

**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. Computer Science and Engineering**

**(B.E CSE)**

**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 young software professionals to compete the global challenges in the field of computer science and engineering and be researcher to meet the need of society.

**Mission of the Department**

- ✓ To provide quality education to develop software for real time problem in scientific and business application for various needs of industry.
- ✓ To provide learning ambience to enhance innovations, problem solving skill, leadership qualities, team spirit and ethical responsibility to serve the society.

## PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1	The graduates will be able to design and to adapt modern tools to innovate ideas and develop computational solution for technological problem.
PEO2	The graduates will be able to develop professional skills for employment and understand the need of lifelong learning for a successful professional career.
PEO3	To develop an ability to become successful professional, entrepreneur and urge for pursuing higher studies.



## PROGRAMME OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and 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.



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	Tamils and Technology	HSS	1	0	0	1
4	24EN231	Presentation And Language Skills Laboratory	HSS	0	0	3	1.5
5	24MG601	Product Innovation & Entrepreneurship	HSS	2	0	0	2
6	24GE701	Professional Ethics and Human Values	HSS	2	0	0	2
7	24MG701	Economics for Engineers	HSS	3	0	0	3
Basic Science Courses (BSC)							
Sl.no	Course Code	Course Title	Course Type	L	T	P	Credit
1	24MA101	Matrices and Calculus	BSC	3	1	0	4
2	24PH101	Engineering Physics	BSC	3	0	2	4
3	24CY101	Engineering Chemistry	BSC	3	0	2	4
4	24MA201	Complex Variables and Transform	BSC	3	1	0	4
5	24MA301	Probability, Random Processes and Statistics	BSC	3	1	0	4
6	24MA402	Discrete Mathematics & Linear Algebra	BSC	3	0	0	3
7	24CY401	Environmental Science and Engineering	BSC	2	0	0	2

<b>Engineering Science Courses (ESC)</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24ME201	Engineering Graphics & Design	ESC	1	0	4	3
2	24CS201	Programming for Problem Solving using C	ESC	2	0	4	4
3	24EC302	Digital Logic Circuits and Design	ESC	3	0	2	4
4	24EE202	Fundamentals of Electrical and Electronics Engineering	ESC	3	0	0	3
5	24EE404	IoT - Sensors and Devices	ESC	3	0	2	4
6	24CS301	Programming for Problem Solving using Python	ESC	0	0	3	1.5
7	24GE231	Workshop Practices	ESC	0	0	3	1.5
8	24CS303	Computer Architecture and Organization	ESC	2	0	2	3
<b>Professional Core Courses (PCC)</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24EC501	Microprocessors, Microcontrollers and Interfacing Techniques	PCC	3	0	2	4
2	24CS301	Data Structures and Algorithms	PCC	3	0	2	4
3	24CS302	Object Oriented Programming using Java	PCC	3	0	2	4
4	24CS304	Database Management Systems	PCC	3	0	2	4
5	24CS403	Theory of Computation	PCC	3	1	0	4
6	24CS404	Operating Systems	PCC	3	0	0	3
7	24CS405	Software Engineering & Package Development	PCC	3	0	2	4
8	24CS401	Computer Networks	PCC	2	0	2	3
9	24CS431	Operating Systems Lab	PCC	0	0	2	1
10	24CS432	Application Development Lab	PCC	0	0	2	1
11	24CS501	Compiler Design	PCC	3	0	2	4
12	24CS502	Artificial Intelligence	PCC	3	0	2	4
13	24CS503	Design and Analysis of Algorithms	PCC	3	0	2	4
14	24CS601	Object Oriented Analysis and Design	PCC	3	0	0	3
15	24CS602	Cryptography & Network Security	PCC	3	0	2	4

16	24AI701	Augmented Reality, Virtual Reality with AI	PCC	3	0	2	4
17	24AI402	Applied Machine Learning	PCC	3	0	2	4
<b>Professional Electives Courses (PEC)</b>							
<b>Professional Elective I - Data Science</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24AI571	Exploratory Data Analysis	PEC	3	0	0	3
2	24AI572	Recommender Systems	PEC	3	0	0	3
3	24AI573	Big Data Analytics	PEC	3	0	0	3
4	24AI574	Cognitive Science	PEC	3	0	0	3
5	24AI575	Natural Language Processing	PEC	3	0	0	3
6	24AI576	Computer Vision	PEC	3	0	0	3
<b>Professional Elective II - Full Stack Development</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24CS581	Agile Software Development	PEC	3	0	0	3
2	24CS582	UI and UX Design	PEC	3	0	0	3
3	24CS583	Web Frameworks	PEC	3	0	0	3
4	24CS584	App Development	PEC	3	0	0	3
5	24CS585	Software Testing and Automation	PEC	3	0	0	3
6	24CS586	DevOps	PEC	3	0	0	3
<b>Professional Elective III - Cloud Computing and Data Center Technologies</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24CS671	Virtualization in Cloud Computing	PEC	2	0	2	3
2	24CS672	Cloud Services and Data Management	PEC	2	0	2	3
3	24CS673	Cloud Storage Technologies	PEC	2	0	2	3
4	24CS674	Cloud Automation Tools and Applications	PEC	2	0	2	3
5	24CS675	Software Defined Networks	PEC	2	0	2	3
6	24CS676	Security and Privacy in Cloud	PEC	2	0	2	3
<b>Professional Elective IV - Cyber Security and Data Privacy</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24CS681	Cyber Security	PEC	2	0	2	3
2	24CS682	Modern Cryptography	PEC	2	0	2	3
3	24CS683	Cyber Forensics	PEC	2	0	2	3



4	24CS684	Ethical Hacking	PEC	2	0	2	3
5	24CS685	Crypto currency and Block chain Technologies	PEC	2	0	2	3
6	24CS686	Malware Analysis	PEC	2	0	2	3
<b>Professional Elective V - Creative Media</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24CS771	Multimedia and Animation	PEC	3	0	0	3
2	24CS772	UI and UX Design	PEC	3	0	0	3
3	24CS773	Augmented Reality and Virtual Reality	PEC	3	0	0	3
4	24CS774	Game Development	PEC	3	0	0	3
5	24CS775	Video Creation and Editing	PEC	3	0	0	3
6	24CS776	Digital Marketing	PEC	3	0	0	3
<b>Professional Elective VI – Artificial Intelligence and Machine Learning</b>							
1	24CS781	Knowledge Engineering	PEC	3	0	0	3
2	24CS782	Soft Computing	PEC	3	0	0	3
3	24CS783	Neural Networks and Deep Learning	PEC	3	0	0	3
4	24CS784	Text and Speech Analysis	PEC	3	0	0	3
5	24CS785	Optimization Techniques	PEC	3	0	0	3
6	24CS786	Ethics and AI	PEC	3	0	0	3
<b>Open Electives Courses (OEC)</b>							
<b>Open Elective I - Electronics and Communication Engineering</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24EC501	Nano Electronics	OEC	3	0	0	3
2	24EC503	Digital Signal Processing	OEC	3	0	0	3
3	24EC504	Fuzzy Logic Systems and ANN	OEC	3	0	0	3
4	24EC505	Consumer Electronics	OEC	3	0	0	3
5	24EC506	Electronic System Design	OEC	3	0	0	3
6	24EC507	Electronic Packaging	OEC	3	0	0	3
<b>Open Elective II - Civil and Agricultural Engineering</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
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 Cooperation	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
<b>Open Elective III - Bio Medical and Electrical Engineering</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24BM701	Wearable Devices	OEC	3	0	0	3
2	24BM702	Telemedicine and Healthcare Delivery	OEC	3	0	0	3
3	24BM703	Medical Informatics	OEC	3	0	0	3
4	24BM704	Basics of Human Anatomy and Physiology	OEC	3	0	0	3
5	24EE701	Robot Process Automation	OEC	3	0	0	3
6	24EE702	Electric vehicle Technology	OEC	3	0	0	3
7	24EE703	Smart Grid	OEC	3	0	0	3
8	24EE704	Energy Conservation and Management	OEC	3	0	0	3
<b>Open Elective IV - Mechanical and Management</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
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
<b>Employability Enhancement Courses (EEC)</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1	24CS351	Mini Project-I (Design Thinking & System Thinking)	EEC	0	0	2	1
2	24CS451	Mini Project-II (Society Attachment)	EEC	0	0	2	1
3	24EN451	Soft Skills Development	EEC	0	0	2	1
4	24CS551	Mini Project-III (Industry Attachment)	EEC	0	0	2	1
5	24EN651	Business And Managerial Communications	EEC	0	0	2	1

6	24GE551	Quantitative and Reasoning Skills-I	EEC	0	0	2	1
7	24CS651	Mini Project- IV (Development of Products)	EEC	0	0	2	1
8	24GE651	Quantitative and Reasoning Skills-II	EEC	0	0	2	1
9	24CS751	Project Work Phase I (Design & Analysis)	EEC	0	0	4	2
10	24CS752	Industrial Training/Internship	EEC	0	0	0	2
11	24CS851	Project Work Phase - II (Prototype& Testing)	EEC	0	0	10	5
<b>Mandatory Courses (MNC)</b>							
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	Constitution of India	MNC	0	0	1	1#

# denotes no credit

**SCHEME OF INSTRUCTION FOR FIRST YEAR B.E.****I SEMESTER**

S.no	Course code	Course Title	Category	L	T	P	C	
<b>THEORY COURSES</b>								
1	24GE101	Heritage of Tamils	HSS	1	0	0	1`	
2	24MA101	Matrices and Calculus	BSC	3	1	0	4	
<b>THEORY COURSE WITH LABORATORY COMPONENT</b>								
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	
<b>MANDATORY COURSES</b>								
8	24MC101	Induction programming	MNC	THREE WEEKS				
<b>TOTAL</b>				14	1	15	22.5	

**II SEMESTER**

<b>S.no</b>	<b>Course code</b>	<b>Course Title</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY COURSES</b>							
1	24GE201	Tamil and technology	HSS	1	0	0	1
2	24MA201	Complex Variables and Transforms	BSC	3	1	0	4
<b>THEORY COURSE WITH LABORATORY COMPONENT</b>							
4	24EC302	Digital logic circuits and design	ESC	3	0	2	4
5	24EE202	Fundamentals of Electrical and Electronics engineering	ESC	3	0	2	4
6	24EE404	IoT - Sensors and Devices	ESC	3	0	2	4
<b>LABORATORY COURSES</b>							
7	24CS301	Programming for problem solving using python	ESC	0	0	3	1.5
8	24GE231	Workshop practices	ESC	0	0	3	1.5
9	24EN231	Presentation and language Skills laboratory	HSS	0	0	3	1.5
<b>MANDATORY COURSES</b>							
10	24MC201	Sports and yoga for youth empowerment - II	MNC	0	0	2	0
11	24MC202	NCC CREDIT COURSE LEVEL - I	MNC	1	0	2	1#
<b>TOTAL</b>				<b>13</b>	<b>1</b>	<b>15</b>	<b>21.5</b>

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, ஓயிலாட்டம், 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]
<p>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</p>	

பாரதிதாசன் ஆகியோரின் பங்களிப்பு.	
<b>அலகு II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை:</b>	[3hours]
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.	

<b>அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:</b>	[3hours]
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	

<b>அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:</b>	[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.	

<b>அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:</b>	[3hours]
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தங்கங்களின் அச்ச வரலாறு.	

**பாடநெறி முடிவுகள் (பாழு):**

பாடநெறியின் முடிவில், மாணவர் பின்வரும் திறன்களைப் பெறுவர்:

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

பாடநெறி முடிவுகள் மற்றும் நிரல் முடிவுகள் ஒப்பிடுதல்



பாடங்கள்	மிக உயர்ந்த அறிவாற்றல் நிலை	பாடநெறி முடிவுகள்											
		1	2	3	4	5	6	7	8	9	10	11	12
பாடம்1	கே 1	2	-	-	-	-	-	-	-	-	-	-	-
பாடம்2	கே 2	1	-	-	-	-	-	-	-	-	-	-	-
பாடம்3	கே 1	1	-	-	-	-	-	-	-	-	-	-	-
பாடம்4	கே 1	1	-	-	-	-	-	-	-	-	-	-	-
பாடம்5	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

பன்னுமின் 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
மதிப்பீடுதல்	0	0	0
உருவாக்குதல்	0	0	0

## TEXT BOOKS:

1. தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு:  
தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம் ).
2. கணினித்தமிழ் - முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).
3. கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4. பொருறை - 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 of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

<b>Course Code:</b>	<b>24MA101</b>	<b>Course Title:</b>	<b>Matrices and calculus</b> (Common to AI&DS,AE,BME,CE,CSE,CSE(AI&ML),EEE,ECE,MECH)
<b>Credits:</b>	<b>4</b>	<b>L – T – P</b>	<b>3 – 1 – 0</b>
<b>Pre-requisite</b>			<b>NIL</b>

**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.

<b>UNIT I – Matrices</b>	<b>[12 hours]</b>
<p>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.</p> <p>Application: Reduction of a quadratic form to canonical form by orthogonal transformation.</p>	

<b>UNIT II – Differential Calculus</b>	<b>[12 hours]</b>
<p>Functions – Limit – Continuity – Derivatives – Differentiation rule – Product and quotient rules – Chain rules – Implicit differentiation – Logarithmic differentiation.</p> <p>Application: Maxima and Minima of functions of one variable</p>	
<b>UNIT III – Functions of Several Variables</b>	<b>[12 hours]</b>
<p>Partial differentiation – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables.</p> <p>Application: Maxima and Minima of functions of two variables using MATLAB - Lagrange’s method of undetermined multipliers.</p>	
<b>UNIT IV – Integral Calculus</b>	<b>[12 hours]</b>
<p>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.</p> <p>Application: Area between simple closed curves.</p>	
<b>UNIT V – Multiple Integrals</b>	<b>[12 hours]</b>
<p>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.</p> <p>Application: Volume of solids, Mass of Lamina</p>	

**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

<b>CO4</b>	Use the partial derivatives to find the maxima and minima of multivariable functions	K3
<b>CO5</b>	Use fundamental theorem of calculus to evaluate definite integrals	K3
<b>CO6</b>	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
<b>CO1</b>	3	2	1	-	2	-	-	-	-	-	-	2
<b>CO2</b>	2	1	1	-	-	-	-	-	-	-	-	1
<b>CO3</b>	3	2	1	-	2	-	-	-	-	-	-	-
<b>CO4</b>	3	2	1	-	-	-	-	-	-	-	-	-
<b>CO5</b>	3	2	1	-	-	-	-	-	-	-	-	-
<b>CO6</b>	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	
<b>Remember</b>	20	20	20
<b>Understand</b>	40	20	20
<b>Apply</b>	40	60	60
<b>Analyse</b>	0	0	0
<b>Evaluate</b>	0	0	0
<b>Create</b>	0	0	0

**Text Books:**

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

**Reference Books:**

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

**Equivalent NPTEL/SWAYAM Courses**

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

**Web Links and Video Lectures (E-Resources):**

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

<b>Course Code:</b>	<b>24EN101</b>	<b>Course Title:</b>	<b>ENGLISH FOR ENGINEERS</b> (Common to AI&DS, AE,BME,CE,CSE,CSE(AI&ML),EEE, ECE,MECH)
<b>Credits:</b>	<b>2.5</b>	<b>L – T – P</b>	<b>2-0-1</b>
<b>Pre-requisite</b>			<b>NIL</b>

**Course Objectives:**

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

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

<b>UNIT II - ACTIVE LISTENING - RESPONDING</b>		<b>[15 hours]</b>
<b>LIST OF EXERCISES</b>		
<b>LAB ACTIVITIES</b>		
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 /	3



	Animated stories / Anecdotes / Event narration	
4.	Video Comprehension – Brainstorming and Note-Taking	3
<b>CLASSROOM ACTIVITIES</b>		
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

<b>UNIT III: SPEAKING AND PRESENTATION SKILLS</b>		<b>[15 hours]</b>
<b>LIST OF EXERCISES</b>		
<b>LAB ACTIVITIES</b>		
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
<b>CLASSROOM ACTIVITIES</b>		
1.	Self-Introduction - Sharing Childhood Experiences- Talking about Favorite Personalities	1
2.	Describing Recent Innovation in Technology	1
3.	Interviewing Celebrities and Entrepreneurs	1
4.	Situational Conversations (Meeting a friend in a cafe) - Narrating Personal Experience	1
5.	Group Communication- Discussing Social Issues- Current Affairs and Debate	1
6.	Role-Play- Picture/Movie Description	1
7.	Presentation – I (Book /Movie Review- Story Telling- General	2

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

<b>UNIT IV: READING BETWEEN LINES</b>		<b>[12 hours]</b>
<b>LIST OF EXERCISES</b>		
<b>LAB ACTIVITIES</b>		
<b>Sl. No.</b>	<b>Topic</b>	<b>Hours</b>
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
<b>CLASSROOM ACTIVITIES</b>		
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

<b>UNIT V- WRITING FOR ENGINEERS</b>	<b>[7+3 hours]</b>
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.	

<b>LIST OF EXERCISES</b>
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<b>LAB ACTIVITIES</b>		
<b>Sl. No.</b>	<b>Topic</b>	<b>Hours</b>
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:

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

**COs and POs Mapping:**

<b>COs</b>	<b>POs</b>											
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>
<b>CO1</b>	-	-	-	-	-	-	-	-	-	3	-	3
<b>CO2</b>	-	-	-	-	-	-	-	-	-	3	-	3
<b>CO3</b>	-	-	-	-	-	-	-	-	-	3	-	3
<b>CO4</b>	-	-	-	-	-	-	-	-	-	3	-	3
<b>CO5</b>	-	-	-	-	-	-	-	-	-	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) - <b>Theory</b>	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) - <b>Laboratory</b>	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	
<b>Remember</b>	10	10	10
<b>Understand</b>	30	30	30
<b>Apply</b>	60	60	60
<b>Analyze</b>	0	0	0
<b>Evaluate</b>	0	0	0
<b>Create</b>	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

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

**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

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

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

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

<b>UNIT IV - LASERS &amp; FIBER OPTICS</b>	<b>[9 hours]</b>
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	
<b>Practical Topics:</b>	
<ol style="list-style-type: none"> <li>1. Determination the acceptance angle and numerical aperture of the given optical fiber.</li> <li>2. Determination of the particle size of the given powder using laser</li> <li>3. Determination of wavelength of a given laser source - Grating method</li> </ol>	

<b>UNIT V - QUANTUM MECHANICS</b>	<b>[9 hours]</b>
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.	
<b>Practical Topics:</b>	
1, Young’s Double Slit Experiment to demonstrate the wave nature of particles	

**Laboratory component:****30 Hours**

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

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



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

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

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

### COs and POs Mapping:

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

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

**Scheme of Evaluation:**

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

**Assessment Pattern:**

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

**End semester Examination: (QP PATTERN)**

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

**TEXT BOOKS:**

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

**REFERENCES:**

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

**Equivalent NPTEL/SWAYAM Courses:**

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

**Web links and Video Lectures (e-Resources):**

1. ELASTICITY  
[https://youtu.be/eICv1p8WjgI?si=88hhiOw\\_fld7ZrBU](https://youtu.be/eICv1p8WjgI?si=88hhiOw_fld7ZrBU)
2. MAXWELL'S EQUATIONS AND ELECTROMAGNETIC WAVES  
<https://youtu.be/3IPVZYf7C-U?si=PnP1nupcfGfr1C76>
3. LASERS & FIBER OPTICS  
<https://youtu.be/Ab1nxxkgjH8?si=KR2GS8iBUFayBwdp>
4. QUANTUM MECHANICS  
[https://youtu.be/AEedn\\_NiWN0?si=Y27pAqawlwKmethNO](https://youtu.be/AEedn_NiWN0?si=Y27pAqawlwKmethNO)

**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.

<b>Course Code:</b>	<b>24CY101</b>	<b>CourseTitle:</b>	<b>Engineering Chemistry</b> (Common to AI&DS,AE,BME,CE,CSE,CSE(AI&ML),EEE,ECE,MECH)
<b>Credits</b>	<b>4</b>	<b>L – T – P</b>	<b>3-0-2</b>
<b>Pre-requisite</b>			<b>NIL</b>

**Course objectives:**

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

**Teaching-Learning Process:**

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

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

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



<b>UNIT II - CHEMISTRY OF ENGINEERING MATERIALS</b>	<b>[9 hours]</b>
<p>Adhesives: Introduction- requisites of a good adhesive-adhesive action- industrial applications of adhesives.</p> <p>Insulating Materials: Introduction- requirements- Glass and ceramics - preparation, properties and applications - fabrication of ceramic ware.</p> <p>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.</p> <p>Electronic materials: Introduction-types, properties and applications of semiconducting materials and transistors, materials used in IC's, fibers and cables- properties and applications, organic solar cells - types and applications.</p>	
<p><b>Practical Topics:</b></p> <ol style="list-style-type: none"> <li>1. Determination of viscosity of oils using Oswald viscometer.</li> <li>2. Determination of cloud point and pour point of oils.</li> </ol>	

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

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 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, 20th Edition, 2018.

**Reference Books:**

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

**Web links and Video Lectures (e-Resources):**

1. Water and wastewater treatment - [https://onlinecourses.nptel.ac.in/noc23\\_ce12/preview](https://onlinecourses.nptel.ac.in/noc23_ce12/preview)
2. Semiconductor Devices and circuits. - <https://nptel.ac.in/courses/108108112>
3. Corrosion Protection Methods - [https://onlinecourses.nptel.ac.in/noc23\\_mm01/preview](https://onlinecourses.nptel.ac.in/noc23_mm01/preview)
4. Elementary Electrochemistry - [https://onlinecourses.nptel.ac.in/noc23\\_cy19/preview](https://onlinecourses.nptel.ac.in/noc23_cy19/preview)
5. Fuel and combustion Technology - <https://archive.nptel.ac.in/courses/103/105/103105110/>

**Suggested Skill Activities:**

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

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

<b>Course Code:</b>	<b>24ME201</b>	<b>Course Title:</b>	<b>Engineering Graphics and Design</b>
<b>Credits:</b>	<b>3</b>	<b>L – T – P</b>	<b>1-0-4</b>
<b>Pre-requisite</b>			<b>NIL</b>

**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

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

<b>UNIT IV- BASIC COMPUTER AIDED DRAWING APPLICATIONS</b>	<b>[15 hours]</b>
<p>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 &amp; Furniture's etc. Drawing Simple Mechanisms - Bicycles, Tricycles, Gear trains, Ratchets, two-wheeler cart &amp; Four-wheeler carts to dimensions etc.</p>	

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

**Course outcomes:**

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

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

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

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO1</b>	3	1	-	-	-	-	-	-	-	2	-	-	1	2	-
<b>CO2</b>	3	1	-	-	-	-	-	-	-	2	-	-	1	2	-
<b>CO3</b>	3	1	-	-	-	-	-	-	-	-	-	-	1	2	-
<b>CO4</b>	3	1	-	-	-	-	-	-	-	2	-	-	1	-	-
<b>CO5</b>	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) - 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)	Lab Exam	100	50	50	50
				Total	100

**End semester Examination: (QP PATTERN)**

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

**Text Books:**

1. 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).





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

**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

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

2. Programs to illustrate the use of user-defined data types	
<b>UNIT II – BASIC CONSTRUCTS IN C</b>	<b>[6 hours]</b>
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	
<b>Practical Topics:</b>	
<ol style="list-style-type: none"> <li>1. Programs using decision making statements</li> <li>2. Programs using looping statements</li> <li>3. Programs using user defined functions and recursive functions</li> </ol>	
<b>UNIT III – ARRAYS AND STRINGS IN C</b>	<b>[6 hours]</b>
Arrays: Initialization - One dimensional, Two dimensional, and Multi-dimensional arrays - String: Basics, declaring and initializing strings, string handling functions: standard and user defined functions	
<b>Practical Topics:</b>	
<ol style="list-style-type: none"> <li>1. Build programs using arrays and array-based operations.</li> <li>2. Programs using one dimensional and two dimensional arrays.</li> <li>3. Implementations involving array usage for string operations.</li> </ol>	
<b>UNIT IV – POINTERS IN C</b>	<b>[6 hours]</b>
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	
<b>Practical Topics:</b>	
<ol style="list-style-type: none"> <li>1. Implementations involving pointers for dynamic memory allocation</li> <li>2. Implementations involving pointers for string manipulation.</li> </ol>	

<b>UNIT V – STRUCTURES, UNIONS AND FILE HANDLING IN C</b>	<b>[6 hours]</b>
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	
<b>Practical Topics:</b>	
<ol style="list-style-type: none"> <li>1. Programs to implement structures</li> <li>2. Programs to implement union</li> <li>3. Programs to implement various file operations.</li> </ol>	

**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	Course 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		
<b>Total</b>					<b>100</b>

**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	
<b>Remember</b>	20	20	20
<b>Understand</b>	20	20	20
<b>Apply</b>	60	60	60
<b>Analyze</b>	0	0	0
<b>Evaluate</b>	0	0	0
<b>Create</b>	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", 1<sup>st</sup> 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:	தமிழரும்தொழில்நுட்பமும்
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.

<b>அலகு I நெசவு மற்றும் பானைத்தொழில்நுட்பம்:</b>	[3 hours]
சங்ககாலத்தில் நெசவுத்தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்புபாண்டங்கள் - பண்டங்களில் கீறல் குறியீடுகள்.	

<b>அலகு II வடிவமைப்பு மற்றும் கட்டிடத்தொழில்நுட்பம்:</b>	[3 hours]
சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடைஅமைப்பு பற்றியவிவரங்கள் - மாமல்லபுரச்சிற்பங்களும், கோவில்களும் - சோழர்காலத்துப் பெருங்கோவில்கள் மற்றும் வழிபாட்டுத்தலங்கள் - நாயக்கர்காலக்கோயில்கள் மாதிரி கட்டமைப்பு பற்றி அறிதல், மதுரைமீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலைநாயக்கர்மஹால் - செட்டி நாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை.	



<b>அலகு III உற்பத்தித் தொழில்நுட்பம்</b>	[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.	

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

<b>அலகு V அறிவியல் தமிழ் மற்றும் கணிதத்தமிழ்:</b>	[3 hours]
அறிவியல் தமிழின் வளர்ச்சி - கணிதத்தமிழ் வளர்ச்சி -தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ்மென்பொருள் 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 பாழு:	கப்பல் கட்டுதல், இரும்புத் தொழில், நாணயம் தயாரித்தல் மற்றும் மணி தயாரிக்கும் தொழில்கள் பற்றி அறிந்து கொள்கிறார்கள்.	கே 1
அலகு IV பாழு:	நீர்நிலைகளின் முக்கியத்துவம், கால்நடை வளர்ப்பு, கிணறு, விவசாயம், மீன்பிடி, முத்து மற்றும் முத்து கலாச்சாரம் மற்றும் கடல் பற்றிய போதுமான அறிவை பெற்றுகொள்கிறார்கள் .	கே 1
அலகு V பாழு:	அறிவியல் தமிழின் வளர்ச்சி, தமிழ்க் கணிப்பொறியின் வளர்ச்சி, இணையத்தில் தமிழ் மென்பொருள் மேம்பாடு, தமிழ் அகராதிகளை சந்தேகம் இன்றி முழுமையாக தெரிந்து கொள்கிறார்கள்.	கே 1

பாடநெறி முடிவுகள் மற்றும் நிரல் முடிவுகள் ஒப்பிடுதல்

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

## மதிப்பீட்டு முறை

ப்ரூமின் 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
மதிப்பீடுதல்	0	0	0
உருவாக்குதல்	0	0	0

## TEXT BOOKS

1. தமிழகவரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம். (விகடன்பிரசுரம்).
3. கீழடி - வைகைநதிக்கரையில் சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4. பொருறை - 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 of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

<b>Course Code:</b>	<b>24MA201</b>	<b>Course Title:</b>	<b>Complex Variables and Transforms</b> (Common to Common to AI&DS,AE,BME,CE,CSE,CSE(AI&ML),EEE, ECE,MECH)
<b>Credits:</b>	<b>4</b>	<b>L – T – P</b>	<b>3 – 1 – 0</b>
<b>Pre-requisite</b>			<b>24MA101- Matrices and Calculus</b>

**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.

<b>UNIT I – Complex Differentiation</b>	<b>[12 hours]</b>
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.	
<b>UNIT II – Complex Integration</b>	<b>[12 hours]</b>
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).	
<b>UNIT III – Laplace Transforms</b>	<b>[12 hours]</b>
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.	
<b>UNIT IV – Fourier Series and Fourier Transforms</b>	<b>[12 hours]</b>
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.	

<b>UNIT V – Partial Differential Equation</b>	<b>[12 hours]</b>
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:

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

**COs and POs Mapping:**

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

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

**Scheme of Evaluation:**

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	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	
<b>Remember</b>	20	20	20
<b>Understand</b>	20	20	20
<b>Apply</b>	60	60	60
<b>Analyse</b>	0	0	0
<b>Evaluate</b>	0	0	0
<b>Create</b>	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):**

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

<b>Course Code:</b>	<b>24EC302</b>	<b>Course Title:</b>	<b>Digital Logic Circuits and Design</b>
<b>Credits:</b>	<b>4</b>	<b>L – T – P</b>	<b>3-0-2</b>
<b>Pre-requisite</b>			<b>24MA101- Matrices and Calculus 24PH101 – Engineering Physics</b>

**Course objectives:**

To impart knowledge on the

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

**Teaching-Learning Process:**

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

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



6. Flipped Class 7. Experimental Learning 8. NPTEL and Other Videos 9. Smart Class Room
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<b>UNIT I – Boolean Algebra And Logic Gates</b>	<b>[9 hours]</b>
Basic gates and truth table, De-Morgan's theorem, SOP and POS, K Map up to five variables, Two bits and three bits binary addition and Subtraction.	
<b>Practical Topics:</b>	
1. To Verify the truth tables of various logic gates. 2. To Implement the Given Boolean Function using Logic Gates. 3. To Verify and Study NAND and NOR gate as Universal Gates.	

<b>UNIT II – Combinational Circuits And Logic Family</b>	<b>[9 hours]</b>
Code converters, Magnitude comparator, Multiplexers and DE multiplexers, Decoders, Encoders, Priority Encoder, Combinational Circuits design-RTL, DTL, TTL & CMOS logic families	
<b>Practical Topics:</b>	
1. To study binary to gray and gray to binary converter and verify it for all possible combinations. 2. To implement and verify the truth table of 4x1 Multiplexer and 1x4 De multiplexer. 3. To implement and verify the truth table of Encoders and Decoders.	

<b>UNIT III – Sequential Logic</b>	<b>[9 hours]</b>
74xx series Integrated Circuits, Flip-Flops, Triggering of Flip-Flops, Design of Clocked Sequential Circuits Moore and Melay model- Flip-Flop Excitation Tables , Master Slave Flip-flop , Shift Registers and Counters.	
<b>Practical Topics:</b>	
1. Flip-flop: assemble, test and investigate operation of SR, D and JK Flip-flops 2. Shift Register: Design and investigate the operation of all type of shift registers with parallel load. 3. Counters: Design, assemble and test various ripple and synchronous counters- decimal counter, Binary counter with parallel load.	

<b>UNIT IV – State Machine Design</b>	<b>[9 hours]</b>
ASM Chart, State table , State condition and Diagrams, State minimization and hazards – analysis of asynchronous sequential logic circuits	
<b>Practical Topics:</b>	
<ol style="list-style-type: none"> <li>1. Clock-pulse generator: design, implement and test.</li> <li>2. Develop an Health track monitor App to measure any 3 parameters heart rate , pressure and temperature monitoring system.</li> </ol>	

<b>UNIT V – Programmable Logic And Memory Devices</b>	<b>[9 hours]</b>
Introduction PLA and PAL, CPLDs and FPGA - Memory Devices - ROM, RAM- Volatile and Non Volatile RAM, SDRAM, DRAM, PROM, EPROM, EEPROM, FRAM, ASIC	
<b>Practical Topics:</b>	
Investigate the behavior of RAM unit and its storage capacity -16 X 4 RAM: testing, simulating and memory expansion.	

**Laboratory Component****30 hours**

S.No.	Name of the Experiment
1	To Verify the truth tables of various logic gates.
2	To Implement the Given Boolean Function using Logic Gates.
3	To Verify and Study NAND and NOR gate as Universal Gates.
4	To study binary to gray and gray to binary converter and verify it for all possible combinations.
5	To implement and verify the truth table of 4x1 Multiplexer and 1x4 DE multiplexer.
6	To implement and verify the truth table of Encoders and Decoders.
7	Flip-flop: assemble, test and investigate operation of SR, D and JK Flip-flop.
8	Shift Register: Design and investigate the operation of all type of shift registers with parallel load.
9	Counters: Design, assemble and test various ripple and synchronous counters with parallel load.
10	Clock-pulse generator: design, implement and test.
11	Develop an Health track monitor App to measure any 3 parameters heart rate , pressure and temperature monitoring system

12	Investigate the behavior of RAM unit and its storage capacity -16 X 4 RAM: testing, simulating and memory expansion Using HDL/VHDL/ Pspice Simulators
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**Course outcomes:** On completion of the course, the student will have the ability to:

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

#### COs and POs Mapping:

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

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

**Scheme of Evaluation:**

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	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	Continuous Assessment Tests		Terminal Examination
	1	2	
<b>Remember</b>	20	20	20
<b>Understand</b>	40	40	40
<b>Apply</b>	40	40	40
<b>Analyze</b>	0	0	0
<b>Evaluate</b>	0	0	0
<b>Create</b>	0	0	0

**End semester Examination: (QP PATTERN)**

- Each unit consists of two 2 marks questions.
- One 16 marks question (either or) will be from any one of the five units.
- All the fifteen questions have to be answered.

**TEXT BOOKS**

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

**REFERENCE BOOKS**

1. Charles H. Roth, Jr, 'Fundamentals of Logic Design', Jaico Books, 4th Edition, 2002.
2. William I. Fletcher, "An Engineering Approach to Digital Design", Prentice- Hall of India, 1980.
3. Floyd T.L., "Digital Fundamentals", Charles E. Merrill publishing company, 1982.

4. John. F. Wakerly, "Digital Design Principles and Practices", Pearson Education, 4 th Edition,2007.
5. Donald D. Givone (2002), Digital Principles and Design, Tata McGraw Hill, India

#### **WEB LINKS AND VIDEO LECTURES (E-RESOURCES):**

1. Introduction To Digital Circuits : <https://nptel.ac.in/courses/117106086/>
2. Combinational Circuits https : <https://nptel.ac.in/courses/117106086/>
3. Code Converters : <https://nptel.ac.in/courses/117106086/>
4. S,R,JK, D Flip Flops :<https://nptel.ac.in/courses/117106086/>
5. Design of Synchronous Sequential Circuits : [https://nptel.ac.in/courses/117106086](https://nptel.ac.in/courses/117106086/)
6. Programmable Logic Devices : [https://nptel.ac.in/courses/117106086](https://nptel.ac.in/courses/117106086/)

#### **SKILLED BASED ASSESSMENTS**

1. Design a fingerprint attendance system circuit, using a Fingerprint Sensor module to authenticate a true person or employee by taking their finger input in the system Employ 4 push buttons to enrol, Delete, UP/Down. ENROLL and DEL key has triple features.
2. Design a Touchless heart rate, pulse rate monitoring and image recognition app to detect changes in face's reflectivity for automobilist safety, based on cutting-edge research and science conducted at the MIT Media Lab and there by allowing the app to calculate a persons heart rate.
3. Design an Obstacle Avoiding Robot Car Using an Ultrasonic Sensor by interfacing three ultrasonic sensors with arduino uno. Run an algorithm according to which you are going to manipulate your desire distance for obstacle detection then you are going to control your motor rotation direction for movement of your bot. 50cm (Front), 15cm (Each Side).
4. Design and implement a Digital code lock System using Arduino. Employ a LCD display which is used to interface with the project to output lock status to be used in places where we need more security.
5. Design a Luggage Security System using GSM to inform about the status of the luggage to the owner, by making of an integrated IR Transmitter Receiver circuit and IR diodes which sense any object about certain range. Make the algorithm tailor-made to the specific requirements of the user.

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

**Course objectives:**

To impart knowledge on the

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

**Teaching-Learning Process:**

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

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

<b>UNIT I –DC Circuits</b>	<b>[9 hours]</b>
Introduction to DC Circuits – Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm’s Law - Kirchhoff’s Laws –Nodal Analysis, Mesh analysis with independent sources only – Appliances.	
Practical Topics:	
<ol style="list-style-type: none"> <li>1. Model an electrical circuit and simulate it to verify Ohms Law.</li> <li>2. Model an electrical circuit and simulate it to verify Kirchhoff’s Voltage Law.</li> <li>3. Model an electrical circuit and simulate it to verify Kirchhoff’s Current Law.</li> </ol>	

<b>UNIT II – AC Circuits and Magnetic Circuits</b>	<b>[9 hours]</b>
Introduction to poly-phase circuits - Representation of sinusoidal waveform – peak and rms values, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations – Converters: rectifiers	

and inverters; Basics of magnetic circuits – Flux – Flux density – Magnetic resonance – Self-inductance – mutual-inductance – Coupling.
<p>Practical Topics:</p> <ol style="list-style-type: none"> <li>1. Demonstrate the measurement of power in an RLC circuit using wattmeter method.</li> <li>2. Interpret the DC output of an RLC circuit using half wave rectifier.</li> <li>3. Interpret the DC output of an RLC circuit using full wave rectifier.</li> </ol>

<b>UNIT III – DC Machines and Transformers</b>	<b>[9 hours]</b>
Construction, principle of operation, characteristic and application – DC Motor and DC Generator, Types of DC motors and generators – Application: Electric Vehicle – Structure of electric power system – Introduction to single phase transformers –Construction, principle of operation, characteristics and application.	
<p>Practical Topics:</p> <ol style="list-style-type: none"> <li>1. Conduct the load test on DC shunt motor to outline its characteristics.</li> <li>2. Outline the study on the starting methods of DC series motor.</li> <li>3. Conduct a study on transformer construction for real-time applications.</li> </ol>	

<b>UNIT IV – Electronic Devices</b>	<b>[9 hours]</b>
Introduction to semiconductor – PN Diode – Zener Diode – BJT and its configurations – CE, CB, CC – SCR – Optoelectronic devices – LED – OLED – Seven segment displays.	
<p>Practical Topics:</p> <ol style="list-style-type: none"> <li>1. Experiment with PN junction diode in an AC circuit to verify its characteristics.</li> <li>2. Experiment with Zener diode in an AC circuit to verify its characteristics.</li> <li>3. Experiment with SCR in an AC circuit to verify its characteristics.</li> </ol>	

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

**Laboratory Component:****[30 hours]**

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

S.No	Name of the Experiment
1	Model an electrical circuit and simulate it to verify Ohms Law.
2	Model an electrical circuit and simulate it to verify Kirchhoff's Voltage Law.
3	Model an electrical circuit and simulate it to verify Kirchhoff's Current Law.
4	Demonstrate the measurement of power in an RLC circuit using wattmeter method.
5	Interpret the DC output of an RLC circuit using half wave rectifier.
6	Interpret the DC output of an RLC circuit using full wave rectifier.
7	Conduct the load test on DC shunt motor to outline its characteristics.
8	Outline the study on the starting methods of DC series motor.
9	Conduct a study on transformer construction for real-time applications.
10	Experiment with PN junction diode in an AC circuit to verify its characteristics.
11	Experiment with Zener diode in an AC circuit to verify its characteristics
12	Experiment with SCR in an AC circuit to verify its characteristics.
13	Utilize Arduino and Bluetooth module for automating home appliances.
14	Utilize ESP8266 processor for automating home appliances.
15	Construct an Arduino based solar tracker for solar irradiation measurement.

**Course outcomes:**

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

COs	Course Outcome	Cognitive domain
CO1	Apply the circuit laws and theorems to compute the electrical parameters of domestic and industrial appliances.	K3
CO2	Compare the behavior of AC circuits & magnetic circuits for a given input.	K2
CO3	Explain the construction, working, and application of electrical machine and transformer to infer its characteristics.	K2
CO4	Apply the semiconductor principles using diodes, transistors, thyristors and displays for developing electronic switches and displays.	K3
CO5	Identify the sensors for applications in Engineering.	K3



**COs and POs Mapping:**

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

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

**Scheme of Evaluation:**

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	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
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

### End semester Examination: (QP PATTERN)

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

### Text Books:

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

### Reference Books:

1. John Bird, “Electrical Circuit theory and technology”, Routledge; 2017.
2. Muthusubramanian R and Salivahanan S, “Basic Electrical and Electronics Engineering,” McGraw Hill, New Delhi, 2009.
3. Nagsarkar T K and Sukhija M S, “Basics of Electrical Engineering,” Oxford University press, 2012.
4. V K Mehta, Rohitmehta “Principles of Electronics,” S.Chand & Company Ltd, 2015.
5. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits,” Schaum’ Outline Series, McGraw Hill, 2009.
6. H.S. Kalsi, “Electronic Instrumentation,” Tata McGraw-Hill, New Delhi, 2010.
7. Ian Sinclair, “Sensors and Transducers,” Elsevier Science, 3rd Edition, 2000.
8. Perry Lea, “Internet of things for architects,” Packt, 2018.
9. V N Mittle and Arvind Mittle “Basic Electrical Engineering,” McGraw Hill, New Delhi, 2005.
10. R.S. Sedha, “A Textbook of Applied Electronics,” S. Chand & Co., 2008.
11. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry and Gonzalo Salgueiro, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, CISCO Press, 2017.

**Web Links and Video Lectures (E-Resources):**

1. A Basic Course on Electric and Magnetic Circuits :  
[https://onlinecourses.nptel.ac.in/noc24\\_ee125/preview](https://onlinecourses.nptel.ac.in/noc24_ee125/preview)
2. Basic Electrical Circuits: [https://onlinecourses.nptel.ac.in/noc24\\_ee112/preview](https://onlinecourses.nptel.ac.in/noc24_ee112/preview)
3. Digital Circuits: [https://onlinecourses.nptel.ac.in/noc24\\_ee147/preview](https://onlinecourses.nptel.ac.in/noc24_ee147/preview)
4. Electrical Machines – I: [https://onlinecourses.nptel.ac.in/noc24\\_ee103/preview](https://onlinecourses.nptel.ac.in/noc24_ee103/preview)
5. Sensor Technologies: Physics, Fabrication and Circuits:  
[https://onlinecourses.nptel.ac.in/noc24\\_ee83/preview](https://onlinecourses.nptel.ac.in/noc24_ee83/preview)
6. Semiconductor Devices and Circuits: [https://onlinecourses.nptel.ac.in/noc24\\_ee143/preview](https://onlinecourses.nptel.ac.in/noc24_ee143/preview)

**Suggested Skill Activities:**

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

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

**Course objectives:**

To impart knowledge on the

- Basic electronic components and Sensors.
- Fundamental concepts of Microcontrollers
- Different types of Microcontrollers
- Different protocols for communication
- Interfacing of Arduino microcontrollers with different applications.

**Teaching-Learning Process:**

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

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

**UNIT I - Sensors for IoT****[6 hours]**

Active and Passive Sensors, Different Types of Sensors such as Capacitive, Resistive, and Surface Acoustic Wave Sensors for Pressure, Humidity, Toxic Gas; Sensors for Water (pH) quality, Accelerometer, Gyroscope, Moisture, Hall effect and Humidity

**Practical Topics:**

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

<b>UNIT II: Microcontroller</b>	<b>[6 hours]</b>
Introduction to microcontrollers and microprocessors, Different microcontrollers, Arduino:Types, UNO Architecture, ADC, DAC, Data acquisition	
<b>Practical Topics:</b>	
<ol style="list-style-type: none"> <li>1. Switch on an LED if a button is pressed.</li> <li>2. Changing brightness of LED using potentiometer.</li> </ol>	
<b>UNIT III: Arduino Programming</b>	<b>[6 hours]</b>
Digital Pins as Input and Output, Reading Analog Quantities, PWM Pin- Arduino's Serial Port and Serial Communication. Interfacing of DC Motor and Relay	
<b>Practical Topics:</b>	
<ol style="list-style-type: none"> <li>1. Change the brightness of LED (Fade in/ Fade out) using PWM</li> <li>2. DC motor speed control using serial communication.</li> </ol>	
<b>UNIT IV – IoT System</b>	<b>[6 hours]</b>
Basics of IoT, IoT Levels, Things and Connections, Building Blocks of IoT connectivity(Client-Server, Web Interface, and API: Qualitative Analysis only), Protocols and Communication (Zigbee, Bluetooth, Wi-Fi, MQTT: Qualitative Analysis only), Bluetooth and Wi-Fi Modules for Arduino	
<b>Practical Topics:</b>	
<ol style="list-style-type: none"> <li>1. Interfacing Wi-Fi module with Arduino</li> <li>2. Design a simple circuit to measure the pH value of wastewater.</li> <li>3. Design a simple circuit to apply Hall effect sensor</li> </ol>	
<b>UNIT V – IoT Applications</b>	<b>[6 hours]</b>
Application of IoT in the industry, buildings, smart city, logistics, environment, health care, agriculture, and lifestyle product	
<b>Practical Topics:</b>	
<ol style="list-style-type: none"> <li>1. Sending information about the patient in home to the doctor's PC/mobile.</li> <li>2. Develop an IoT System for smart home applications</li> </ol>	

**Laboratory Component****30 hours**

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

**Course outcomes:**

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

CO	Course Outcome	Cognitive domain
CO1	Illustrate the working principles of different types of sensors.	K2
CO2	Describe the basic concepts of the different types of Microcontrollers.	K2
CO3	Apply the knowledge of PWM and Serial communication in different circuits.	K3
CO4	Explain the working of Wi-Fi module and different protocols for communication for usage in IoT.	K2
CO5	Apply the sensor to build an IoT System for Real time applications.	K3

**COs and POs Mapping:**

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

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

**Scheme of Evaluation:**

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	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	
<b>Remember</b>	20	20	20
<b>Understand</b>	60	40	40
<b>Apply</b>	20	40	40
<b>Analyse</b>	0	0	0
<b>Evaluate</b>	0	0	0
<b>Create</b>	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. Peter Dalmaris, “Basic Electronics for Arduino Makers”, Packt Publishing, 2017.
2. Tim Pulver, “Hands-On Internet of Things with MQTT: Build Connected IoT Devices with Arduino and MQ Telemetry Transport (MQTT)”, Packt Publishing, 2019.
3. Marco Schwartz, “Internet of Things with Arduino Cookbook”, Packt Publishing, 2016.

**Reference Books:**

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

**Web Links and Video Lectures (E-Resources):**

1. Sensors for IoT- <https://youtube.com/watch?v=njgixrZOT1E>
2. Microcontroller- <https://www.youtube.com/watch?v=l9DC9ZpQ5yo>
3. Arduino Programming- [https://www.youtube.com/watch?v=OO\\_Jlz1qpDw](https://www.youtube.com/watch?v=OO_Jlz1qpDw)
4. IoT System- <https://www.youtube.com/watch?v=9KIHDew6bO4>
5. IoT Applications- <https://www.youtube.com/watch?v=91aXs9E0qAI>

**Online Courses:**

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

**Suggested Skill Activities:**

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



<b>Course Code:</b>	<b>24CS301</b>	<b>Course Title:</b>	<b>PROGRAMMING FOR PROBLEM SOLVING USING PYTHON</b>
<b>Credits:</b>	<b>1.5</b>	<b>L – T – P</b>	<b>0-0-3</b>
<b>Pre-requisite</b>			<b>NIL</b>

**Course objectives:**

To impart knowledge on the

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

**Teaching-Learning Process:**

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

9. Lab experiment videos
10. Project based Learning

**Laboratory Component:****[20 hours]**

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

**Course outcomes:**

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

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

**COs and POs Mapping**

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

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

**Scheme of Evaluation:**

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

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

<b>Course Code:</b>	<b>24GE231</b>	<b>Course Title:</b>	<b>WORKSHOP PRACTICE</b>
<b>Credits:</b>	<b>1.5</b>	<b>L – T – P</b>	<b>0-0-3</b>
<b>Pre-requisite</b>			<b>NIL</b>

**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)**

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

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

**GROUP – B (Electrical, Electronics and IT)**

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

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

<b>PART V COMPUTER SCIENCE AND ENGINEERING PRACTICES</b>		<b>[3 hours]</b>
6.	<b>INTERACTIVE DYNAMIC WEBSITE</b> 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:

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

**COs and POs Mapping:**

<b>COs</b>	<b>PO</b>												<b>PSO</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO1</b>	3	2	1	1	2	-	-	-	1	1	-	1	3	2	1
<b>CO2</b>	3	2	1	1	2	-	-	-	1	1	-	1			
<b>CO3</b>	3	2	1	1	2	-	-	-	1	1	-	1			
<b>CO4</b>	3	2	1	1	2	-	-	-	1	1	-	1	1	-	-
<b>CO5</b>	3	2	1	1	2	-	-	-	1	1	-	1			
<b>CO6</b>	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
4.	<b>Continuous Internal Examination(CIE)- Laboratory</b>	Continuous Assessment	75	75	100	60
5.		Model Lab Exam	25	25		
6.	<b>End Semester Examination (ESE)</b>	Lab Exam	100	40	40	40
					<b>Total</b>	100

**Text Books:**

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

**Reference Books:**

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

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

**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

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

<b>UNIT II</b>		<b>[12 hours]</b>
<b>LIST OF EXERCISES</b>		
<b>LAB ACTIVITIES</b>		
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
<b>CLASSROOM ACTIVITIES</b>		
1	Speaking - Just a minute talk and expressions for plans and decisions	3
2	Describing a product	3

<b>UNIT III</b>		<b>[12 hours]</b>
<b>LIST OF EXERCISES</b>		
<b>LAB ACTIVITIES</b>		
Sl. No.	Topic	Hours
1.	Listening to TED talks, scientific lectures.	3
2.	Reading Comprehension strategies	2
3.	Reading- Editorials	2
<b>CLASSROOM ACTIVITIES</b>		
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

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

<b>UNIT V</b>		<b>[12 hours]</b>
<b>LIST OF EXERCISES</b>		
<b>LAB ACTIVITIES</b>		
Sl. No.	Topic	Hours
1.	Prepare PowerPoint presentation (topics selected by	3



	students)	
2.	Reading newspaper articles	2
<b>CLASSROOM ACTIVITIES</b>		
1.	Present the selected topic.	3
2.	Making a short speech / Extempore	2
3.	Writing - Expanding a Proverb Writing Instructions	2

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

**Course Outcomes:**

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

CO No.	Course Outcomes	Cognitive Domain
CO1	Build communicative competence through critical listening skills.	K3
CO2	Make use of critical thinking skills to express plans and opinions.	K3
CO3	Apply stress as well as tonal variations for effective communication.	K3
CO4	Make use of language skills to produce error free sentences.	K3
CO5	Experiment with presentation skills to address confidently.	K3

**COs and POs Mapping:**

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

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

**Assessment Pattern:**

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

**Textbooks:**

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

**Reference Books:**

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

**MANUALS/ SOFTWARE:** Open Sources / Websites