefficient handling using arrays and lists	

Laboratory component:**30 Hours**

Any 12 experiments have to be completed from the following list of experiments

Sl.No.	Name of the experiment
1	Write a C++ class to model an electronic component (e.g., resistor, capacitor).
2	Use constructor, destructor, and member functions to display component properties.
3	Design a queue system for real-time biomedical data processing
4	Simulate sampled signals and perform basic signal processing.
5	Implement a dynamic circular buffer for real-time signal storage
6	Use a circular queue to simulate data buffering in an oscilloscope or ECG machine.
7	Linked List for ADC Data Logging.
8	Stack for Expression Evaluation in Digital Systems
9	Build a binary expression tree for arithmetic or Boolean expressions.
10	Model a simple sensor network using an adjacency list.
11	Use a circular queue to simulate data buffering in an oscilloscope or ECG machine.

12	Implementation of Prim's Algorithm.
13	Use binary search to find a threshold-crossing event in a sorted signal array.
14	Use merge sort and quick sort to sort detected peak amplitudes from ECG data.
15	Create a hash table to store and retrieve device IDs and types in an embedded system.
16	Write a program to log sensor readings to a CSV file using file handling in C++.

Course outcomes:

On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Level
CO1	Apply C++ programming concepts to model basic embedded system components and control flows.	K3
CO2	Implement linear data structures using C++ to manage signal buffers and device data in embedded systems.	K3
CO3	Use tree structures to represent and process hierarchical data in circuit design and biomedical signal analysis.	K3
CO4	Apply graph algorithms to simulate communication networks and model system connectivity.	K3
CO5	Use searching, sorting, and hashing techniques to organize and access sensor and signal data efficiently.	K3

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	1	2	2	-	-	-	1	-	-	1
CO2	3	2	1	2	2	-	-	-	2	-	-	1
CO3	3	2	1	1	2	-	-	-	2	-	-	1
CO4	3	2	1	2	2	-	-	-	2	-	-	1
CO5	3	2	1	2	2	-	-	-	2	-	-	1

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,

Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	10	10	10
Understand	30	30	30
Apply	60	60	60
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Balagurusamy, E, "Object Oriented Programming with C++", 8th Edition, Tata McGraw-Hill, New Delhi, 2021.
2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
3. Langsam Y.M., Augenstein J. and Tenenbaum A. M., "Data Structures using C and C++", 2nd Edition, Pearson Education, 2015.

Reference Books:

1. Herbert Schildt, "C++: The Complete Reference", 5th Edition, McGraw Hill Education, 2012.
2. Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson.
3. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and Mount, Wiley student edition, John Wiley and Sons.

Web Links and Video Lectures (E-Resources):

1. Data structures and algorithms: <https://www.coursera.org/specializations/data-structures-algorithms>
2. C++ data structures: https://www.tutorialspoint.com/cplusplus/cpp_data_structures.htm
3. Data structures Tutorial: <https://www.geeksforgeeks.org/data-structures/>
4. Data structures: https://onlinecourses.swayam2.ac.in/cec19_cs04/preview
5. C++ DSA: <https://www.javatpoint.com/cpp-dsa>

Activity-Based Learning /Practical-Based Learning:

1. <http://nptel.ac.in>
2. <https://swayam.gov.in>

Suggested Skill Activities:

1. Create a program using a linked list to continuously store incoming signal samples (e.g., from a temperature or ECG sensor).
2. Use a circular queue to simulate the rolling buffer in an oscilloscope.
3. Use classes to define components like resistors, capacitors, transistors, and simulate simple circuit behavior (e.g., voltage divider).
4. Write a C++ program using a stack to evaluate postfix Boolean expressions used in digital circuits.
5. Build a graph to represent a sensor or communication network, and perform BFS/DFS to simulate routing.
6. Collect synthetic signal peaks and sort them using insertion, merge, and quick sort. Measure time for comparison.
7. Implement a hash map to store configuration settings (baud rate, mode, address) for different hardware devices.
8. Write a program to collect dummy sensor data and save it as a .csv file.

Course Code:	24EC451	Course Title:	MINI PROJECT II - COMMUNITY SERVICE PROJECT
Credits	1	L – T – P	0-0-2
Pre-requisite			NIL

Course objectives:

To impart knowledge on the

- To instill social responsibility and community engagement among engineering students.
- To enable students to understand societal issues and apply ECE knowledge where possible.
- To enhance problem-solving, communication, and team-building skills

MODULE I – ORIENTATION & SENSITIZATION	3 [hours]
Introduction to community service and its importance- Understanding rural/urban societal structures and issues-Role of engineers in social development-Ethics and responsibilities in service learning	
MODULE II – NEED IDENTIFICATION & PLANNING	[10 hours]
Field visit/virtual community interaction - Interaction with local NGOs, schools, health centers, or government bodies- Problem identification (sanitation, water, digital illiteracy, health awareness, etc.)- Team formation and project proposal preparation	
MODULE III – IMPLEMENTATION	[15 hours]
Students work in teams on selected community problems	
MODULE IV – EVALUATION & REFLECTION	[2 hours]
Preparation of final report and multimedia documentation (photos, videos) - Presentation of project outcomes	
MOULE V – COMMUNITY PARTNER	[2 hours]
NGO/Local Body/School/Health Center	

SAMPLE PROJECT TITLES

- Water Level Indicator for Rural Tanks
- Automated Bell System for Schools
- Solar-Powered Mobile Charging Station in Public Areas
- Voice Alert System for Blind Navigation (basic version)
- Design and Installation of Solar-Powered LED Street Lights in Villages
- Development of a Low-Cost Water Level Alarm for Rural Households
- Design of a Smart Dustbin with Overflow Alert System
- Assembling and Donating Rechargeable Emergency Lights to Low-Income Families
- Creating a Battery Recycling Awareness Model and Collection System
- Design of a Basic ECG Monitor for Rural Health Camps
- Donation and Demonstration of Fire Alarm Systems in Orphanages/Old Age Homes
- Design of a Hand-Cranked Mobile Charger for Rural Use
- Creating Awareness About Safe Handling of Electrical Appliances in Government Schools
- IoT-Based Air Pollution Monitoring and Display System in Urban Slums
- Real-Time Weather Station Setup in Village Schools Using Sensors
- Developing a Low-Cost RFID Attendance System for Rural Schools

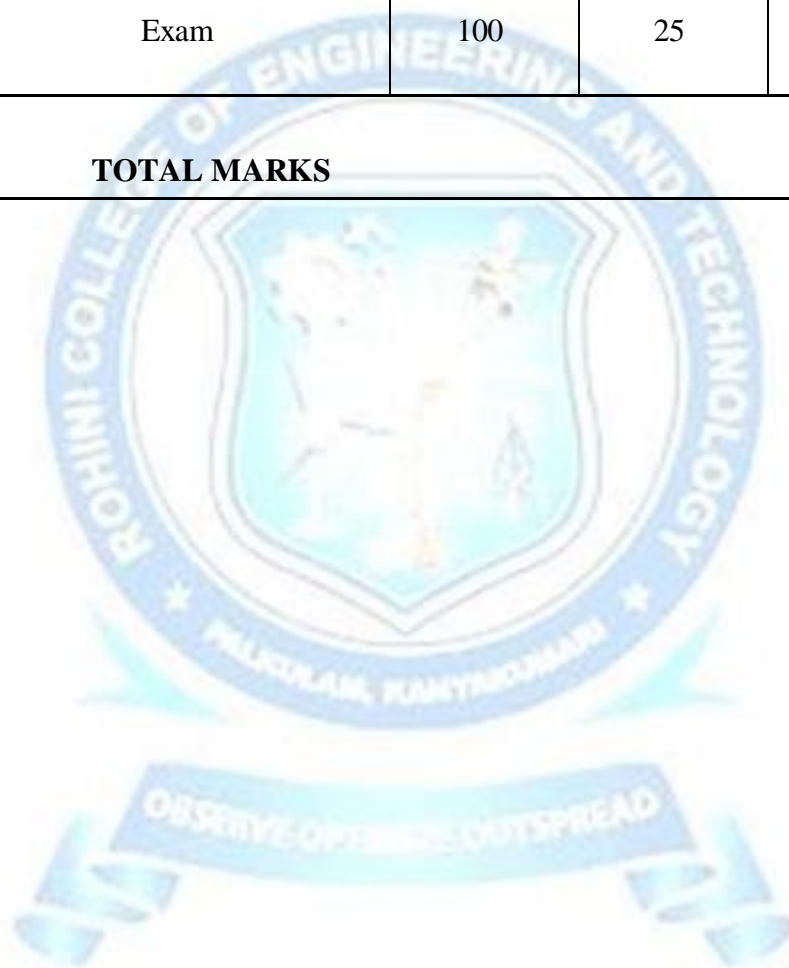
Course outcomes:

On completion of the course, the student will have the ability to:

CO No.	Course Outcomes	Cognitive Level
CO1	Identify key issues in rural/urban communities and suggest relevant solutions.	K2
CO2	Participate actively in community- based problem-solving	K3
CO3	Apply basic electronics and communication concepts to real-life issues	K3
CO4	Document and present findings in a structured report	K2

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Assessment	Evaluation of Different modules of work and Mini project Report	100	75	100	100
End Semester Examination (ESE)	Exam	100	25		
TOTAL MARKS					100



Course Code:	24EN451	Course Title:	SOFT SKILLS DEVELOPMENT
Credits	1	L – T – P	0-0-2
Pre-requisite		NIL	

Course Objectives:

By the end of this course, students will be able to:

- Understand and apply ethical values and personal behavior frameworks to make principled decisions in real-life situations.
- Develop self-awareness and emotional intelligence to recognize, express, and manage emotions effectively while building empathy toward others.
- Work effectively in teams by building communication, leadership, trust, and cooperation through role-based and interactive activities.
- Set meaningful personal and academic goals using structured methods like SMART planning and implement action plans to overcome challenges.
- Enhance business and interpersonal communication skills through creative expression, structured writing, motivation techniques, and proposal development.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Interactive Lectures
2. Collaborative Learning
3. Lab-Based Experiential Activities
4. Tech-Aided Learning
5. Mini-Project

UNIT I – LESSONS ON EXCELLENCE	[9 hours]
<ol style="list-style-type: none"> 1. Role-play ethical dilemmas using virtue ethics vs situation ethics frameworks. 2. Reflective writing on personal moral decisions and ethical frameworks used. 3. Analyze personal habits using the Cue–Routine–Reward model. 	

4. Maintain a 7-day habit tracker to replace a bad habit with a good one via habit-stacking or substitution.
5. Listen to short talks and answer comprehension and inference questions.
6. Create and recall a memorable story linking 10–15 unrelated words.
7. Identify a delayed task, analyze triggers, and write a plan to overcome procrastination.

UNIT II - EMOTIONAL INTELLIGENCE	[8 hours]
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. LAB ACTIVITY	
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1. Role-play affective vs cognitive empathy through emotional scenarios.
2. Use empathy maps to chart feelings, thoughts, and responses.
3. Solve real-life problems involving percentages and proportions.
4. Justify multiple-choice answers logically and explain reasoning.

UNIT III -TEAM SKILLS	[8 hours]
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LAB ACTIVITY	
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1. Conduct activities to improve team communication, planning, and creativity.
2. Practice delegation, coordination, and cooperation within teams.
3. Engage in group problem-solving and decision-making tasks.
4. Take on and rotate different team roles (leader, recorder, presenter, etc.).
5. Participate in trust-building and non-verbal communication exercises.

UNIT IV – GOAL SETTING	[8 hours]
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LAB ACTIVITY	
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1. Set SMART goals and identify steps and obstacles for achievement.
2. Develop detailed step-by-step action plans for goals.
3. Identify potential challenges and strategies to overcome them.
4. Create vision boards or other visual motivational tools for goal reinforcement.
5. Participate in trust-building and non-verbal communication exercises.

UNIT V – BUSINESS SKILLS	[8 hours]
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LAB ACTIVITY	
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1. Conduct structured brainstorming sessions to enhance divergent thinking.
2. Identify motivators and develop personalized motivation techniques.
3. Improve reading comprehension and writing skills through analysis and creative exercises.

4. Assess personal traits, soft skills, and express ideas via text and visuals.
5. Learn and practice professional communication skills including business proposal writing.

Course Outcomes:

On completion of the course, the student will be able to

CO1	Apply ethical decision-making and habit formation for personal excellence.	K3
CO2	Demonstrate the ability to recognize and respond to emotional cues effectively using empathy, and apply logical problem-solving in real-life scenarios.	K3
CO3	Exhibit teamwork skills including communication, role clarity, and trust-building.	K3
CO4	Set SMART goals, develop action plans, and overcome obstacles effectively.	K3
CO5	Apply creative thinking, motivation, and professional communication in business contexts.	K3

Reference Books:

1. Melvin, Jacqueline. English Grammar Reference Book. W. W. Norton & Company. 2020.
2. Swan, Michael. Practical English Usage. Oxford University Press, 2016.
3. Krogerus, Mikael and Roman Tschappeler. The Communication Book. W. W. Norton & Company, 2020.
4. Chaturvedi, P D. T
5. The Art and Science of Business Communication, Skills, Concepts, Cases and Applications. Pearson, 2017.

COs and POs Mapping:

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1						-	-	-		3	-	3
CO2				-		-	-	-		3	-	3
CO3				-		-	-	-	3	3	-	3
CO4						-	-	-		3	-	3
CO5						-	-	-		3	-	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped,
Level 0- Not Mapped

Assessment Pattern:

Name of the Test	Marks	Total	Final Marks
Continuous Assessment (Experiments 1-10)	50	100	50
Model Examination	50		
End Semester Lab Exam	100	100	50
TOTAL MARKS			100
