

**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**



**BE. Mechanical Engineering**  
**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 inculcate competence in the field of mechanical engineering for the students by providing quality education and learning opportunities to become ethically strong engineers for the development of society.

**Mission of the Department**

To provide fundamentals and technical skills in Mechanical Engineering through effective teaching-learning methodologies.

To provide an ambience for research through collaborations with industry and academia.

To inculcate the students' leadership quality through employability skills with ethical values.

## PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- PEO1 Graduates will apply the knowledge of Mechanical Engineering concepts and innovative methods to solve real-world engineering problems.
- PEO2 Graduates will have the required qualities for a successful carrier in Mechanical Engineering and related fields.
- PEO3 Graduates will exhibit professional skills with ethical values and teamwork.



## PROGRAMME OUTCOMES (POs)

PO1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	<b>Design/development of solutions:</b> 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	<b>Conduct investigations of complex problems:</b> 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	<b>Modern tool usage:</b> 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	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	<b>Communication:</b> 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	<b>Project management and finance:</b> 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	<b>Life-long learning:</b> 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 Courses (PCC)	59
5	Professional Electives Courses (PEC)	18
6	Open Electives Courses (OEC)	12
7	Employability Enhancement Courses (EEC)	17
8	Mandatory Courses (MNC)	-
Total Credits		169

Humanities and Social Science (HSS)							
Sl.no	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24GE101	Heritage of Tamils	HSS	1	0	0	1
2.	24EN101	English for Engineers	HSS	2	0	1	2.5
3.	24GE201	Tamil and Technology	HSS	1	0	0	1
4.	24EN231	Presentation and Language Skills Laboratory	HSS	0	0	3	1.5
5.	24MG601	Product Innovation & Entrepreneurship	HSS	2	0	0	2
6.	24GE701	Professional Ethics and Human Values	HSS	2	0	0	2
7.	24ME701	Industrial Engineering & Psychology	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 Transforms	BSC	3	1	0	4
5.	24PH202	Applied Material Science	BSC	3	0	0	3
6.	24CY401	Environmental Science and Engineering	BSC	2	0	0	2

7.	24MA302	Probability, Statistics and Numerical Methods	BSC	4	0	0	4
<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.	24EE201	Fundamentals of Electrical Engineering	ESC	2	0	4	4
3.	24ME301	Engineering Mechanics	ESC	3	1	0	4
4.	24CS201	Programming for Problem Solving Using C	ESC	2	0	4	4
5.	24EC201	Fundamentals of Electronics Engineering	ESC	2	0	2	3
6.	24GE231	Workshop Practice	ESC	0	0	3	1.5
7.	24CS331	Programming for Problem Solving In Python	ESC	0	0	3	1.5
8.	24EE404	IoT-Sensors and Devices	ESC	3	0	2	4
<b>Professional Core Courses (PCC)</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24ME302	Engineering Thermodynamics	PCC	3	0	0	3
2.	24ME304	Kinematics of Machinery	PCC	3	0	0	3
3.	24ME305	Fluid Mechanics & Hydraulic Machines	PCC	3	0	2	4
4.	24ME306	Engineering Materials & Metallurgy	PCC	2	0	2	3
5.	24ME307	Manufacturing Processes	PCC	3	0	2	4
6.	24ME401	Thermal Engineering	PCC	3	0	2	4
7.	24ME402	Mechanics of Materials	PCC	3	0	2	4
8.	24ME403	Metrology & Measurements	PCC	2	0	2	3
9.	24ME404	Machine Tools and Machining	PCC	3	0	2	4
10.	24EC501	Microprocessors, Microcontrollers and Interfacing Techniques	PCC	3	0	2	4
11.	24ME501	Dynamics of Machinery	PCC	3	0	2	4
12.	24ME502	Heat and Mass Transfer	PCC	3	0	2	4
13.	24ME601	Design of Machine Elements	PCC	3	0	0	3

14.	24ME602	Mechatronics, Robotics & Control	PCC	3	0	2	4
15.	24ME631	Computer Aided Modelling and Assembly Laboratory	PCC	0	0	2	1
16.	24ME702	Design of Transmission Systems	PCC	3	0	0	3
17.	24ME703	Finite Element Analysis	PCC	3	0	2	4
<b>Professional Electives Courses (PEC)</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
<b>Professional Elective- I (Materials And Design Stream)</b>							
1.	24ME571	Foundation Skills In Integrated Product Development	PEC	3	0	0	3
2.	24ME572	Engineering Optimization	PEC	3	0	0	3
3.	24ME573	Bio-Materials	PEC	3	0	0	3
4.	24ME574	Micro And Nano Electro-Mechanical Systems	PEC	3	0	0	3
5.	24ME575	Geometric Modeling	PEC	3	0	0	3
6.	24ME576	Composite materials	PEC	3	0	0	3
<b>PROFESSIONAL ELECTIVE- II (Automotive ENGINEERING STREAM)</b>							
1.	24ME581	Intelligent Vehicle System	PEC	3	0	0	3
2.	24ME582	Automotive Testing	PEC	3	0	0	3
3.	24ME583	Electric And Hybrid Vehicle Systems	PEC	3	0	0	3
4.	24ME584	Automotive Electronic Systems	PEC	3	0	0	3
5.	24ME585	Automotive Emission & NVH Control	PEC	3	0	0	3
6.	24ME586	Automotive Styling	PEC	2	0	2	3
<b>PROFESSIONAL ELECTIVE- III (THERMAL STREAM)</b>							
1.	24ME671	Computational Fluid Dynamics	PEC	2	0	2	3
2.	24ME672	Refrigeration And Air Conditioning	PEC	2	0	2	3
3.	24ME673	Energy Conversion Technologies	PEC	2	0	2	3
4.	24ME674	Renewable Energy	PEC	2	0	2	3
5.	24ME675	Design Of Heating And Ventillation Systems	PEC	2	0	2	3



6.	24ME676	Gas Dynamics And Jet Propulsion	PEC	2	0	2	3
<b>PROFESSIONAL ELECTIVE- IV (MANUFACTURING STREAM)</b>							
1.	24ME681	Pneumatic And Hydraulic Systems	PEC	2	0	2	3
2.	24ME682	Additive Manufacturing	PEC	2	0	2	3
3.	24ME683	Computer Integrated Manufacturing	PEC	2	0	2	3
4.	24ME684	Advance In Welding Technology	PEC	2	0	2	3
5.	24ME685	Non-Destructive Testing	PEC	2	0	2	3
6.	24ME686	Intelligent Manufacturing	PEC	2	0	2	3
<b>PROFESSIONAL ELECTIVE- V (INDUSTRIAL ENGINEERING STREAM)</b>							
1.	24ME771	Statistical Quality Control	PEC	3	0	0	3
2.	24ME772	Operation Research	PEC	3	0	0	3
3.	24ME773	Supply Chain Management	PEC	3	0	0	3
4.	24ME774	Total Quality Management	PEC	3	0	0	3
5.	24ME775	Product Development And Management	PEC	3	0	0	3
6.	24ME776	Digital Marketing	PEC	3	0	0	3
<b>PROFESSIONAL ELECTIVE- VI (ROBOTICS &amp;AUTOMATION STREAM)</b>							
1.	24ME781	Industry 4.0	PEC	3	0	0	3
2.	24ME782	Industrial Robotics	PEC	3	0	0	3
3.	24ME783	Industrial Automation	PEC	3	0	0	3
4.	24ME784	Industrial Networking	PEC	3	0	0	3
5.	24ME785	Virtual Instrumentation Systems	PEC	3	0	0	3
6.	24ME786	Material Handling Systems	PEC	3	0	0	3
<b>Open Electives Courses (OEC)</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
<b>OPEN ELECTIVE-I (Artificial Intelligence and Computer science and Engineering)</b>							
1.	24AI601	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3
2.	24AI602	Business Intelligence and Its Applications	OEC	3	0	0	3



3.	24AI603	Data Science Fundamentals	OEC	3	0	0	3
4.	24CS601	Augmented Reality / Virtual Reality	OEC	3	0	0	3
5.	24CS602	Full Stack Development	OEC	3	0	0	3
6.	24CS603	Software Testing and Quality Assurance	OEC	3	0	0	3
7.	24CS604	Cloud Computing	OEC	3	0	0	3
<b>OPEN ELECTIVE-II (Civil and Agricultural Engineering)</b>							
1.	24AG601	Principles of Crop Production	OEC	3	0	0	3
2.	24AG602	Dairy and Food Engineering	OEC	3	0	0	3
3.	24AG603	Post-Harvest Technology	OEC	3	0	0	3
4.	24AG604	Agricultural Finance, Banking and Co-operation	OEC	3	0	0	3
5.	24CI601	Rural Development	OEC	3	0	0	3
6.	24CI602	Geographic Information System	OEC	3	0	0	3
7.	24CI603	Water Resources management	OEC	3	0	0	3
8.	24CI604	Climate Change and its Impact	OEC	3	0	0	3
<b>OPEN ELECTIVE-III (Bio Medical and Electrical Engineering)</b>							
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 (Electronics and Communication and Instrumentation)</b>							
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.	24EC506	Fiber Optic Sensors	OEC	3	0	0	3

5.	24MG701	Industrial Instrumentation	OEC	3	0	0	3
6.	24MG702	Process Automation and Control	OEC	3	0	0	3
7.	24MG703	Control Systems	OEC	3	0	0	3
8.	24MG704	Micro Electromechanical Systems	OEC	3	0	0	3
<b>Employability Enhancement Courses (EEC)</b>							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24ME351	Mini Project – I (Introduction to Innovative Projects)	EEC	0	0	2	1
2.	24ME451	Mini Project – II (Design and development of the product)	EEC	0	0	2	1
3.	24EN451	Soft Skills Development	EEC	0	0	2	1
4.	24ME551	Mini Project – III (Community based Project)	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.	24ME651	Mini Project-IV (Micro Project)	EEC	0	0	2	1
8.	24GE651	Quantitative and Reasoning Skills-II	EEC	0	0	2	1
9.	24ME751	Project Work Phase- I (Design & Analysis)	EEC	0	0	4	2
10.	24ME752	Industrial Training / Internship	EEC	0	0	0	2
11.	24ME851	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	Constitutions of India	MNC	1	0	0	1#

# denotes no credit

### Recommended Courses for I<sup>st</sup> SEMESTER

S. No.	Course Code	Course Title	Course Category	L	T	P	C
<b>THEORY COURSES</b>							
1.	24GE101	தமிழர் மரபு /Heritage of Tamils	HSS	1	0	0	1
2.	24MA101	Matrix and calculus	BSC	3	1	0	4
<b>INTEGRATED COURSES</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.	24EE101	Fundamentals of Electrical Engineering	ESC	2	0	4	4
<b>MANDATORY COURSES</b>							
8.	24MC101	Induction Programming	MNC	Three Weeks			
<b>Total</b>				<b>14</b>	<b>1</b>	<b>15</b>	<b>22.5</b>

Recommended Courses for II<sup>nd</sup> SEMESTER

S. No.	Course Code	Course Title	Course Category	L	T	P	C
<b>THEORY COURSES</b>							
1.	24GE201	தமிழரும் தொழில்நுட்பமும் / Tamil and Technology	HSS	1	0	0	1
2.	24MA201	Complex Variables and Transforms	BSC	4	0	0	4
3	24PH202	Applied Material Science	BSC	3	0	0	3
4	24CY401	Environmental Science and Engineering	BSC	2	0	0	2
5	24ME301	Engineering Mechanics	ESC	3	1	0	4
<b>INTEGRATED COURSES</b>							
6	24CS201	Programming For Problem Solving Using C	ESC	2	0	4	4
7	24EC201	Fundamentals of Electronics Engineering	ESC	2	0	2	3
<b>LABORATORY COURSES</b>							
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 - I	MNC	0	0	2	0
11	24MC202	NCC Credit Course Level - I	MNC	1	0	2	1#
		<b>Total</b>		<b>17</b>	<b>1</b>	<b>12</b>	<b>24</b>



பாடநெறி குறியீடு:	24GE101	பாடத்தின் தலைப்பு:	தமிழர்மரபு
கிரெடிட்	1	L - T - P	1-0-0

**பாடத்திட்ட நோக்கங்கள்:**

1. தமிழின் மதச்சார்பற்ற தன்மை, இந்திய மொழிக் குடும்பத்தின் திராவிட மொழி, திருக்குறளின் கருத்துக்கள், சமயங்களின் தாக்கம், நவீன இலக்கிய வளர்ச்சி ஆகியவற்றை நினைவு கூர்தல்.
2. தமிழர்களின் சமூக மற்றும் பொருளாதார வாழ்வில் நடுகல், சிற்பங்கள், சிலைகள் மற்றும் அழகிய கைவினைப் பொருட்கள், இசைக்கருவிகள் ஆகியவற்றின் தொடர்புடைய அறிவைக் கோடிட்டுக் காட்டுதல்.
3. தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகளை மனதில் பதிய வைத்தல்.
4. தமிழ்நாட்டின் தாவரங்கள் மற்றும் விலங்கினங்கள், சங்க நகரங்கள் மற்றும் துறைமுகங்கள், சங்க காலத்தின் ஏற்றுமதி மற்றும் இறக்குமதிகளை நினைவுபடுத்துதல், வெளிநாடுகளில் சோழர் படையெடுப்பைக் கண்டறிதல்.
5. இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கைக் கண்டறிதல், இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்குக்கு இணையாக இந்தியாவின் பிற பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கத்தை அடையாளம் காணுதல்.

<b>அலகு I மொழி மற்றும் இலக்கியம்:</b>	[3hours]
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம்- பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.	
<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, கையெழுத்துப்படிக்கள் - 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 என்ற 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

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

பாடநெறி முடிவுகள் மற்றும் நிரல் முடிவுகள் ஒப்பிடுதல்

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

மதிப்பீட்டு முறை

ப்ளூமின் வகை	தொடர்ச்சியான மதிப்பீட்டு சோதனைகள்		இறுதி தேர்வு
	1	2	
நினைவில் கொள்ளுதல்	60	50	60
புரிந்து கொள்ளுதல்	40	50	40
விண்ணப்பித்தல்	0	0	0
பகுப்பாய்வுதல்	0	0	0
மதிப்பீடுதல்	0	0	0
உருவாக்குதல்	0	0	0

இறுதி பருவ தேர்வு: (கேள்வி முறை)

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

TEXT BOOKS

1. தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும் கல்வியியல்பணிகள்கழகம் ).
2. கணினித்தமிழ் -முனைவர் இல. சுந்தரம். (விகடன்பிரசுரம்).
3. கீழடி - வைகைநதிக்கரையில் சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4. பொருநை - ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.



**REFERENCE BOOKS**

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

<b>Course Code:</b>	<b>24MA101</b>	<b>Course Title:</b>	<b>Matrices and calculus</b> (Common to AI&DS, Agri, Biomedical, Civil, 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>
Eigenvalues, Eigenvectors and their properties – Diagonalization of a matrix (Symmetric matrix) – Cayley - Hamilton theorem (without proof) – Inverse and Power of a matrix by Cayley - Hamilton theorem – Quadratic forms and Nature of quadratic forms.  Application: Reduction of a quadratic form to canonical form by orthogonal transformation.	

<b>UNIT II – Differential Calculus</b>	<b>[12 hours]</b>
Functions – Limit – Continuity – Derivatives – Differentiation rule – Product and quotient rules – Chain rules – Implicit differentiation – Logarithmic differentiation.  Application: Maxima and Minima of functions of one variable	

<b>UNIT III – Functions of Several Variables</b>	<b>[12 hours]</b>
Partial differentiation – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables.  Application: Maxima and Minima of functions of two variables using MATLAB - Lagrange's method of undetermined multipliers.	

<b>UNIT IV – Integral Calculus</b>	<b>[12 hours]</b>
Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Bernoulli's theorem (without proof) – Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.  Application: Area between simple closed curves.	

<b>UNIT V – Multiple Integrals</b>	<b>[12 hours]</b>
Double integrals – Double integrals in cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves – Triple integrals – Change of variables in double and triple integrals.  Application: Volume of solids, Mass of Lamina	

**Course outcomes:**

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

COs	Course Outcome	Cognitive domain
CO1	Apply the matrix algebraic techniques for eigen value related applications	K3
CO2	Understand the concepts of limit and continuity of functions	K2
CO3	Compute the derivatives and the extreme points and solve engineering problems	K3
CO4	Use the partial derivatives to find the maxima and minima of multivariable functions	K3
CO5	Use fundamental theorem of calculus to evaluate definite integrals	K3
CO6	Apply the concepts of multiple integrals to find the areas and volumes of geometrical shapes	K3

**COs and POs Mapping:**

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

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

**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>1-0-3</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 / Animated stories / Anecdotes / Event narration	3
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>		
<b>Sl. No.</b>	<b>Topic</b>	<b>Hours</b>
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 Presentations)	2
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>		
<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 Level</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:**

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

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

**Scheme of Evaluation:**

Component	Type of assessment	Max. Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - <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>CourseCode</b>	<b>24CY101</b>	<b>Course Title:</b>	<b>Engineering Chemistry (Common to ALL Branches)</b>
<b>Credits:</b>	<b>4</b>	<b>L – T – P</b>	<b>3-0-2</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-1 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-2  CHEMISTRY OF ENGINEERING MATERIALS</b>	<b>[9 hours]</b>
<p><b>Adhesives:</b> Introduction- requisites of a good adhesive-adhesive action- industrial applications of adhesives.</p> <p><b>Insulating Materials:</b> Introduction- requirements- Glass and ceramics - preparation, properties and applications - fabrication of ceramic ware.</p> <p><b>Lubricants</b>-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><b>Electronic materials:</b> 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-3  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><b>Electrodes:</b> Construction, working and applications of Standard and reference electrode (Hydrogen &amp; Calomel) – Ion selective (glass electrode) – determination of pH using glass electrode.</p> <p>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>	

**Practical Topics:**

1. Estimation of strength of hydrochloric acid by pHmetry.
2. Determination of strength of acids in a mixture of acids using conductivity meter.
3. Determination of charging and discharging rate of batteries.

**UNIT-4****[9 hours]****CORROSION AND ITS CONTROL**

Corrosion – causes, factors, types, Chemical and Electrochemical Corrosion (Galvanic, Differential aeration) –galvanic series-factors influencing rate of corrosion-measurement of corrosion. Determination of corrosion rate by weight loss method.

Control Methods-Electrochemical protection – Sacrificial Anodic method – Impressed Current Cathodic Protection – Corrosion Inhibitors – Bio corrosion Protective Coatings – Paints, Constituents, Functions- Surface coating - Surface preparation for metallic coatings, Electroplating and Electro-less Plating- ceramic coatings, thermal vaporization coating, HVOF coating

**Practical Topics:**

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

**UNIT-5****[9 hours]****FUELS AND COMBUSTION**

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

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	Highest 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

COs	Highest Cognitive Level	POs											
		1	2	3	4	5	6	7	8	9	10	11	12
CO1	K4	3	2	-	-	-	1	-	-	-	-	-	-
CO2	K3	3	2	1	1	-	-	-	-	-	-	-	-
CO3	K4	3	2	1	1	-	-	-	-	-	-	-	-
CO4	K3	2	1	1	-	-	1	2	-	-	-	-	-
CO5	K3	3	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	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>	10	10	10
<b>Understand</b>	30	30	30
<b>Apply</b>	40	40	40
<b>Analyze</b>	20	20	20
<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. 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>



**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>
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Drawing BIS standards – Orthographic projections – First angle projection - Drawing instruments – Sheet layout – Conventions – Lines, Lettering, Numbering and Dimensioning

Geometric construction – Construction of regular polygons – Conic sections – Ellipse, Parabola and Hyperbola by eccentricity method.

Projection of points – Points situated in all four quadrants.

Projection of straight lines – Straight lines inclined to both principal planes – Finding true length of the line and true inclinations with respect to principal planes – Rotating line method.

Projection of planes – Introduction – Polygonal lamina and Circular lamina - Orientation of planes - Plane parallel to both principal planes, Planes perpendicular to both principal planes and Planes inclined to both principal planes – Rotating object method.

Orthographic projection of simple engineering components.

<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.</p> <p>Pictorial Projection – Isometric projection – Introduction – Isometric scale – Isometric view of two right regular composite solids – Isometric projection of truncated frustum of solids – Box method. 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.</p> <p>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><b>Electric Wiring and lighting diagrams</b> - Like, Automatic fire alarm, Call bell system, UPS system, Basic power distribution system using suitable software.</p> <p><b>Basic Building Drawing</b> - 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><b>Electronics Engineering Drawings</b> - Like, Simple Electronics Circuit Drawings, practice on layers concept.</p>	

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

**Course outcomes:**

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

<b>CO1</b>	Apply principles of first angle projection in drafting plan and elevation of points, lines, planes, and solids.	K3
<b>CO2</b>	Apply change of position method in the projection of solids and determine the true shape of the section.	K3
<b>CO3</b>	Apply principles of orthographic projection to extract 2D views from 3D drawing using freehand sketching.	K3
<b>CO4</b>	Apply parallel line and radial line methods to develop lateral surfaces of solids so that students can understand applications in sheet metal design.	K3
<b>CO5</b>	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

**COs and POs Mapping:**

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	P O8	P O9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 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

### Assessment Pattern

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

### End semester Examination: (QP PATTERN)

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

### Text Books:

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

**Reference Books:**

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

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

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

**Publication of Bureau of Indian Standards:**

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

**LABORATORY REQUIREMENTS**

**SYSTEM REQUIREMENTS (For a batch of 30 Students)**

**Hardware:**

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

**Software:**

Drafting package – AutoCAD – Adequate license (Open source)

**Suggested Skill Activities:**

1. 2D drafting of plan and elevation of computer CPU.
2. 2D drafting of plan and elevation of a thermos flask.

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

<b>Course Code:</b>	<b>24EE101</b>	<b>Course Title:</b>	<b>Fundamentals of Electrical Engineering</b>
<b>Credits:</b>	<b>4</b>	<b>L – T – P</b>	<b>3-0-2</b>

**Course objectives:**

To impart knowledge on the

- Basics of DC electric circuits
- Concepts of AC circuits and magnetic circuits
- Working principle of electrical machines
- Working principle of transformers and special machines
- Sensors used for IoT and Automation

**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 –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>
Representation of sinusoidal waveform – peak and rms values, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations – Converters: rectifiers and inverters; Basics of magnetic circuits – Flux – Flux density – Magnetic resonance – Self-inductance – mutual-inductance – Coupling.	
Practical Topics:	
<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 – Electrical Machines</b>	<b>[9 hours]</b>
Selection of Motor- DC Motor and DC Generator - Construction - Principle of operation - Speed control – Emf and Torque equations- Applications - Single-phase induction motors – Construction –Principle of operation- Types - Three phase Induction motors -Construction–Principle of Operation –Types.	
Practical Topics:	
<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 the load test on three phase induction motor to obtain its characteristics.</li> </ol>	

<b>UNIT IV – Transformers and Special Machines</b>	<b>[9 hours]</b>
Single phase transformer – Construction – Principle of Operation – Applications – Three phase transformer – Construction – Principle of Operation – Applications – Permanent Magnet Brushless	

DC motors – Stepper motor – Linear Induction motor – Hysteresis motor – Introduction to Electric Vehicle.
<p>Practical Topics:</p> <ol style="list-style-type: none"> <li>1. Interpret the study on the operation of single phase transformer for different constructions.</li> <li>2. Interpret the study on the operation of three phase transformer for different constructions.</li> <li>3. Outline the study on the operation of a stepper motor for different step angles.</li> </ol>

<b>UNIT V – Sensors and its Applications</b>	<b>[9 hours]</b>
Introduction – Protocols – Sensors in IoT – Mobile based sensors –Medical sensor – Neural sensor – Motion sensor – PIR sensor, Air quality sensor – CO <sub>2</sub> Sensor, RFID sensor, Water leakage detection sensor – Introduction to actuators in automation – Case studies: 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 12experiments have to be completed from the following list of experiments.

S.No.	Name of the Experiment
1	Model an electrical circuit and simulate it to verify Ohms Law.
2	Model an electrical circuit and simulate it to verify Kirchhoff's Voltage Law.
3	Model an electrical circuit and simulate it to verify Kirchhoff's Current Law.
4	Demonstrate the measurement of power in an RLC circuit using wattmeter method.
5	Interpret the DC output of an RLC circuit using half wave rectifier.
6	Interpret the DC output of an RLC circuit using full wave rectifier.
7	Conduct the load test on DC shunt motor to outline its characteristics.
8	Outline the study on the starting methods of DC series motor.
9	Conduct the load test on three phase induction motor to obtain its characteristics.
10	Interpret the study on the operation of single phase transformer for different constructions.
11	Interpret the study on the operation of three phase transformer for different constructions.

12	Outline the study on the operation of a stepper motor for different step angles.
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:

<b>CO1</b>	Apply the circuit laws and theorems to compute the electrical parameters of domestic and industrial appliances.	K3
<b>CO2</b>	Compare the behavior of AC circuits & magnetic circuits for a given input.	K3
<b>CO3</b>	Explain the construction, working, and application of rotating electric machines to infer its characteristics.	K2
<b>CO4</b>	Explain the working and applications of transformers and special machines.	K2
<b>CO5</b>	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
<b>CO2</b>	2	1	1	-	-	-	-	-	-	-	-	1
<b>CO3</b>	2	1	1	-	-	-	-	-	-	-	-	1
<b>CO4</b>	2	1	1	-	-	-	-	-	-	-	-	1
<b>CO5</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) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	40		
	Skill Assessment - I	40			
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
				Total	100



### Assessment Pattern

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

#### 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)

**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 mention its parts.
10. Visit nearby power plants and demonstrate the various components, working, power generation and distribution in power plants as a report.

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

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

**பாடநெறி முடிவுகள் (பாமு):**

பாடநெறியின் முடிவில், மாணவர் பின்வரும் திறன்களைப் பெறுவார்:

பாமு	பாடநெறி முடிவுகள்	மிக உயர்ந்த அறிவாற்றல் நிலை
அலகு I பாமு:	சங்க கால ஜவுளி தொழில் மற்றும் மட்பாண்ட தொழில்நுட்பம் பற்றி அறிவார்கள்.	கே 1
அலகு II பாமு:	சங்க கால கட்டுமானம், மேடை அமைப்பு, சிற்பங்கள், கோவில்கள், அம்மன் கோவில், திருமலை நாயக்கர் மஹால், செட்டிநாட்டு வீடுகள், இந்தோ-சராசனிக் கட்டிடக்கலை ஆகியவற்றை விவரிக்க இயலும்.	கே 2
அலகு III பாமு:	கப்பல் கட்டுதல், இரும்புத் தொழில், நாணயம் தயாரித்தல் மற்றும் மணி தயாரிக்கும் தொழில்கள் பற்றி அறிந்து கொள்கிறார்கள்.	கே 1
அலகு IV பாமு:	நீர்நிலைகளின் முக்கியத்துவம், கால்நடை வளர்ப்பு, கிணறு, விவசாயம், மீன்பிடி, முத்து மற்றும் முத்து கலாச்சாரம்	கே 1

	மற்றும் கடல் பற்றிய போதுமான அறிவை பெற்றுகொள்கிறார்கள் .	
அலகு V பாமு:	அறிவியல் தமிழின் வளர்ச்சி, தமிழ்க் கணிப்பொறியின் வளர்ச்சி, இணையத்தில் தமிழ் மென்பொருள் மேம்பாடு, தமிழ் அகராதிகளை சந்தேகம் இன்றி முழுமையாக தெரிந்து கொள்கிறார்கள்.	கே 1

## மதிப்பீட்டு முறை

ப்ளமின் 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

## பாடநெறி முடிவுகள் மற்றும் நிரல் முடிவுகள் ஒப்பிடுதல்

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

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

ஒத்துப்போதல், நிலை 0- ஒத்துப்போகவில்லை

## மதிப்பீட்டுத் திட்டம்:

கூறுகள்	மதிப்பீட்டின் வகை	அதிகபட்ச மதிப்பெண்கள்	குறைக்கப்பட்ட மதிப்பெண்கள்	இறுதி மதிப்பெண்கள்
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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 யூனிடும் இரண்டு 2 மதிப்பெண் வினாக்களையும் ஒரு 16 மதிப்பெண் வினாவையும் (இரண்டில் ஒன்று) கொண்டுள்ளது.
- பதினைந்து கேள்விகளுக்கும் பதிலளிக்க வேண்டும்.

### TEXT BOOKS

1. தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம் ).
2. கணினித்தமிழ் - முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).
3. கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4. பொருநை - ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).

### REFERENCE BOOKS

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



5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

6. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

<b>Course Code:</b>		<b>Course Title:</b>	<b>Complex Variables and Transforms</b> (Common to ALL branches)
<b>Credits:</b>	<b>4</b>	<b>L – T – P</b>	<b>3 – 1 – 0</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:

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

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

**COs and POs Mapping:**

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

**Scheme of Evaluation:**

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

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

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

**Assessment Pattern**

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

**Text Books:**

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill



Education Pvt. Ltd., New Delhi, Second reprint, 2012

4. Kandasamy. P., Thilagavathy. K, and Gunavathy. K, Engineering Mathematics Volume I & II, S. Chand & Co, New Delhi, 2005. Reference Books:

#### Equivalent NPTEL/SWAYAM Courses

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

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

1. Analytic Functions, C-R Equations:

<https://www.nptelvideos.com/lecture.php?id=13416>

2. Laplace Transform and its Existence:

<https://www.nptelvideos.com/lecture.php?id=13433>

3. Taylor's, Laurent Series of  $f(z)$  and Singularities:

<https://www.nptelvideos.com/lecture.php?id=13431>

4. Applications of Fourier Transform to PDEs:

<https://www.nptelvideos.com/lecture.php?id=13442>

Course Code	24PH202	Course Title:	APPLIED MATERIAL SCIENCE (Common to Mech,Civil & Agri)
Credits	3	L – T – P	3-0-0

#### Course objectives:

- To study the electrical properties of materials including electron theory of metals.
- To familiarize with the properties of semiconductors, determination of charge carriers and device applications.
- Equipping the students to understand the applications of magnetic materials and dielectric materials.
- To impart knowledge on the processing and applications of new engineering materials
- To motivate the students towards the different material testing methods

**Teaching-Learning Process:**

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

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

**UNIT I CONDUCTING MATERIALS****[9 hours]**

Classical free electron theory - Expression for electrical conductivity - Thermal conductivity, Wiede- Mann Franz law, Merits & Demerits of classical free Electron Theory - Quantum free electron theory - Electron in a metal – degenerate and non-degenerate states – Fermi- Dirac statistics– Density of energy states – Energy bands in solids – Electron effective mass.

**UNIT II SEMICONDUCTING MATERIALS****[9 hours]**

Direct and indirect band gap semiconductors – Intrinsic Semiconductors - Carrier concentration in intrinsic semiconductors - Variation of Fermi level with temperature – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of Fermi level with temperature – Hall effect and devices- Ohmic contacts– Schottky diode.

**UNIT III MAGNETIC AND DIELECTRIC MATERIALS****[9 hours]**

Magnetic materials – Classification (Dia , Para & Ferro) – Hysteresis – Ferrites - BaTiO<sub>3</sub> – Application of Nd-FeB magnets. Electric polarization – Different types of polarization – Temperature and frequency dependence –Dielectric loss and dielectric breakdown – dielectric materials applications - capacitors and transformers

**UNIT IV SMART MATERIALS****[9 hours]**

Metallic glasses - Shape memory alloys - Composites - Definition and Classification - Fiber reinforced plastics (FRP) and fiber reinforced metals (FRM) - Ceramics - Classification - Crystalline - Non Crystalline - Bonded - ceramics, Manufacturing methods - Slip casting - Isostatic pressing - Gas pressure

bonding - Properties - thermal, mechanical, electrical and chemical ceramic fiber- Applications of ceramics in electronics.

**UNIT V MATERIALS TESTING**

**[9 hours]**

Microscope-Magnification Power-Resolving Power-Optical & Electron Microscope-Difference between optical & Electron Microscope-Tunneling - Scanning Electron Microscope-Transmission Electron Microscope- Scanning Tunneling Microscope- hardness - Rockwell and Brinell hardness - Knoop and Vickers Micro hardness- spot test techniques

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

CO No	Course Outcomes	Level
<b>CO1</b>	Explain the electrical properties of materials.	K2
<b>CO2</b>	Apply the properties of semiconducting materials in electronics.	K3
<b>CO3</b>	Infer the properties of magnetic and dielectric materials for relevant electrical and electronics engineering applications.	K2
<b>CO4</b>	Utilize the smart materials in the field of Engineering..	K3
<b>CO5</b>	Make use of different testing methods for analyzing the properties of materials.	K3

**COs and POs Mapping**

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

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



**Scheme of Evaluation:**

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

**Assessment Pattern**

Bloom's Category	Continuous Internal Examination		End semester Examination
	1	2	
<b>Remember</b>	20	20	20
<b>Understand</b>	60	40	40
<b>Apply</b>	20	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 and one 16 marks question (either or).
- All the fifteen questions have to be answered

**TEXT BOOKS:**

- 1.S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education(Indian Edition), 2020.
- 2.R.F.Pierret. Semiconductor Device Fundamentals. Pearson (Indian Edition), 2006.
3. O.P.Khanna. "Materials Science and metallurgy: Dhanpat Rai Publications,2011

**REFERENCE BOOKS:**

1. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-HillEducation (Indian Edition), 2019.
2. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGrawHill (Indian Edition), 2017.

**NPTEL COURSE:**

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

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

1. Electrical Conductivity: <https://www.youtube.com/watch?v=QvPSVwzU-8A>
2. Band Theory of solids: [https://www.youtube.com/watch?v=qcE2Wcpm05k&ab\\_channel=npTELhrd](https://www.youtube.com/watch?v=qcE2Wcpm05k&ab_channel=npTELhrd)
3. Intrinsic semiconductor: <https://www.youtube.com/watch?v=JZN3DAaeOB8>
4. Brinell Hardness Test: <https://www.youtube.com/watch?v=TM487F4p-YM>
5. FRP: <https://www.youtube.com/watch?v=tyKtUoQo9VM&list=PLbMVogVj5nJTnVB Y4n36KHSPJsPDy38QS>

**Suggested Skill Activities:**

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

<b>Course Code:</b>	<b>24CY401</b>	<b>Course Title:</b>	<b>Environmental Science and Engineering</b>
<b>Credits:</b>	<b>2</b>	<b>L – T – P</b>	<b>2-0-0</b>

**Course objectives:**

To impart knowledge on the

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

**Teaching-Learning Process:**

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

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

<b>UNIT I - Ecology and Biodiversity</b>	<b>[6 hours]</b>
Definition, scope and importance of environment – need for public awareness – concept of an ecosystem - Biodiversity and its values- Biodiversity at global, national and local level- India as a mega-diversity nation – hotspots of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	
<b>UNIT II - Water resources and Environment microbiology</b>	<b>[6 hours]</b>
Water resources: Use and over- utilization of surface and groundwater – dams benefits and problems, conflicts over water – Water availability at global level, surface level, ground level- Sources- Hydroponics - Classification of microorganism – Role of microorganism in waste water treatment- Bacterial nutrition and growth.	
<b>UNIT III - Air and Noise pollution</b>	<b>[6 hours]</b>
Sources and classification of air pollutants and their effect on human health- Ambient air quality and emission standards- Air pollutants- Particulate matters- Control equipments- Gravity separator- Centrifugal separator- fabric filter- Electrostatic separator, Catalytic convertors – Noise pollution- causes – Consequences- Control measures- modern tools used in pollution mitigation measures- sustainable activity of pollution control- recent case studies - Environmental Protection Act.	



<b>UNIT IV- Solid waste and Hazardous waste management</b>	<b>[6 hours]</b>
Soil contaminants–sources and management methods of -Solid Waste Hazardous waste – Plastic waste- -Biomedical waste- Hazardous waste& E-waste management -Case studies on Occupational Health and Safety Management system (OHASMS).	
<b>UNIT V-Environmental management and Sustainable development</b>	<b>[6 hours]</b>
Renewable and non-renewable energy Sources- Energy Policies- Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment-Sustainable goals -Sustainable habitat- Green buildings, Green materials, Energy efficiency, Sustainable transports. Carbon emission-Carbon footprint-Carbon Sequestration.	

**Course outcomes:**

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

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

**COs and POs Mapping:**

COs	Highest Cognitive Level	POs											
		1	2	3	4	5	6	7	8	9	10	11	12
<b>CO1</b>	K2	1	-	-	-	-	1	1	-	-	-	-	-
<b>CO2</b>	K2	2	1	-	-	-	1	1	-	-	-	-	-
<b>CO3</b>	K3	2	-	-	-	-	1	2	1	-	-	-	-
<b>CO4</b>	K3	1	-	-	-	-	2	2	1	-	-	-	-
<b>CO5</b>	K2	1	-	-	-	-	1	2	1	-	-	-	-

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

**Scheme of Evaluation:**

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

**Assessment Pattern**

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
<b>Remember</b>	20	20	20
<b>Understand</b>	60	40	40
<b>Apply</b>	20	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 and one 16 marks question (either or).
- All the fifteen questions have to be answered.

**Text Books:**

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

**Reference Books:**

1. Dharmendra S.Sengar, ‘Environmental law ‘, Prentice hall of India Pvt Ltd, New Delhi, (2007).

2. Erach Bharucha, “Textbook of Environmental Studies”, Universities Press (I) Pvt, Ltd, Hyderabad, (2015).
3. G.TylerMiller,Scott E.Spoolman,“Environmental Science”,Cengag Learning IndiaPvt.Ltd,Delhi, (2014).
4. Mahuabasu, Xavier saverimuthu, “Fundamentals of Environmental Studies”, Cambridge university press,(2017)
5. Anubha Kaushik , C.P. Kaushik, “Perspectives in Environmental Studies”, New Age International Pvt. Ltd, New Delhi, (2004).
6. Frank R. Spellman, “Handbook of EnvironmentalEngineering”, CRC Press, (2015).

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

1. Ecology and Society: [https://onlinecourses.nptel.ac.in/noc24\\_hs149/preview](https://onlinecourses.nptel.ac.in/noc24_hs149/preview)
2. Sustainable Power Generation Systems: [https://onlinecourses.nptel.ac.in/noc24\\_ge54/preview](https://onlinecourses.nptel.ac.in/noc24_ge54/preview)
3. Environment and Development: [https://onlinecourses.nptel.ac.in/noc24\\_hs150/preview](https://onlinecourses.nptel.ac.in/noc24_hs150/preview)

**Suggested Skill Activities:**

1. Why is it beneficial to follow a student centered and participatory process for environmental education?
2. Identify the endemic species of flora and fauna found nearest to your locality.
3. List the major arguments cited against the construction of dams.
4. Discuss how the symbiotic relationship between algae and bacteria is useful in the treatment of sewage in an oxidation pond.
5. List the various ways in which an individual can contribute towards pollution prevention in the society.
6. Mention any four hazardous wastes originating from households and explain their management strategies.
7. Conduct a survey and find out how chemicals and various material are distributed /cycled in your campus.
8. List the common organic materials that are suitable and unsuitable for composting.
9. List the advantages of recycling of MSW with examples.
10. What are the major obstacles in the implementation of incineration technology in developing countries.



<b>Course Code:</b>	<b>24ME301</b>	<b>Course Title:</b>	<b>Engineering Mechanics</b>
<b>Credits:</b>	<b>4</b>	<b>L – T – P</b>	<b>3-1-0</b>

**Course objectives:**

To impart knowledge on the

- To Learn the use scalar and vector analytical techniques for analysing forces in statically determinate structures
- To introduce the equilibrium of rigid bodies, vector methods and free body diagram
- To study and understand the properties of surfaces and solids.
- To learn the principles of friction, forces and apply the concepts of frictional forces at the contact surfaces of various engineering systems.
- To develop basic dynamics concepts – force, momentum, work and energy

**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 – Statics of Particles</b>	<b>[9+3 hours]</b>
<p>Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles - Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams.</p>	

<b>UNIT II – Equilibrium of Rigid Bodies</b>	<b>[9+3 hours]</b>
Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon’s Theorem, Rectangular Components of the Moment of a Force, Distributed Loads on Beams, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two Dimensions - Reactions at Supports.	

<b>UNIT III – Properties of Surfaces and Solids</b>	<b>[9+3 hours]</b>
Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Centre of Gravity of a Three-Dimensional Body, Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates.	

<b>UNIT IV – Friction</b>	<b>[9+3 hours]</b>
The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction, Belt friction.	

<b>UNIT V – Dynamics of Particles</b>	<b>[9+3 hours]</b>
Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton’s Second Law of Motion-Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.	

**Course outcomes:**

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

<b>CO1</b>	Illustrate the vector and scalar representation of forces and moments of particles	K2
<b>CO2</b>	Draw the free body diagram and apply equilibrium principle for two dimensional rigid bodies.	K2
<b>CO3</b>	Determine the centroid and moment of inertia of various surface and solids.	K3
<b>CO4</b>	Apply the friction and its effects by the laws of friction	K3
<b>CO5</b>	Apply fundamental principle to solve the problem in dynamics of particles and rigid bodies.	K3

**COs and POs Mapping:**

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

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

**Scheme of Evaluation:**

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

**Assessment Pattern**

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

**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. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 12thEdition, 2019.
2. Vela Murali, “Engineering Mechanics-Statics and Dynamics”, Oxford University Press, 2018.
3. Kottiswaran N “Engineering Mechanics-Statics and Dynamics”, Pearson Education,.

**Reference Books:**

1. Boreasi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2. Hibbeler, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
3. Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4thEdition, Pearson Education Asia Pvt. Ltd., 2005.
4. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
5. Timoshenko S, Young D H, Rao J V and SukumarPati, Engineering Mechanics, 5thEdition, McGraw Hill Higher Education, 2013.
6. Bansal R K., Engineering Mechanics-Statics and Dynamics, Revised 7th Edition, Laxmi Publications.

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

**1. NPTEL: Engineering Mechanics**

<https://archive.nptel.ac.in/courses/112/106/112106286/>

**2. <https://www.iitg.ac.in/rkbc/me101/Presentation/L16-18.pdf>**

**Suggested Skill Activities:**

1. Force analysis on any stationary object
2. Force analysis of structures and structural components
3. Determination of centre of gravity of composite surfaces
4. Building different types of slopes for frictional applications
5. Force analysis on any moving object

<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>

**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>UNIT1 - 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>Practical Topics:</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> <li>2. Programs to illustrate the use of user-defined data types</li> </ol>	
<b>UNIT II – BASIC CONSTRUCTS IN C</b>	<b>[6 hours]</b>
<p>Managing simple Input and Output operations - Operators and Expressions - Decision Making:</p>	

Branching statements, looping statements - Function: Declaration, Definition - Passing arguments by value - Recursion - Storage classes	
Practical Topics: <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	
Practical Topics: <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	
Practical Topics: <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	
Practical Topics: <ol style="list-style-type: none"> <li>4. Programs to implement structures</li> <li>5. Programs to implement union</li> <li>6. 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:

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

**COs and POs Mapping**

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

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

**Scheme of Evaluation:**

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

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

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

**Assessment Pattern**

Bloom's Category	Continuous Internal Examination		End Semester Examination
	1	2	
<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)

<b>Course Code:</b>		<b>Course Title:</b>	<b>Fundamentals of Electronics Engineering</b>
<b>Credits:</b>	<b>3</b>	<b>L – T – P</b>	<b>2-0-2</b>
<b>Pre-requisite</b>			<b>NIL</b>

**Course objectives:**

To impart knowledge on the

- Semiconductor devices and applications
- Fundamentals of digital electronics
- Basics of operational amplifiers and its applications
- Basic concepts of Microcontrollers.
- Interfacing of microcontrollers with 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 - Semiconductor Devices and Applications****[6 hours]**

PN Junction Diodes, V-I Characteristics – Half wave and full wave rectifiers- Physical operation of special diodes: LED, OLED, AMOLED, - Bipolar Junction Transistors – Construction, types, Configuration, BJT as a single stage common Emitter amplifier

**Practical Topics:**

1. Familiarize with lab instruments (Multi-meter/Power supply/CRO).
2. Plot V-I characteristics of a PN junction diode
3. Observe the wave shapes for the Half wave and full wave rectifier circuit.
4. Plot of input and output characteristics and calculation of parameters of transistors in CE configuration.

<b>UNIT II – Fundamentals of Digital Electronics</b>	<b>[6 hours]</b>
Logic gates – Combinational Logic: Boolean Algebra, Logic simplification using K- map, De Morgan's Theorem, Logic IC, Half Adder, Full Adder, Multiplexers, Demultiplexers- Sequential circuits- Shift Register, Counters	
Practical Topics:	
<ol style="list-style-type: none"> <li>1. Implementation of the given Boolean function using logic gates.</li> <li>2. Design and verify the truth table of a S-R and J-K flip-flop.</li> <li>3. Design and verify operation of half adder and full adder.</li> </ol>	
<b>UNIT III – Operational Amplifiers</b>	<b>[6 hours]</b>
Basic model; Virtual ground concept; Inverting Amplifier, Non-inverting Amplifier, Integrator, Differentiator, Summing Amplifier, Comparator - Analog to Digital Converter, Successive approximation type-Digital to Analog Converter, R-2R Ladder Networks.	
Practical Topics:	
<ol style="list-style-type: none"> <li>1. Verify the operation of an op-amp as Inverting and non-inverting amplifiers.</li> <li>2. Verify the operation of an op-amp as (a) adder (b) subtractor.</li> <li>3. Design and verify a voltage follower and voltage comparator circuit with OPAMP IC 741C and observe the wave forms.</li> </ol>	
<b>UNIT IV – Microcontrollers</b>	<b>[6 hours]</b>
8051 architecture – Pin Diagrams -Types of buses - I/O Ports functions – Instruction set – Addressing modes – Assembly language programming - Introduction to Arduino platform- Arduino UNO architecture	
Practical Topics:	
<ol style="list-style-type: none"> <li>1. Perform assembly language program for addition using 8051 microcontroller</li> <li>2. Perform Subtraction of 2 - 8 bit numbers using microcontroller 8051.</li> <li>3. Write and verify assembly language program for arithmetic and logical operations.</li> </ol>	
<b>UNIT V – Interfacing of Microcontroller</b>	<b>[6 hours]</b>
LED interfacing - Stepper motor interfacing -DC motor interfacing	
Practical Topics:	
<ol style="list-style-type: none"> <li>1. Interface the stepper motor using 8051 interface modules.</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	Familiarize with lab instruments (Multi-meter/Power supply/CRO).
2	Plot V-I characteristics of a PN junction diode
3	Observe the wave shapes for the Half wave and full wave rectifier circuit
4	Plot of input and output characteristics and calculation of parameters of transistors in CE configuration.
5	Implementation of the given Boolean function using logic gates
6	Design and verify the truth table of a S-R and J-K flip-flop
7	Design and verify operation of half adder and full adder
8	Verify the operation of an op-amp as Inverting and non-inverting amplifiers
9	Verify the operation of an op-amp as (a) adder (b) subtractor (c) voltage comparator
10	Design and verify a voltage follower and voltage comparator circuit with OPAMP IC 741C and observe the wave forms.
11	Perform assembly language program for addition using 8051 microcontroller
12	Perform Subtraction of 2 - 8 bit numbers using microcontroller 8051
13	Write and verify assembly language program for arithmetic and logical operations.
14	Interface the stepper motor using 8051 interface modules
15	Design, Construct and verify the XOR gate using switches.

**Course outcomes:**

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

<b>CO1</b>	Explain the basic concepts of semiconductor devices and applications
<b>CO2</b>	Construct the simple linear Integrated circuits for an application using IC741
<b>CO3</b>	Build a basic combinational and sequential circuit using the fundamental concepts and techniques used in digital electronics
<b>CO4</b>	Illustrate the concepts of basic architecture of microcontrollers
<b>CO5</b>	Develop software and hardware for interfacing peripherals with 8051 microcontrollers

**COs and POs Mapping:**

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

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

**Scheme of Evaluation:**

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

**Assessment Pattern**

Bloom's Category	Internal Assessment Tests		Terminal Examination
	1	2	
Remember	30	20	30
Understand	40	50	30
Apply	30	30	20
Analyse	0	0	20
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.

**Reference Books:**

1. Satya Sai Srikant Prakash Kumar Chaturvedi, Basic Electronics Engineering, Springer Nature Singapore Publishing Company Pvt Ltd., 2020
2. R.K. Singh, Ashish Dixit, Basic Electronics Engineering & Devices, University Science Press, Laxmi Publications Pvt. Ltd., 2021
3. Ramesh Gaonkar, “Microprocessor Architecture, Programming and Applications with the 8085”, 6<sup>th</sup> Edition, Pangram International Publication (India) Pvt. Ltd., 2013
4. “Sensors and Transducers – D. Patranabis” –PHI Learning Private Limited., 2003
5. Floyd, Electronic Devices, Pearson Education 10<sup>th</sup> edition, 2018
6. Electronic Devices & Circuit Theory, R.L Boylestad and L. Nashelsky, Pearson Education, 2021
7. Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education, 4<sup>th</sup> Edition, 2015
8. Digital Logic and Computer Design, M. Morris Mano, Pearson India, 2017, ISBN: 9789332586048,9332586047

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

1. Semiconductor Devices and Circuits:  
[https://onlinecourses.nptel.ac.in/noc24\\_ee143/preview](https://onlinecourses.nptel.ac.in/noc24_ee143/preview)
2. Digital Circuits: [https://onlinecourses.nptel.ac.in/noc24\\_ee147/preview](https://onlinecourses.nptel.ac.in/noc24_ee147/preview)
3. Operational amplifiers: <https://nptel.ac.in/courses/108/108/108108114/>
4. Microcontrolles and Microprocessors:  
[https://onlinecourses.nptel.ac.in/noc22\\_ee12/preview](https://onlinecourses.nptel.ac.in/noc22_ee12/preview)
5. Introduction to Microprocessors and Microcontrollers:  
<https://nptel.ac.in/courses/117104072>



**Suggested Skill Activities:**

1. **Construct** a simple ‘**Rain alert alarm**’ using Transistors.
2. **Build** a ‘**Touch Sensor**’ circuit with three components, a resistor, a transistor, and a light-emitting diode.
1. **Make** a simple photodiode-based ‘**fire sensor**’
2. **Demonstrate** that a zener diode can be used as a ‘**voltage regulator**’ in the reverse biased mode.
3. **Build** the microcontroller circuit for a simple **real-world application**

<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>

**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> </ol> </li> </ol>	

- b. Visit a nearby site where construction is at initial stage and observe for following (if necessary, visit two/three times with a gap of a week). If drawings are available relate/match activities with the drawings.
- i. Digging and filling.
  - ii. Foundation preparations.
  - iii. Brick/stone masonry.
  - iv. Concrete laying and curing.
  - v. Laying of sewerage/sanitary lines.
  - vi. Bar bending and bar laying for columns, beams and ceiling.
  - vii. Onsite testing for quality.
  - viii. Onsite preparation for construction work.
  - ix. Erection and removal of form work, scaffolding, centering/shuttering.
- Prepare a brief report on the construction activities, methods, tools, equipments and materials being used.
- c. Installation of water lines for wash basin and showers faucet.

<b>PART II</b>	<b>MECHANICAL ENGINEERING PRACTICES</b>	<b>[5 hours]</b>
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- |  |  |
|--|--|
| <b>2. CARPENTRY, FOUNDRY, WELDING AND SHEET METAL</b>  |  |
| <ol 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> </ol> |  |
| <b>3. LATHE, DRILLING MACHINE AND 3D PRINTER</b>   |  |
| <ol 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> </ol>   |  |

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

<b>PART III</b>	<b>ELECTRICAL ENGINEERING PRACTICES</b>	<b>[3 hours]</b>
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| <b>4. ELECTRICAL WIRING</b>  |  |
| <ol 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> </ol> |  |

<b>PART IV</b>	<b>ELECTRONICS ENGINEERING PRACTICES</b>	<b>[4 hours]</b>
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|---|--|
| <b>5. IOT BASED SOLUTIONS AND PCB</b>   |  |
| <ol 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> </ol> |  |

- d. GPIO programming in ESP8266, sensor and actuator interfacing with internet enabled microcontroller device.
- e. Integration of microcontroller-based system with Cloud platform.

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

### Course outcomes:

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

<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:

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

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



**Scheme of Evaluation:**

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

S.No	Component	Type of Assessment	Max Marks	Reduced Marks	Total	Final Marks
1.	<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

**Assessment Pattern**

Bloom's Category	Terminal Examination
<b>Remember</b>	0
<b>Understand</b>	0
<b>Apply</b>	100
<b>Analyze</b>	0
<b>Evaluate</b>	0
<b>Create</b>	0

**Text Books:**

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

**Reference Books:**

1. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 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>

**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>		
<b>Sl. No.</b>	<b>Topic</b>	<b>Hours</b>
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>		
<b>Sl. No.</b>	<b>Topic</b>	<b>Hours</b>
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>		
<b>Sl. No.</b>	<b>Topic</b>	<b>Hours</b>
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>		
<b>Sl.No.</b>	<b>Topic</b>	<b>Hours</b>
1.	Reading Popular Blogs Listening Editorials	3
2.	Creating a Blog	2
<b>CLASSROOM ACTIVITIES</b>		



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	
<b>UNIT V</b>		<b>[12 hours]</b>
1.	Errors in Pronunciation. Error detection	3
2.	Writing - Terminology for Engineers. Writing Articles and preparing day to day scripts.	2 2

<b>LIST OF EXERCISES</b>		
<b>LAB ACTIVITIES</b>		
Sl. No.	Topic	Hours
1.	Prepare PowerPoint presentation (topics selected by students)	3
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

**Course Outcomes:**

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

CO No.	Course Outcomes	Cognitive Level
<b>CO1</b>	Build communicative competence through critical listening skills.	K3
<b>CO2</b>	Make use of critical thinking skills to express plans and opinions.	K3
<b>CO3</b>	Apply stress as well as tonal variations for effective communication.	K3

<b>CO4</b>	Make use of language skills to produce error free sentences.	K3
<b>CO5</b>	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
<b>CO1</b>	-	-	-	-	-	-	-	-	-	3	-	3
<b>CO2</b>	-	-	-	-	-	-	-	-	-	3	-	3
<b>CO3</b>	-	-	-	-	-	-	-	-	-	3	-	3
<b>CO4</b>	-	-	-	-	-	-	-	-	-	-	-	3
<b>CO5</b>	-	-	-	-	-	-	-	-	-	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