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. Electrical and Electronics Engineering

(B.E. EEE)

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 create technically competent technocrats to meet the demand of Electrical and Electronics industry and societal need for the wellbeing of human kinds.

Mission of the Department

- To provide knowledge and skills necessary for professional development in Electrical and Electronics Engineering.
- To promote research and creativity in the area of Electrical and Electronics Engineering.
- To promote team work and professional conduct in societal activities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1 Graduates of the programme will possess career in electrical and allied fields

PEO2 Graduates will have the ability to adapt to the growing technological requirement of the society through lifelong learning and team work

PEO3 Graduates of the programme will possess knowledge to pursue higher studies

PROGRAM 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 analyse 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 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.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO1 Ability to design and analyze various issues in power system, control and Instrumentation systems and power electronic and drive system.

PSO2 Ability to design and simulate real time problems in electrical system using modern software tools.

PSO3 Ability to apply the knowledge for the development of renewable energy to meet the demand of society.

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)							
Sl.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	2	0	1	2.5
3	24GE201	Tamil and Technology	HSS	1	0	0	1
4	24EN231	Presentation and Language Skills Laboratory	HSS	0	0	3	1.5
5	24MG701	Economics for Engineers	HSS	3	0	0	3
6	24MG601	Product Innovation & Entrepreneurship	HSS	2	0	0	2
7	24GE701	Professional Ethics and Human Values	HSS	2	0	0	2
Basic Science Courses (BSC)							
Sl.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24MA101	Matrix 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	4	0	0	4
5	24PH201	Physics for Electronics Engineering	BSC	3	0	0	3
6	24CY201	Environmental Science and Engineering	BSC	2	0	0	2
7	24MA302	Probability, Statistics and Numerical Methods	BSC	3	1	0	4

Engineering Science Courses (ESC)							
Sl.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24ME201	Engineering Graphics	ESC	1	0	4	3
2	24CS201	Programming for Problem Solving in C	ESC	2	0	4	4
3	24GE202	Basics of Civil and Mechanical Engineering	ESC	4	0	0	4
4	24EE201	Electric Circuits	ESC	3	0	0	3
5	24EE231	Electric Circuits Laboratory	ESC	0	0	2	1
6	24GE231	Workshop Practices	ESC	0	0	3	1.5
7	24EE301	Electromagnetic Theory	ESC	3	0	0	3
8	24EE404	IoT-Sensors and Devices	ESC	3	0	2	4
9	24CS331	Programming for Problem Solving in Python	ESC	0	0	3	1.5
Professional Core Courses (PCC)							
Sl.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24EC301	Electron Devices and Circuits	PCC	3	0	2	4
2	24EE302	Power System Generation, Transmission and Distribution	PCC	3	0	0	3
3	24EC302	Digital Logic Circuits and Design	PCC	3	0	2	4
4	24EE303	Electrical Machines - I	PCC	3	0	2	4
5	24EE401	Electrical Machines II	PCC	3	0	0	3
6	24EE402	Control Systems	PCC	3	0	0	3
7	24CS402	Data Structures using C++	PCC	2	0	2	3
8	24EC403	Digital Signal Processing	PCC	3	0	2	4
9	24EC503	Linear Integrated Circuits	PCC	3	0	2	4
10	24EE431	Electrical Machines II	PCC	0	0	3	1.5
11	24EE432	Control System Lab	PCC	0	0	3	1.5
12	24EE501	Power System Protection and Switchgear	PCC	3	0	0	3
13	24EC501	Microprocessors, Microcontrollers and Interfacing Techniques	PCC	3	0	2	4
14	24EE502	Power Electronics and Applications	PCC	3	0	2	4
15	24EE503	Measurements and Instrumentation	PCC	2	0	2	3
16	24EE601	High Voltage Engineering	PCC	3	0	0	3
17	24EC603	Embedded Systems	PCC	3	0	0	3
18	24EE701	Power System Analysis	PCC	3	0	2	4

Professional Electives Courses I (PEC)							
POWER SYSTEM STREAM							
Sl.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24EE571	Power Quality	PEC	3	0	0	3
2	24EE572	Power System Operation and Control	PEC	3	0	0	3
3	24EE573	High Voltage DC Transmission	PEC	3	0	0	3
4	24EE574	Smart Grid Technologies	PEC	3	0	0	3
5	24EE575	Utilization and Conservation of Electrical Energy	PEC	3	0	0	3
6	24EE576	Demand Side Management	PEC	3	0	0	3
Professional Electives Courses II (PEC)							
ELECTRIC VEHICLE TECHNOLOGY STREAM							
1	24EE581	Electric Vehicle Architecture	PEC	3	0	0	3
2	24EE582	Design of Motor and Power Converters for Electric Vehicles	PEC	3	0	0	3
3	24EE583	Electric Vehicle Design, Mechanics and Control	PEC	3	0	0	3
4	24EE584	Design of Electric Vehicle charging system	PEC	3	0	0	3
5	24EE585	Grid Integration of Electric Vehicles	PEC	3	0	0	3
6	24EE586	Intelligent Control of Electric Vehicles	PEC	3	0	0	3
Professional Electives Courses III (PEC)							
GREEN ENERGY TECHNOLOGY STREAM							
1	24EE671	Solar Energy Conversion Systems	PEC	2	0	2	3
2	24EE672	Wind Power Technology	PEC	2	0	2	3
3	24EE673	Fuel Cell Systems	PEC	2	0	2	3
4	24EE674	Renewable Energy Systems	PEC	2	0	2	3
5	24EE675	Energy Storage Systems	PEC	2	0	2	3
6	24EE676	Grid Integration of Renewable Energy Sources	PEC	2	0	2	3
Professional Electives Courses IV (PEC)							
ELECTRICAL TECHNOLOGY STREAM							
1	24EE681	Electric Drives and Control	PEC	2	0	2	3
2	24EE682	Special Machines and Controllers	PEC	2	0	2	3
3	24EE683	Electrical Machine Design	PEC	2	0	2	3
4	24EE684	Industrial Automation	PEC	2	0	2	3
5	24EE685	Energy Auditing	PEC	2	0	2	3
6	24EE686	Big Data Analytics for Smart Grid	PEC	2	0	2	3

Professional Electives Courses V (PEC)							
ELECTRONICS STREAM							
1	24EC771	Analog VLSI Circuits	PEC	3	0	0	3
2	24EE772	Communication Systems	PEC	3	0	0	3
3	24EC773	Nano Electronics	PEC	3	0	0	3
4	24EE774	Virtual Instrumentation	PEC	3	0	0	3
5	24EE775	Automotive Electrical and Electronics Systems	PEC	3	0	0	3
6	24EE776	Power Electronic Interfaces for Renewable Energy Sources	PEC	3	0	0	3
Professional Electives Courses VI (PEC)							
COMPUTER STREAM							
1	24CS781	Computer Networks	PEC	3	0	0	3
2	24CS782	Software Project Management and Quality Assurance	PEC	3	0	0	3
3	24CS783	Internetworking and Applications	PEC	3	0	0	3
4	24CS784	Database Management Systems	PEC	3	0	0	3
5	24CS785	Object Oriented Analysis and Design	PEC	3	0	0	3
6	24CS786	Cyber Security	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 Electronics and Communication 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	24EC504	Fuzzy Logic Systems and ANN	OEC	3	0	0	3
6	24EC505	Consumer Electronics	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	24EE351	Mini Project – I (Introduction to Innovative Projects)	EEC	0	0	2	1
2	24EE451	Mini Project – II (Design and development of the product)	EEC	0	0	2	1
3	24EN451	Soft Skills Development	EEC	0	0	2	1
4	24EE551	Mini Project – III (Community based Project)	EEC	0	0	2	1
5	24GE551	Quantitative and Reasoning Skills - I	EEC	0	0	2	1
6	24EE651	Mini Project-IV (Micro Project)	EEC	0	0	2	1
7	24GE651	Quantitative and Reasoning Skills – II	EEC	0	0	2	1
8	24EN651	Business and Managerial Communication	EEC	0	0	2	1
9	24EE751	Project Work Phase I (Design and Analysis)	EEC	0	0	4	2
10	24EE752	Industrial Training/Internship	EEC	0	0	0	2
11	24EE851	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	2	1#
6	24MC601	Disaster Management	MNC	1	0	0	1#
7	24MC701	Constitutions 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	2	0	1	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				15	1	13	22.5

Recommended Courses for SEMESTER-II

S.No	Course Code	Course Title	Category	L	T	P	C
THEORY COURSES							
1	24GE201	Tamil 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	24CY201	Environmental Science and Engineering	BSC	2	0	0	2
5	24GE202	Basics of Civil and Mechanical Engineering	ESC	4	0	0	4
6	24EE201	Electric Circuits	ESC	3	0	0	3
THEORY COURSE WITH LABORATORY COMPONENT							
7	24EC301	Electron Devices and Circuits	PCC	3	0	2	4
LABORATORY COURSES							
8	24EE231	Electric Circuits Laboratory	ESC	0	0	2	1
9	24GE231	Workshop Practices	ESC	0	0	3	1.5
10	24EN231	Presentation and Language Skills Laboratory	HSS	0	0	3	1.5
MANDATORY COURSES							
11	24MC201	Sports and Yoga for Youth Empowerment - I	MNC	0	0	2	0
12	24MC202	NCC Credit Course Level- I	MNC	1	0	2	1#
TOTAL				20	0	10	25

பாடநெறி குறியீடு:	**24GE101**	***பாடத்தின் தலைப்பு:***	***தமிழர்மரபு*** (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, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகளை மனதில் பதிய வைத்தல்.

தமிழ்நாட்டின் தாவரங்கள் மற்றும் விலங்கினங்கள், சங்க நகரங்கள் மற்றும் துறைமுகங்கள், சங்க காலத்தின் ஏற்றுமதி மற்றும் இறக்குமதிகளை நினைவுபடுத்துதல், வெளிநாடுகளில் சோழர் படையெடுப்பைக் கண்டறிதல்.

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கைக் கண்டறிதல், இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்குக்கு இணையாக இந்தியாவின் பிற பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கத்தை அடையாளம் காணுதல்.

அலகு I மொழி மற்றும் இலக்கியம்:	**[3hours]**

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த 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:	**[3hours]**
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.	

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:	**[3hours]**
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:	**[3hours]**
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் 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:	**[3hours]**
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தங்கங்களின் அச்சு வரலாறு.	

பாடநெறி முடிவுகள் (பாமு):

பாடநெறியின் முடிவில், மாணவர் பின்வரும் திறன்களைப் பெறுவர்:

பாமு	**பாடநெறி முடிவுகள்**	**மிக உயர்ந்த அறிவாற்றல் நிலை**
அலகு I பாமு:	தமிழின் மதச்சார்பற்ற தன்மை, திராவிட மொழியின் பங்கு, திருக்குறளின் கருத்துக்கள், சமயங்களின் தாக்கம், நவீன இலக்கிய வளர்ச்சி ஆகியவற்றையும் தெரிந்துகொள்கிறார்கள்.	கே 1
அலகு II பாமு:	தமிழர்களின் சமூக மற்றும் பொருளாதார வாழ்வில் நடுகல், சிற்பங்கள், சிலைகள் மற்றும் அழகிய கைவினைப் பொருட்கள், இசைக்கருவிகள் ஆகியவற்றை விவரிக்கும் ஆற்றலை பெறுகிறார்கள்.	கே 2
அலகு III பாமு:	தமிழர்களின் பாரம்பரிய விளையாட்டுகளை தெரிந்து கொள்ளுவதால் விளையாட வேண்டும் ஏன்ற ஆர்வத்தை பெறுகிறார்கள்.	கே 1
அலகு IV பாமு:	தமிழ்நாட்டின் தாவரங்கள் மற்றும் விலங்கினங்கள் பற்றிய அறிவையும், சங்க கால கட்டிடக்கலை, ஏற்றுமதி மற்றும் இறக்குமதி தொழில் நுட்ப அறிவை பெறுகிறார்கள்..	கே 1
அலகு V பாமு:	இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கையும், இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு இணையாக இருப்பதையும், தெரிந்து கொள்கிறார்கள்.	கே 1

பாடநெறி முடிவுகள் ***மற்றும் நிரல் முடிவுகள் ஒப்பிடுதல்***

பாமுகள்	மிக உயர்ந்த அறிவாற்றல் நிலை	பாடநெறி முடிவுகள்											
		1	2	3	4	5	6	7	8	9	10	11	12
பாமு1	கே 1	2	-	-	-	-	-	-	-	-	-	-	-
பாமு2	கே 2	1	-	-	-	-	-	-	-	-	-	-	-
பாமு3	கே 1	1	-	-	-	-	-	-	-	-	-	-	-
பாமு4	கே 1	1	-	-	-	-	-	-	-	-	-	-	-
பாமு5	கே 1	1	-	-	-	-	-	-	-	-	-	-	-

நிலை 3- அதிக ஒத்துப்போதல், நிலை 2- மிதமாக ஒத்துப்போதல், நிலை 1- குறைவாக ஒத்துப்போதல், நிலை 0- ஒத்துப்போகவில்லை

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	
இறுதி பருவ தேர்வு	எழுத்து தேர்வு	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

ப்ளூமின் வகை	***தொடர்ச்சியான மதிப்பீட்டு சோதனைகள்***		***இறுதி தேர்வு***
	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. தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2. கணினித்தமிழ் - முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல்துறைவெளியீடு)
4. பொருநை - ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு)
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 ofArchaeology & 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:	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: Maximа 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	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 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

SI.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]**
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.	

UNIT II - ACTIVE LISTENING - RESPONDING		**[15 hours]**
LIST OF EXERCISES		
LAB ACTIVITIES		
SI. 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 / Animated stories / Anecdotes / Event narration	3
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		
SI. 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 Presentations)	2
8.	Presentation – II (Technical Presentations)	2

UNIT IV: READING BETWEEN LINES		[12 hours]
LIST OF EXERCISES		
LAB ACTIVITIES		
SI. 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		
SI. 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]

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.
Practical Topics: 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]**
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.	
Practical Topics: 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]**
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..	
Practical Topics: 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: 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 ofExperiments

S. 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

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	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,
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:

SI.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=88hhiQw_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=Y27pAqawlwKmthNO

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 treatmenttechniques and wastewater systems.
- To use the fundamental science and engineering principles relevant to materials that includescharacterization, properties and processing of engineering materials.
- To familiarize with the principles, working and applications of electrochemistry and storagedevices for safe, effective and efficient operations.
- To study, measure, monitor, control and prevent corrosion processes, economically andsafely.
- To classify different types of fuel and fuel analysis techniques that assists to choose mostconvenient 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]
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 andelectro dialysis- Municipal water treatment and waste water treatment process.	
Practical Topics: 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]
Adhesives: Introduction- requisites of a good adhesive-adhesive action-industrial applications of adhesives. Insulating Materials: Introduction- requirements- Glass and ceramics - preparation, properties andapplications - 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.	
Practical Topics: 1. Determination of viscosity of oils using Oswald viscometer. 2. Determination of cloud point and pour point of oils.	

UNIT III -ELECTROCHEMISTRY	[9 hours]

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.

Practical Topics:

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-lessPlating- 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 of 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:

CO No.	Course Outcomes	Cognitive Level
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, 20thEdition, 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 towardsInnovation, 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. SemiconductorDevices and circuits. - https://nptel.ac.in/courses/108108112
3. Corrosion ProtectionMethods - https://onlinecourses.nptel.ac.in/noc23_mm01/preview
4. Elementary Electrochemistry - https://onlinecourses.nptel.ac.in/noc23_cy19/preview
5. Fuel and combustionTechnology -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 and 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]**

Drawing BIS standards – Orthographic projections – First angle projection - Drawing instruments – Sheet layout – Conventions – Lines, Lettering, Numbering and Dimensioning Geometric construction – Construction of regular polygons – Conic sections – Ellipse, Parabola and Hyperbola by eccentricity method.Projection of points – Points situated in all four quadrants.

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.

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.Orthographic projection of simple engineering components.

UNIT II - PROJECTION OF SOLIDS	**[15 hours]**

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.

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.

UNIT III - DEVELOPMENT OF SURFACES AND PICTORIAL PROJECTION	**[15 hours]**

Development of lateral surfaces of truncated Prisms, Pyramids, Cylinders and Cones– Parallel line method and Radial line method. Pictorial Projection – Isometric projection – Introduction – Isometric scale – Isometric view of two right regular composite solids – Isometric projection of truncated frustum of solids – Box method. Problems on applications of Isometric projections of simple objects / engineering components.

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]**

Electric Wiring and lighting diagrams - Like, Automatic fire alarm, Call bell system, UPS system, Basic power distribution system using suitable software.

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,

Electronics Engineering Drawings - Like, Simple Electronics Circuit Drawings, practice on layers concept.

Graphs & Charts - Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software.

Course outcomes:

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

CO No.	Course Outcomes	Cognitive Level
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

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	-

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	25
	CIE – II	100			
	MCQ	20	10		

- Theory	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	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", Charotor 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]**

Problem Solving Techniques: Introduction to Algorithm, Pseudo code, Flow Chart, Structure of 'C' program. C Tokens: Keywords, Data Types, Constants, Variables - Declaration - Qualifiers – typedef

Practical Topics:

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:

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: 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: 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: 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:

CO No	Corse Outcomes	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:

1. சங்ககாலத்து நெசவுத்தொழிலை விவரிப்பதற்கும் மட்பாண்டத்தொழில் நுட்பத்தைக் கண்டறிவதற்கும்.
2. சங்ககால கட்டுமானம், மேடை அமைப்பு, சிற்பங்கள், கோவில்கள், அம்மன்கோவில், திருமலைநாயக்கர் மஹால், செட்டிநாட்டு வீடுகள், இந்தோ - சாரோசெனிக் கட்டிடக்கலை ஆகியவற்றைக் கண்டறிந்து மேற்கோள் காட்ட.
3. கப்பல் கட்டுதல் மற்றும் இரும்புத் தொழிலைக் கண்டறிதல், சிலப்பதிகாரத்தில் நாணயங்கள், மணி தயாரிக்கும் தொழிற்சாலைகள், மணிகளின் வகைகள் ஆகியவற்றைப் படிக்க.
4. நீர்நிலைகளின் முக்கியத்துவத்தைகாட்ட, கால்நடை வளர்ப்பு மற்றும் கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகளை கண்காணிக்க, விவசாயம், மீன்பிடி, முத்து மற்றும் முத்துகலாச்சாரம் மற்றும் கடல் பற்றிய பண்டைய அறிவை அங்கீகரிக்க.
5. 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 சிவப்பு பாண்டங்கள் - பண்டங்களில் கீறல் குறியீடுகள்.	

அலகு II வடிவமைப்பு மற்றும் கட்டிடத்தொழில்நுட்பம்:	**[3 hours]**
சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடைஅமைப்பு பற்றியவிவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர்காலத்துப் பெருங்கோவில்கள் மற்றும் வழிபாட்டுத்தலங்கள் - நாயக்கர்காலக்கோயில்கள் மாதிரி கட்டமைப்பு பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டி நாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை.	

அலகு III உற்பத்தித் தொழில்நுட்பம்	[3 hours]
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.	

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

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தத்தமிழ்:	[3 hours]
அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.	

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

மதிப்பீட்டு முறை

ப்ளூமின் வகை	தொடர்ச்சியான மதிப்பீட்டு சோதனைகள்		இறுதி தேர்வு
	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

பாடநெறி முடிவுகள் ***மற்றும் நிரல் முடிவுகள் ஒப்பிடுதல்***

பாமு**கள்**	மிக உயர்ந்த அறிவாற்றல் நிலை	**பாடநெறி முடிவுகள்**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
பாமு**1**	கே 1	**2**											
பாமு**2**	கே 2	**1**											
பாமு**3**	கே 1	**1**											
பாமு**4**	கே 1	**1**											
பாமு**5**	கே 1	**1**											

நிலை 3- அதிக ஒத்துப்போதல், நிலை 2- மிதமாக ஒத்துப்போதல், நிலை 1- குறைவாக ஒத்துப்போதல், நிலை 0- ஒத்துப்போகவில்லை

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	
இறுதி பருவ தேர்வு	எழுத்து தேர்வு	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.

TEXT BOOKS

1. *தமிழக வரலாறு – மக்களும் பண்பாடும் -* கே. கே. *பிள்ளை* (*வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்*).
2. *கணினித்தமிழ் – முனைவர் இல. சுந்தரம்.* (*விகடன் பிரசுரம்*).
3. *கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்* (*தொல்லியல்துறை வெளியீடு*)
4. *பொருநை – ஆற்றங்கரை நாகரிகம்.* (*தொல்லியல்துறை 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 C ivilization 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)
7. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Code:	24MA201	Course Title:	Complex Variables and Transforms (Common to ALL branches)
Credits:	4	L – T – P	3 – 1 – 0

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:

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	-	-	-	-	-	-	-	-	-
CO6	3	2	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)	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
Analyze	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.Reference Books:

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**

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 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]
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.	

UNIT V NANO MATERIALS	[9 hours]
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.	

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

CO No	Course Outcomes	Level
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	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)

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 alphanumerical 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

Course objectives:

To impart knowledge on the

- To gain in-depth knowledge on natural processes and resources that sustain life andgovern the economy.
- To know the importance of water resources which are important socially, economicallyviable and environmentally sustainable.
- To impart the Knowledge of pollution and its control methods.
- To mitigate the environmental and health risks associated with indiscriminate waste andfind 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 – conceptof 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 speciesof 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-Hydro phonics -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 air quality 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:

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- NotMapped

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, New Delhi, (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, New Delhi, (2007).
2. Erach Bharucha, “Textbook of Environmental Studies”, Universities Press Pvt, Ltd, Hydrabad, (2015).
3. G. Tyler Miller, Scott E.Spoolman,“Environmental Science”,Cengag 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. Environmentand 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:	24GE202	Course Title:	Basic Civil and Mechanical Engineering
Credits:	4	L – T – P	4-0-0

Course objectives:

To impart knowledge on the

- To help students acquire knowledge in the basics of surveying and the materials used for construction.
- To learn the concepts and laws of thermodynamics to predict the operation of thermodynamic cycles.
- To explain the component of power plant units and detailed explanation to IC engines their Working principles
- To explain the Refrigeration & Air-conditioning system.

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 - SURVEYING AND CIVIL ENGINEERING MATERIALS	[12 hours]

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples. Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel Sections-Thermal and acoustic insulating materials- Decorative panels- water proofing materials.

UNIT II - BUILDING COMPONENTS AND INFRASTRUCTURE	[12 hours]

Foundations: Types, Bearing capacity – Requirement of good foundations. Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering-– Introduction to Green Buildings.

UNIT III - LAW OF THERMODYNAMICS	[12 hours]

Basic Concepts: Thermodynamic systems, properties with measurements – Zeroth law of thermodynamics, states, and processes- definition and classification, Thermodynamic work and heat – Classification and sign convention. Point and path functions. Statement for control mass undergoing cycle, corollaries –. Internal energy and Enthalpy – specific heats, application of First law to standard reversible processes – Isochoric, Isobaric, Isothermal, reversible adiabatic and Polytropic, Second law of thermodynamics.

UNIT IV- POWER PLANTS AND INTERNAL COMBUSTION ENGINES	[12 hours]
Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydro -electric and Nuclear Power plants- Internal combustion engines as automobile power plant – Otto cycle, Diesel cycle -Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines.	

UNIT V- REFRIGERATION AND AIR CONDITIONING SYSTEM	[12 hours]
Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner. Properties of air - water mixture, concepts of psychometry and its process.	

Course Outcomes:

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

CO1	Describe the importance, objectives and principles of surveying and construction materials.	K1
CO2	Outline the building planning and components including Infrastructure.	K2
CO3	Illustrate the power production based on the fundamentals Laws of Thermal Engineering.	K2
CO4	Illustrate the working principle of IC Engines and Power Plants	K2
CO5	Explain the principles of Refrigeration and Air Conditioning	K2

COs and POs Mapping:

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
CO 1	2	1	1	-	-	-	-	-	-	-	-	1	1	-	2
CO 2	2	1	1	-	-	-	-	-	-	-	-	1	1	-	2
CO 3	2	1	1	-	-	-	-	-	-	-	-	1	1	-	2
CO 4	2	1	1	-	-	-	-	-	-	-	-	1	1	-	2
CO 5	2	1	1	-	-	-	-	-	-	-	-	1	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	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		Terminal Examination
	1	2	
Remember	20	20	20
Understand	80	80	80
Apply	0	0	0
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. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018.
2. Nag.P.K., "Engineering Thermodynamics", 6th Edition, Tata McGraw Hill (2017), New Delhi.
3. Natarajan, E., "Engineering Thermodynamics: Fundamentals and Applications", 2nd Edition (2014), Anuragam Publications, Chennai.
4. Ganesan.V, " Internal Combustion Engines" 4th Edition, Tata McGraw Hill, 2012.

Reference Books:

1. Ramamrutham S., ―Basic Civil Engineering‖, Dhanpat Rai Publishing Co.(P) Ltd, 2013.
2. Seetharaman S., ―Basic Civil Engineering‖, Anuradha Agencies, 2005.
3. Chattopadhyay, P, "Engineering Thermodynamics", 2nd Edition Oxford University Press, 2016.
4. Rathakrishnan, E., "Fundamentals of Engineering Thermodynamics", 2nd Edition, Prentice Hall of India Pvt. Ltd, 2006.

5. Claus Borgnakke and Richard E. Sonntag, "Fundamentals of Thermodynamics", 10th Edition, Wiley Eastern, 2019.
6. Venkatesh. A, "Basic Engineering Thermodynamics", Universities Press (India) Limited, 2007.
7. Gupta H.N, "Fundamentals of Internal Combustion Engines", 2nd Edition Prentice Hall of India, 2013.
8. Mathur M.L and Mehta F.S., "Thermal Science and Engineering", 3rd Edition, Jain Brothers Pvt. Ltd, 2017.
9. Soman. K, "Thermal Engineering", 2nd Edition, Prentice Hall of India, 2011.

Web Links and Video Lectures (E-Resources):

1. Building materials and components**:** https://onlinecourses.nptel.ac.in/noc24_ar21/preview
2. Advanced Thermodynamics and Combustion**:** https://onlinecourses.nptel.ac.in/noc24_me135/preview
3. Applied Thermodynamics for Engineers**:** https://onlinecourses.nptel.ac.in/noc24_me137/preview
4. Refrigeration and Air-conditioning: https://onlinecourses.nptel.ac.in/noc24_me90/preview

Suggested Skill Activities:

1. Explain the classification of surveying. (i) What are the differences between prismatic compass and surveyors' compass? (ii) What is the difference between plane surveying and geodetic surveying? 2. Explain the measurement of horizontal angles using theodolite.
3. Discuss the various physical and mechanical properties of building materials. 4. State and explain the various essential qualities of good bricks.
5. A rigid tank containing 0.4 m3 of air at 400 kPa and 30°C is connected by a valve to a piston cylinder device with zero clearance. The mass of the piston is such that a pressure of 200 kPa is required to raise the piston. The valve is opened slightly and air is allowed to flow into the cylinder until the pressure of the tank drops to 200 kPa. During this process, the heat is exchanged with the surrounding such that the entire air remains at 30°C at all times. Determine the heat transfer for this process. 6. A piston and cylinder machine contains a fluid system which passes through a complete cycle of four processes. During the cycle, the sum of all heat transfers is - 170 kJ. The system completes 100 cycles per minute. Complete the following table showing the method for each item and compute the net rate of work output in kW. 7. A piston cylinder assembly contains air (ideal gas with $\gamma = 1.4$) at 200 kPa and occupies a volume of 0.01 m3. The piston is attached to one end of a spring and the other end of the spring is fixed to a wall. The force exerted by a spring on the piston is proportional to the decrease in length of the spring from its natural length. The ambient atmospheric pressure is 100 kPa. Now, the air in the cylinder is heated till the volume is doubled and

at this instant, it is found that the pressure of the air in the cylinder is 500 kPa. Calculate the work done by the gas.
8. Stages of combustion process in SI Engine with P- θ diagram. 9. Working of thermal power plant. 10. Different types of combustion chambers in SI engine
11. Describe construction and working of window air conditioner. 12. Write note on 13. (a) packaged air conditioner (b) chilled water plant.

Course Code:	**24EE201**	**Course Title:**	**Electric Circuits**
Credits:	**3**	**L – T – P**	**3-0-0**

Course objectives:

To impart knowledge on the

- To apply the concepts to analyze and understand electrical circuits
- To identify the knowledge on solving circuit equations using network theorems
- To interpret the transient response of electric circuits.
- To identify the phenomenon of resonance in coupled circuits.
- To illustrate Phasor diagrams and analysis of single &three phase circuits

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.	

UNIT II – Network Reduction and Theorems for DC and AC Circuits	[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	

UNIT III – Transient Response Analysis	[9 hours]
Introduction - Laplace transforms and inverse Laplace transforms - standard test signals - Transient response of RL, RC and RLC circuits using Laplace transform for Source free, Step and Sinusoidal input.	

UNIT IV – Resonance and Coupled Circuits	[9 hours]
Series and parallel resonance - frequency response - Quality factor and Bandwidth - Self and mutual inductance - Coefficient of coupling - Dot rule- Single Tuned circuits.	

UNIT V – Three Phase Circuits	[9 hours]
Analysis of three phase 3wire and 4wire circuits with star and delta connected loads, balanced and unbalanced - phasor diagram of voltages and currents - power measurement in three phase circuits.	

Course outcomes:

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

CO No	Course Outcomes	Cognitive Level
CO1	Apply the circuit laws for measuring the electrical parameters in DC & AC circuits.	K3
CO2	Apply the network theorem for measuring the electrical parameters of Domestic & Industrial Appliances.	K3
CO3	Interpret the transient response of RLC circuit for standard test signals by using Laplace Transform.	K2
CO4	Infer the frequency response to find its domain specifications.	K2
CO5	Interpret the three phase system performance under balanced and unbalanced condition.	K2

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	-	-	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)	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	20	80	40
Apply	60	0	40
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, 9thedition, New Delhi, 2020.
2. Chakrabarti A, "Circuits Theory (Analysis and synthesis), DhanpatRai& 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", McGraHill, 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:	24EC301	Course Title:	Electron Devices and Circuits
Credits:	4	L – T – P	3-0-2
Pre-requisite			NIL

Course objectives:

To impart knowledge on the

- Characteristics of PN junction diode, rectifiers and special diodes
- Operation of transistors for obtaining the switching responses.
- Concept of amplifiers and oscillators to generate analog signals.
- Operation of wave shaping circuits and multivibrators.
- Working principles and application of the optoelectronic devices and sensors

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. Experiential Learning
5. NPTEL and Other Videos
6. Smart Class Room
7. Flipped Class

UNIT I – Semiconductor Diodes	[9 hours]

PN junction diode, forward and reverse bias characteristics, Rectifiers – Half Wave and Full Wave Rectifier, Zener and Avalanche breakdown, Zener diode, Varactor diode, Tunnel diode- Gallium Arsenide device.

Practical Topics:

1. Verify the characteristics of PN-diode working in forward and reverse bias condition
2. Verify the characteristics of Zener-diode working in forward and reverse bias condition
3. Implementation of Full Wave Rectifier with Filters.

UNIT II – Transistors	[9 hours]

Bipolar Junction Transistors: NPN –PNP, transistor, Principle of Operation: Common Emitter, Common Base and Common Collector Configurations. Field Effect Transistors: Junction field Effect Transistor (JFET) – Drain and Transfer characteristics, MOSFET-Characteristics, Comparison of MOSFET with JFET, Uni Junction Transistor (UJT), Silicon Controlled Rectifier (SCR), CMOS.

Practical Topics:

1. Plot Input, Output characteristics for BJT in CE mode
2. Determine output, transfer characteristics of Enhancement MOSFET

UNIT III - Feedback Amplifiers and Oscillators	[9 hours]
Feedback Concepts, gain with feedback, Effect of feedback on gain stability, distortion, bandwidth, input and output impedances; topologies of feedback amplifiers - Barkhausen criterion for oscillation, phase shift, Wien bridge — Hartley & Colpitts oscillators, Clapp oscillator-crystal oscillators	
Practical Topics: 1. Design and implementation of Hartley oscillators.	

UNIT IV - Wave Shaping and Multivibrator Circuits	[9 hours]
Pulse circuits, Attenuators, RC integrator and differentiator circuits, diode clampers and clippers, Multivibrators: Astable Multivibrator, Monostable Multivibrator, Bistable Multivibrator, Schmitt Trigger	
Practical Topics: 1. Design and implementation RC integrator and differentiator circuits 2. Design and implementation diode clampers and clippers	

UNIT V – Optoelectronic Devices and Sensors	[9 hours]
Construction operation and characteristics of seven segment Displays, LCD, Plasma devices, Photo conductive cells, Photodiodes and, Optocouplers, Photomultiplier Tube. Optical sensors: light intensity – wavelength and color – light dependent resistors, photo transistor	
Practical Topics: 1. Automatic ON and OFF Light Circuit using Phototransistor	

Laboratory component: **30 Hours**

S.No.	Name of the experiment
1	Study of electronic instruments and components
2	Verify the characteristics of PN-diode working in forward and reverse bias condition
3	Verify the characteristics of Zener diode working in forward and reverse bias condition
4	Implementation of Full Wave Rectifier with Filters.
5	Plot Input, Output characteristics for BJT in CE mode
6	Determine output, transfer characteristics of Enhancement MOSFET
7	Design and implementation of Hartley oscillators.
8	Design and implementation of RC integrator and differentiator circuits
9	Design and implementation of diode clampers and clippers
10	Automatic ON and OFF Light Circuit using Phototransistor

Course Outcomes:

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

COs	Course outcomes	Cognitive domain
CO1	Explain the working principle of diodes to use it as switching devices in electronic circuits.	K2
CO2	Infer the switching characteristics of transistors to compare the current controlled and voltage-controlled devices for real time applications.	K2
CO3	Construct oscillators and amplifiers for various signal generation circuits.	K3
CO4	Construct the wave shaping circuits to modify waveforms for realizing analog signal.	K3
CO5	Explain the application of optoelectronic devices and sensors in various fields to sense the physical input quantity.	K2

COs and POs Mapping:

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

Assessment Pattern:

Bloom's Category	Internal 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

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.

Text Books:

1. Zedra Smith, "Microelectronic Circuits: Theory And Applications," 7th edition, Oxford Higher Education, 2014.
2. Salivahanan S, Suresh Kumar N, Vallavaraj A, "Electronic Devices and circuits", Fifth Edition, Tata McGraw- Hill, 2022.
3. Ben G. Streetman and Sanjay Banerjee, "Solid State Electronic Devices", Pearson India, 2016 (Seventh Edition).
4. Thomas Grandke, Henry Bolte, 'Sensors – A Comprehensive Sensors,' John Wiley

Reference Books:

1. Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory", Pearson Prentice Hall, 10th edition, July 2008.
2. R.S.Sedha," A Text Book of Applied Electronics", S.Chand Publications, 2006.
3. Floyd, "Electronic Devices", Ninth Edition, Pearson Education, 2012.
4. Yang, "Fundamentals of Semiconductor devices", McGraw Hill International Edition, 1978.

Web Links and Video Lectures (E-Resources):

1. PN Junction Diode: https://nptelvideos.com/video.php?id=2442&c=4
2. Diode Rectifier circuits: https://nptelvideos.com/video.php?id=2441&c=4
3. NPN –PNP, transistor operation: https://nptelvideos.com/video.php?id=2439&c=4
4. Feedback amplifiers: https://nptel.ac.in/courses/117106088
5. Diode clampers and clippers: https://nptelvideos.com/video.php?id=408
6. Optical sensors: https://onlinecourses.nptel.ac.in/noc22_ph01/preview

Suggested Skill Activities:

1. Apply the concept of PN junction diode design Half wave rectifier for electronic circuits.
2. Convert AC signals to DC by using the concept of Rectifier
3. Construct the electronic switch using transistor in any one application
4. Regulate the voltage using the characteristics of Zener diode.
5. Design LED flasher/ change colour using transistor
6. Make the model of Automatic light lamp for the traffic system using transistor
7. Make a proximity sensor using BC547 NPN transistor, photo Diode and LED

Course Code:	**24EE231**	**Course Title:**	**ELECTRIC CIRCUITS LABORATORY**
Credits:	**1**	**L – T – P**	**0-0-2**

Course objectives:

To provide hands on training to the students in:

- To simulate various electric circuits using Pspice/ Matlab/e-Sim / Scilab
- To gain practical experience on electric circuits and verification of theorems.

Teaching-Learning Process:

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

7. Project based learning
8. Lab Experiment Videos

EXPERIMENTS	**[60 hours]**

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. Simulation and Experimental validation of RLC electric circuit transients
9. Design and implementation of series resonance circuit.
10. Design and implementation parallel resonance circuit.
11. Simulation of three phase balanced star, delta networks circuit (Power and Power factor calculations).
12. 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:

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	K3
CO3	Outline the transient characteristics of RLC circuits.	K2
CO4	Make use of the frequency response of the electric circuit to obtain its characteristics.	K3
CO5	Interpret the three phase star and delta connected load with balanced and unbalanced system.	K2

COs and POs Mapping:

CO/PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	1	-	2	-	-	-	-	-	-	-	3	-	-
CO2	3	2	1	-	2	-	-	-	-	-	-	-	3	-	-
CO3	2	1	-	-	2	-	-	-	-	-	-	-	3	-	-
CO4	3	2	-	-	2	-	-	-	-	-	-	-	3	-	-
CO5	2	1	-	-	2	-	-	-	-	-	-	-	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. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis",McGraw Hill publishers, 9thedition, New Delhi, 2020.
2. Chakrabarti A, "Circuits Theory (Analysis and synthesis), DhanpatRai& 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",McGraHill, 2015.
3. Joseph A. Edminister, MahmoodNahvi, "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.

Course Code:	24GE231	Course Title:	WORKSHOP PRACTICE
Credits:	1.5	L – T – P	0-0-3

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]

1. FIELD MEASUREMENT, MASONRY WORK AND PLUMBING

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.

i. Digging and filling.

ii. Foundation preparations.

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.

c. Installation of water lines for wash basin and showers faucet.

PART II MECHANICAL ENGINEERING PRACTICES	[5 hours]

2. CARPENTRY, FOUNDRY, WELDING AND SHEET METAL
   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.
3. LATHE, DRILLING MACHINE AND 3D PRINTER
   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]

4. ELECTRICAL WIRING
   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]

5. IOT BASED SOLUTIONS AND PCB
   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]**

6. INTERACTIVE DYNAMIC WEBSITE
   a. Design a website for an application using HTML and CSS.
   b. Convert the designed website into responsive website using Bootstrap.
   c. Add dynamism to the website by using JavaScript and embed the social media components to the website.
   d. Incorporate the database interaction with the website.
   e. Deploy the developed website in the server.

Course outcomes:

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

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:

CO/PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 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

Assessment Pattern

Bloom's Category	Terminal Examination
Remember	0
Understand	0
Apply	100
Analyze	0
Evaluate	0
Create	0

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 & 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**

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.	**Topic**	**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		
4	Speaking current issues (selected topics)	2
5	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		
3	Speaking - Just a minute talk and expressions for plans and decisions	3
4	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:

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

CO No.	**Course Outcomes**	**Cognitive Level**
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**

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:

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

MANUALS/ SOFTWARE: Open Sources / Websites