MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

An Autonomous Institution

Department of Electronics and Communication Engineering

Curriculum and Syllabus (I - IV Semester) 2024 - 2025

[Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai | Recognised by UGC 12(B) & 2(f) Act | An ISO 9001:2015 Certified | NAAC Accredited with 'A' Grade | NBA – Mechanical]

34, Rajiv Gandhi Salai (OMR) Siruseri IT Park, Chennai - 603 103

MOHAMED SATHAK A J COLLEGE OF ENGINEERING
Chennai – 603103

REGULATIONS 2024
(CHOICE BASED CREDIT SYSTEM)

B. E. ELECTRONICS AND COMMUNICATION ENGINEERING

I. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: **Technical Proficiency and Innovation**
Graduates will possess strong technical knowledge and skills in **Electronics and Communication Engineering**, enabling them to solve complex problems, design and implement, innovative and sustainable solutions for Industry and Society.

PEO2: **Professional and Ethical Leadership**
Graduates will achieve successful careers and contribute towards technological advancements in terms of leadership, ethical responsibility, effective communication, and teamwork.

PEO3: **Lifelong Learning and Societal Contribution**
Graduates will engage in lifelong learning to be updated with cutting edge technology and apply their skills to address global challenges thus promoting socio economic development.

II. PROGRAM OUTCOMES (POs)

i. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
ii. **Problem Analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
iii. **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
iv. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems
v. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
vi. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
vii. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

viii. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

ix. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

x. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

xi. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

xii. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

III. PROGRAM SPECIFIC OUTCOMES (PSOs)

Graduates will be able to

PSO1: Design and implement sustainable solutions in Electronics and Communication domain by using innovation, technical knowledge acquired, modern hardware and software tools.

PSO2: Adapt and excel in Electronics and Communication domain through continual learning, higher education, research and use of new technology for societal and industry needs.

PSO3: Contribute in leadership roles to create new opportunities and ensuring adherence of economic, environmental and ethical standards.

PEO	PO												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO4
1	3	3	3	3	3						2	1	3	3	2
2						2	2	3	3	3	3	1	3	1	3
3						3	3		1			3	2	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No correlation

Department of Electronics and Communication Engineering

Curriculum for the students Admitted from 2024 - 2025 onwards

Semester - I

S.No	Subject Code	Subject	L	T	P	Credit	Conduct Periods	Category
	24IP101	Induction Program : (Universal Human Value - I)						
Theory Course								
1	24TA101	Heritage of Tamils / தமிழர் மரபு	1	0	0	1	1	HSMC
2	24EN101	Technical Communication - I	3	0	0	3	3	HSMC
3	24MA101	Matrices and Calculus	3	1	0	4	4	BSC
4	24PY111	Engineering Physics	3	0	2	4	5	BSC
5	24CH111	Engineering Chemistry	3	0	2	4	5	BSC
6	24CS112	Computational Thinking	1	0	2	2	3	ESC
7	24GE121	Engineering Visualization	1	0	4	3	5	ESC
Laboratory Course								
8	24EN121	English for Enhancing Self Competence	0	0	2	1	2	EEC
9	24GE124	Electrical and Electronics Workshop Practice	0	0	2	1	2	ESC
10	24GE122	Product Tinkering Laboratory	0	0	2	1	2	ESC
			15	**1**	**16**	**24**	**32**	

Semester - II								
S.No	**Subject Code**	**Subject**	**L**	**T**	**P**	**Credit**	**Conduct Periods**	**Category**
Theory Course								
1	24TA201	Tamils and Technology / தமிழரும் தொழில் நுட்பமும்	1	0	0	1	1	HSMC
2	24EN201	Technical Communication - II	3	0	0	3	3	HSMC
3	24MA202	Transforms and Fourier Analysis	3	1	0	4	4	BSC
4	24EC201	Electronic Devices and Circuits	3	0	0	3	3	PCC
5	24EE201	Electric Circuit Analysis	3	0	0	3	3	PCC
6	24CS111	Programming in C	2	0	4	4	6	ESC
7	24GE101	Basic Civil and Mechanical Engineering	3	0	0	3	3	ESC
Laboratory Course								
8	24EN221	English for Professional Competance	0	0	2	1	2	EEC
9	24MA222	Engineering Mathematics Laboratory	0	0	2	1	2	BSC
10	24EC221	Electronic Devices and Electric Circuits Laboratory	0	0	2	1	2	PCC
11	24IT121	IT Essential Skills	0	0	2	1	2	ESC
			18	**1**	**12**	**25**	**31**	
Mandatory Course#								
A		Personality and Character Development Activity: (Universal Human Value - II)						MC
B		NSS / NCC / NSO / YRC / Club Activity : Phase 1*						MC*
*	The student may opt any one. They have to complete the respective Phase II and Phase III. It is a mandatory course to get the degree certificate after completing 4 years as per the norms of UGC, AICTE & Anna University. If any student did not complete the course after completing it only degree certificate is awarded.							
#	Activities are conducted exclusively for two week apart from the academic activity							

SEMESTER III								
S.No	**Subject Code**	**Subject**	**L**	**T**	**P**	**Contact Periods**	**Credits**	**Category**
1	24MA302	Linear Algebra and Numerical Method	2	1	0	3	3	BSC
2	24EC301	Signals and Systems	2	1	0	3	3	PCC
3	24EC311	Analog Circuits - I	2	1	2	5	4	PCC
4	24EC312	Digital System Design	2	1	2	5	4	PCC
5	24EE311	Principles of Electrical Engineering	2	1	2	5	4	PCC
6	24GE311	Universal Human Values and Ethics	1	0	2	3	2	HSMC
7	24ES321	Innovation and Design Thinking	1	0	2	3	2	ESC
8	24CS323	Application of Python Programming	0	0	2	2	1	ESC
9		Language Elective - Level I*	0	0	2	2	0	MC
10	24MC321	NSS / NSO / YRC - Level II	0	0	2	2	0	MC
Total						**33**	**23**	

Language Elective (Non-Credit Mandatory Course): Student can select any one and submit the certificate

1. Advanced English Communication-Level I and Level II–Certified by Cambridge University Press & Assessment
2. Hindi - Level I (Parichaya) and Level II (Prathmic) Certified by Dakshina Bharat Hindi Prachar Shaba
3. Japanese – Level N5 and N4 Certified by JLPT / NPTEL / SWAYAM
4. German – Level A1 and A2 Certified by Goethe / NPTEL / SWAYAM
5. French - Level A1 and A2 Certified by Goethe / NPTEL / SWAYAM

SEMESTER IV								
S.No	**Subject Code**	**Subject**	**L**	**T**	**P**	**Contact Periods**	**Credits**	**Category**
1	24EE301	Electromagnetic Theory	2	1	0	3	3	PCC
2	24MA412	Statistics, Probability and Stochastic Process	2	1	2	5	4	BSC
3	24AC411	Analog and Digital Communication	2	1	2	5	4	PCC
4	24EC411	Analog Circuits - II	2	1	2	5	4	PCC
5	24EC413	Digital Signal Processing	2	1	2	5	4	PCC
6	24EC412	Microcontroller and Interfacing	3	0	2	5	4	PCC
7	24PC411	Idea to Product	1	0	2	3	2	PCC
8		Language Elective - Level I*	0	0	2	2	0	MC
9		Audit Course - II	0	0	2	2	0	MC
Total						**35**	**25**	

Audit Course-II (Non-Credit Mandatory Course): Student can select any one of the following and Complete the same to get the degree certificate

1. Disaster Management
2. Industrial Safety
3. Gender Sensitisation

Chairman BoS Director IQAC Head Academics Principal

HERITAGE OF TAMILS

(Common to all branches)

Course Code	24TA101	**Course Type**	Theory
Teaching Periods/Week (L: T:P)	1:0:0	**Credits**	1
Total Teaching Periods	15	**IAT + ESE Marks**	40 + 60
Teaching Department	Tamil		

Course Objectives:

1. To familiarize about the importance of Tamil Language and its literature
2. To teach about the heritage of Tamil from art and sculpture
3. To teach about the culture of Tamil from Folk music and martial arts
4. To impart knowledge on thinai concepts
5. To provide insight on the contribution of Tamil in freedom struggle and Indian culture

Unit: I LANGUAGE AND LITERATURE **3**

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

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

Unit: II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE **3**

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

Unit: III FOLK AND MARTIAL ARTS **3**

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

Unit: IV THINAI CONCEPT OF TAMILS **3**

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

Unit: V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE **3**

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

Total **15**

Pedagogical Methods:

Unit 1:	Sol Vilayattu
Unit 2:	Drawing
Unit 3:	Theme based activities (Folk and Dance)
Unit 4:	Essay & Poetry Writing (Thinai)
Unit 5:	Try to learn about basic Siddha Vaithiyam

Course Outcomes:

After successful completion of this course, the students will be able to

CO1:	Explain the salient features of Tamil language and its literature.
CO2:	Discuss about the heritage of Tamil exhibited by various forms of art and sculpture.
CO3:	Describe Tamil heritage displayed by folk music and martial arts
CO4:	Discuss and describe the features of five Thinais in Tamil.
CO5:	Describe the contribution of Tamil in freedom struggle and Indian culture.

Text Books:

T1: Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

T2: Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies. ISBN 9788185693343.

References

R1: Dr.K.K.Pillay "Social Life of Tamils A joint publication of TNTB & ESC and RMRL – (in print)

R2: Social Life of the Tamils - The Classical Period (Published by: International Institute of Tamil Studies

R3: Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).ISBN 9788185329567.

R4: The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

R5: Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

R6: Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author) ISBN 8170260548.

R7: Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

R8: Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

Web links and Video Lectures (e-Resources):

1. https://onlinecourses.nptel.ac.in/noc24_cs36/preview - Unit IV
2. https://digimat.in/nptel/courses/video/113106106/L01.html - Unit I

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
2	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
3	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
4	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
5	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
AVG	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-

'1' – Low, '2' – Medium, '3'- High, '-' – No correlations

தமிழர் மரபு

(Common to all branches)

Course Code	24TA101	**Course Type**	Theory
Teaching Periods/Week (L: T:P)	1:0:0	**Credits**	1
Total Teaching Periods	15	**IAT + ESE Marks**	40 + 60
Teaching Department	Tamil		

Course Objectives:

1. தாய்மொழியின் நிகரற்ற தொன்மையை விளக்குவது
2. பழம் தமிழரின் துறை சார்ந்த ஓவியங்கள் மற்றும் சிற்பங்கள் நவீன கலைகள் குறித்து விளக்குவது
3. வியக்க வைக்கும் பழந்தமிழரின் கலைகள், இசை மற்றும் வீரவிளையாட்டுகள் பற்றி தெரியப்படுத்துவது
4. தமிழர்களின் திணைக் கோட்பாடுகளை பற்றி விளக்குவது
5. தமிழரின் தன்னிகரற்ற ஈடுபாடு - சித்த மருத்துவம் மற்றும் விடுதலைப் போராட்டம் பற்றி விளக்குவது

அலகு – I மொழி மற்றும் இலக்கியம் **3**

இந்திய மொழிக் குடும்ங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கirள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம் ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

அலகு - II மரபு பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை சிற்பக் கலை **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள் பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் மிருதங்கம் - பறை வீணை யாழ் நாதஸ்வரம் தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

அலகு – III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் **3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

அலகு – IV தமிழர்களின் திணைக் கோட்பாடுகள் **3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

அலகு – V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு **3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள்-தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

Total **15**

Pedagogical Methods:

Unit 1:	Sol Vilayattu
Unit 2:	Drawing
Unit 3:	Theme based activities (Folk and Dance)
Unit 4:	Essay & Poetry Writing (Thinai)
Unit 5:	Try to learn about basic Siddha Vaithiyam

Course Outcomes:

After successful completion of this course, the students should be able to

CO1:	தமிழ் மொழி மற்றும் அதன் இலக்கியத்தின் முக்கிய அம்சங்களை விளக்குவார்கள்.
CO2:	கலை மற்றும் சிற்பத்தின் பல்வேறு வடிவங்களால் காட்சிப்படுத்தப்பட்ட தமிழின் பாரம்பரியத்தைப் பற்றி விவாதிப்பார்கள்
CO3:	நாட்டுப்புற இசை மற்றும் தற்காப்பு கலைகளால் காட்டப்படும் தமிழ் பாரம்பரியத்தை விளக்குவார்கள்
CO4:	தமிழில் ஐந்து திணைகளின் அம்சங்களைப் பற்றி விளக்குவார்கள்.
CO5:	சுதந்திரப் போராட்டத்திலும் இந்திய கலாச்சாரத்திலும் தமிழின் பங்களிப்பை விவரிப்பார்கள்.

Text Books:

T1:	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்.)
T2:	கணினித் தமிழ் - முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)

References

R1: Dr.K.K.Pillay "Social Life of Tamils A joint publication of TNTB & ESC and RMRL – (in print)

R2: Social Life of the Tamils - The Classical Period (Published by: International Institute of Tamil Studies

R3: Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).ISBN 9788185329567.

R4: The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

R5: Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

R6: Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author) ISBN 8170260548.

R7: Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

R8: Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

Web links and Video Lectures (e-Resources):

3. https://onlinecourses.nptel.ac.in/noc24_cs36/preview - Unit IV
1. https://digimat.in/nptel/courses/video/113106106/L01.html - Unit I

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
2	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
3	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
4	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
5	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
AVG	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-

'1' – Low , '2' – Medium , '3'- High, '-' – No correlations

TECHNICAL COMMUNICATION -I

(Common to all branches)

Course Code	24EN101	**Course Type**	Theory
Teaching Periods/Week (L: T:P)	3:0:0	**Credits**	3
Total Teaching Periods	45	**IAT + ESE Marks**	40 + 60
Teaching Department	English		

Course Objectives:

1. To facilitate students to develop their comprehension skills.
2. To equip the students to improve their receptive skills.
3. To equip learners with better vocabulary and enhance their writing skills.
4. To aid students to speak effectively in all kinds of communicative contexts.
5. To improve the learners' basic proficiency in workplace communication.

Unit: I DEVELOPING COMPREHENSION SKILLS 9

Listening: Introduction to Informational listening **Reading**: Short Narratives and Skimming Passages. **Speaking** Introducing Oneself, Narrating a Story / Incident. **Writing:** Sequential Writing (Jumbled Sentences), Process/Product Description **Grammar:** Parts of Speech -Verbs – Main & Auxiliary- Pronouns **Vocabulary**: Misleading words- Spell check - Homonyms & homophones.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: II LISTENING AND EXTENDED READING 9

Listening: Listening for Comprehension-Gap Filling **Reading**: News reading-Scanning Passages – Reading Longer Texts- Cloze Reading **Speaking**: Importance of speaking skill - Short Conversation- Public Speaking Do's & Don'ts **Writing**: Note Making, Note Taking - Paragraph Writing - Types of Paragraph - Compare and Contrast **Grammar**: Tenses – Form, Function and Meaning - Basic Sentence structure-Articles **Vocabulary**: One-Word Substitutes, Phrasal Verbs – Cause and Effect expressions

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: III INTRODUCTION TO FORMAL WRITING 9

Listening: Listening to Lectures and Taking Notes **Reading**: Reading on Visual Content **Speaking**: One-Minute Talk **Writing**: Informal Letter Writing , Email Writing, Data Interpretation-Pie chart, Bar chart **Grammar**: Tenses, Active Voice, Passive Voice, Impersonal-Preposition **Vocabulary**: Guessing the meaning from context, Cloze Exercise - Word power.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: IV ENHANCING SPEAKING ABILITY 9

Listening: Listening to Speeches **Reading:** Speed Reading **Speaking:** Just a Minute **Writing:** Instructions,Formal letter writing, Data Interpretation-Flow chart, Table **Grammar:** 'Wh' Questions / Yes or No Questions, Question Tag, Imperatives **Vocabulary:** Synonyms, Antonyms, Different forms of same words.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: V **EXTENSIVE LANGUAGES FOR WORKPLACE** **9**

Listening: Extensive Listening -Audio scripts – Listening to Conversation **Reading**: Extensive reading (Jigsaw Reading, Short Stories, Novels) - Introduction to Technical Article **Speaking**: Short Presentations on Technical Topics -Tips for Doing Presentation **Writing:** Recommendations, Essay Writing **Grammar:** Collocation, Concord -Compound words **Vocabulary:** Informal Vocabulary and Formal Substitutes

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT

RBT Level: L1, L2, L3

Total **45**

Pedagogical Methods:

Unit 1:	Speaking task
Unit 2:	Reading task
Unit 3:	Speaking task
Unit 4:	Reading task
Unit 5:	Speaking task

Course Outcomes:

After successful completion of this course, the students will be able to

CO1:	Apply comprehension skills and interpret different contents.
CO2:	Read and comprehend various texts and audiovisual contents
CO3:	Infer data from graphs and charts and communicate it in varied contexts.
CO4:	Participate in diverse speaking situations.
CO5:	Present, discuss and coordinate with peers in workplace using language skills.

Text Books:

T1: Anna University English Department, "English for Engineers and Technologists", Orient Black Swan, ISBN-978-93-5442-067-2, Edition 2022 –Vol-I.

T2: Ashraf Rizvi. M, "Effective Technical Communication", McGraw Hill Education, Second edition (2017)- ISBN-9352605780, 978-9352605781 2nd Edition.

T3: Sylvan Barnet, Hugo Bedau, and John O'Hara, "Critical Thinking Reading and Writing", Bedford/St. Martin's: 11th Edition, ISBN-13 : 978-1319332051 (16 December 2022)

References

R1: Addison Wesley Longman, "Technical English", Pearson, ISBN:978-1292042862, 8th Edition 2013.

R2: Norman Lewis, "Word Power Made Easy", Goyal Saab; Latest edition (1 January 2020), ebook ISBN-978-0-307-81749-5

R3: Pinnacle , "SSC 60 Days English Vocabulary book" 3rd edition, English and Hindi, 20,000+ words, , ISBN-715791456, 3rd Edition - 19 September 2023

Web links and Video Lectures (e-Resources):

1. https://leverageedu.com/blog/internship-request-letter/ - Unit - IV
2. https://www.englishgrammar.org/ - All Units Grammar
3. https://www.indeed.com/career-advice/career-development/letter-of-introduction - Unit III

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	-	-	-	1	3	-	2	1	1	1
2	-	-	-	-	-	-	-	-	1	3	-	2	1	1	1
3	-	-	-	-	-	-	-	-	1	3	-	2	1	1	1
4	-	-	-	-	-	-	-	-	1	3	-	3	1	1	1
5	-	-	-	-	-	-	-	-	1	3	-	3	1	1	1
AVG	-	-	-	-	-	-	-	-	1	3	-	2.4	1	1	1

'1' – Low, '2' – Medium, '3'- High, '-' – No correlations

MATRICES AND CALCULUS

(Common to All Branches)

Course Code	24MA101	**Course Type**	Theory
Teaching Periods/Week (L: T:P)	3:1:0	**Credits**	4
Total Teaching Periods	60	**IAT + ESE Marks**	40 + 60
Teaching Department	Mathematics		

Course Objectives:

1. To impart knowledge on the concepts of matrix algebra techniques needed for practical applications.
2. To familiarize the students with differential calculus.
3. To familiarize students with single integrals and multiple integrals.
4. To illustrate the simple applications of vector calculus.
5. To make the students to understand the concept of analytic function.
6. To introduce the basic concepts of complex integration.

Unit: I MATRICES `12

Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL Videos
RBT Level: L1 - L3

Unit: II DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation -Applications: Maxima and Minima of functions of one variable.

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL Videos
RBT Level: L1 - L3

Unit: III INTEGRAL CALCULUS & MULTIPLE INTEGRAL 12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts - Double integrals - Double integral in polar coordinates - Area-enclosed by plane curves – Triple integrals – Volume of solids.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1 - L3

Unit: IV VECTOR CALCULUS 12

Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems.

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL Videos
RBT Level: L1 - L3

Unit: V ANALYTIC FUNCTIONS AND COMPLEX INTEGRATION 12

Analytic functions –Necessary and sufficient conditions for analyticity -Construction of analytic function - Conformal mapping – Mapping by functions w=z+c, cz, 1/z -Bilinear Transformation, Line integral - Cauchy‟s integral theorem – Cauchy's integral formula – Taylor's and Laurent's series

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1 - L3

Total 60

Pedagogical Methods:

Unit 1:	To Explore the applications of matrices in real-world scenarios.
Unit 2:	Use differential equations to model the rate of change of pollutant concentration over time and space.
Unit 3:	Apply integral calculus to optimize production levels, pricing strategies, and economic decision- making.
Unit 4:	Apply concepts of gradient, divergence, and curl in various coordinate systems to analyze vector fields.
Unit 5:	Use Python to visualize complex functions in the complex plane., Example: $w= 1/z^2$

Course Outcomes:

After successful completion of this course, the students will be able to

CO1:	Use the matrix algebra methods to diagonalize a given matrix and identify the special properties of matrices.
CO2:	Demonstrate different differentiation techniques and find maxima and minima of a given function.
CO3:	Find area enclosed by plane curves and volume of solids using integration techniques.
CO4:	Apply the concepts of gradient, curl and divergence across various disciplines.
CO5:	Utilize the concepts of analytic functions and construct analytic functions.
CO6:	Apply the basic concepts of complex integration to solve complex integrals. Expand a given function into Taylor's Series and Laurent's Series

Text Books:

T1: Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.ISBN : 9788126567880

T2: B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45th Edition, 2016.ISBN : 9789382332300

References

R1: M. K. Venkataraman, "Engineering Mathematics", Volume I, 4th Edition, The National Publication Company, Chennai, 2003. ISBN : 9788183311261

R2: Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2015. ISBN : 9789385509183

R3: S.S. Sastry, "Engineering Mathematics", Vol. I & II, PHI Learning Private Limited, 4th Edition, New Delhi, 2014 ISBN : 9788120350039

R4: Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.ISBN : 9781259064917

Web links and Video Lectures (e-Resources):

1. https://archive.nptel.ac.in/courses/111/108/111108157/ - Unit I
2. https://archive.nptel.ac.in/courses/111/106/111106146/ - Unit II
3. https://archive.nptel.ac.in/courses/111/105/111105122/ - Unit III
4. https://archive.nptel.ac.in/courses/111/105/111105122/ - Unit IV
5. https://archive.nptel.ac.in/courses/111/103/111103070/ - Unit V

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	-	-	-	-	-	-	-	1	1	1	-
2	3	2	2	-	-	-	-	-	-	-	-	1	1	1	-
3	3	2	2	-	-	-	-	-	-	-	-	1	1	1	-
4	3	2	2	-	-	-	-	-	-	-	-	1	1	1	-
5	3	2	2	-	-	-	-	-	-	-	-	1	1	1	-
AVG	3	2	2	-	-	-	-	-	-	-	-	1	1	1	-

'1' – Low, '2' – Medium, '3'- High, '-' – No correlations

ENGINEERING PHYSICS
(Common to all branches)

Course Code	24PY111	**Course Type**	Integrated
Teaching Periods/Week (L: T:P)	3:0:2	**Credits**	4
Total Teaching Periods	75	**IAT + ESE Marks**	50+50
Teaching Department	Physics		

Course Objectives:

1. To impart knowledge on physical properties of materials and inculcate interest in students in observing facts experimentally.
2. To teach various types of oscillations.
3. To teach the acoustic properties and its applications.
4. To equip the students with understanding the importance of thermal physics and its applications
5. To impart the basics of optics, lasers, and their applications.
6. To introduce the importance and applications of quantum mechanics.

Unit: I MECHANICS OF MATERIALS 9

Rigid Body - Centre of mass - Rotational Energy - Moment of inertia (M.I) - Moment of Inertia for uniform objects with various geometrical shapes. Elasticity - Hooke's law - Poisson's ratio - stress-strain diagram for ductile and brittle materials - uses- Bending of beams - Cantilever - supported beams - uniform and non-uniform bending - Young's modulus determination - I shaped girders -Twisting couple

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: II OSCILLATIONS AND ACOUSTICS 9

Simple harmonic motion – Torsional pendulum – Damped oscillations – Shock Absorber – Forced oscillations and Resonance – Applications of resonance.- Waves and Energy Transport – Sound waves – Intensity level – Standing Waves – Doppler effect and its applications – reverberation – Sabine's Reverberation formula- Speed of blood flow. Ultrasound – applications – Echolocation and Medical Imaging.

Teaching-Learning Process **Pedagogy:** Lecture Method, NPTEL
RBT Level: L1, L2, L3

Unit: III THERMAL PHYSICS 9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints – bimetallic strips – thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity – Forbe's and Lee's disc method: theory and experiment – conduction through compound media (series and parallel) – thermal insulation -applications: heat exchangers, refrigerators, ovens and solar water heaters.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: IV OPTICS AND LASERS **9**

Interference – Thin film interference – Air wedge – Applications – Interferometers – Michelson Interferometer – Polarization – polarizers – Laser – characteristics – Spontaneous and Stimulated emission- population- inversion – Metastable states – optical feedback – Nd-YAG laser, CO2 laser, Semiconductor laser – Industrial and medical applications – Optical Fibers – Total internal reflection – Numerical aperture and acceptance angle – Fiber optic
communication – Fiber sensors – Fiber lasers.

Teaching-Learning Process **Pedagogy:** Lecture Method, NPTEL
RBT Level: L1, L2, L3

Unit: V QUANTUM PHYSICS **9**

Black body radiation (Qualitative) – Planck's hypothesis – Einstein's theory of Radiation – Matter waves – de Broglie hypothesis – Electron microscope – Uncertainty Principle – The Schrodinger Wave equation (time-independent and time-dependent) – Physical significance of wave function – Normalization – Particle in an infinite potential well-particle in a three-dimensional box – Degenerate energy states – Barrier penetration and quantum, tunneling – Tunneling microscope.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2

Total **45**

Pedagogical Methods:

Unit 1:	Models- Based on Moment of Inertia, cantilever and center of mass
Unit 2:	Case Studies – Based on the intensity of different animals, birds, and mammals.
Unit 3:	Chart – Based on the difference between Forbes and Lee's disc apparatus
Unit 4:	Presentation- Application of Laser and different types of Lasers
Unit 5:	Problems Assignment – problems DeBroglie, Schrodinger

PRACTICAL (Any seven experiments) **30**

1. Torsional Pendulum-Determination of rigidity modulus of wire and moment of inertia of the disc
2. Non-uniform bending -Determination of Young's modulus of the material of the beam.
3. Uniform bending–Determination of Young's modulus of the material of the beam.
4. Lee's Disc Experiment - Determination of thermal conductivity of bad conductors.
5. Laser-Determination of the wavelength of the laser using grating - Determination of the width of the groove of the compact disc using laser. - Estimation of laser parameters
6. Optical fibre -Determination of Numerical Aperture and acceptance angle
7. Simple harmonic oscillations of cantilever
8. Air wedge - Determination of thickness of a thin sheet/wire
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.
10. Melde's string experiment

Equipments required

S.No	Name of the Equipment and Accessories	Required numbers for batch of 30 students
1	Torsional Pendulum Kit	5
2	Simple harmonic oscillations of cantilever	5
3	Travelling Microscope (Non-Uniform / Uniform)	5
4	He-Ne/Diode laser (red), Grating	5
5	Air Wedge Apparatus	5
6	Diode laser (green or red), fiber optic Kit	5
7	Ultrasonic interferometer apparatus with high-frequency wave generator	5
8	Lee's Disc Apparatus	2
9	Vernier Calliper, Screw Gauge	5
10	Melde's String Kit	1

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Explain the mechanical properties of materials like brittle and ductile.

CO2: Discuss different types of oscillation and its applications.

CO3: Summarize the acoustic properties and its applications.

CO4: Discuss the thermal properties of materials and their applications.

CO5: Summarize the principle of operation, characteristics, and application of laser and optics.

CO6: Explain the concepts of quantum physics and its applications.

Text Books:

T1: D. Halliday, R. Resnick and J. Walker, "Principles of Physics" John Wiley & Sons, 2012 ISBN 978-1-118-23072-5

T2: N. Garcia, A. Damask and S. Schwarz, "Physics for Computer Science Students", Springer Verlag, 2012. ISBN-13: 978-0-387-97656-3

References

R1: D. Kleppner and R. Kolenkow. "An Introduction to Mechanics", McGraw Hill Education, 2014. ISBN: 978-0-521-19811-0

R2: K. Thyagarajan and A. Ghatak. "Lasers: Fundamentals and Applications". Springer, 2012 ISBN: 978-1-4419-6441-0

Web links and Video Lectures (e-Resources):

1. https://youtu.be/aQf6Q8t1FQE?si=HKYtEGMgu-y7WnLB - Unit-1
2. https://youtu.be/yBC-PuCMMWw?si=lZ4sz88U33vD55To - Unit-2
3. https://youtu.be/DPK1z3QSY_8?si=J04HysWSvmQJwRFo - Unit-3
4. https://youtu.be/PK4yFaGHSFc?si=rrPgMVbD6fMPAPql - Unit-4
5. https://youtu.be/TcmGYe39XG0?si=hBMV6uBRAIa3eHE3 - Unit-5

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	2	-	-	-	-	-	-	-	1	1	1	1
2	3	2	1	2	-	-	-	-	-	-	-	1	1	1	1
3	3	2	1	2	-	-	-	-	-	-	-	1	1	1	1
4	3	2	1	2	-	-	-	-	-	-	-	1	1	1	-
5	3	2	1	2	-	-	-	-	-	-	-	1	1	1	-
6	3	1	-	-	-	-	-	-	-	-	-	1	1	1	-
AVG	3	1.83	1	2	-	-	-	-	-	-	-	1	1	1	1

'1' – Low, '2' – Medium, '3'- High, '-' – No correlations

ENGINEERING CHEMISTRY
(Common to all branches)

Course Code	24CH101	**Course Type**	Integrated
Teaching Periods/Week (L:T:P)	3:0:0	**Credits**	3
Total Teaching Periods	75	**IAT + ESE Marks**	50 + 50
Teaching Department	Chemistry		

Course Objectives:

1. To impart knowledge on treatment of water for potable and industrial purposes.
2. To introduce the basic concepts and applications of phase rule and composites.
3. To explain the applications of energy sources and storage devices.
4. To facilitate the understanding of different types of fuels, their properties and combustion characteristics.
5. To acquaint the students with the basics of nanomaterials, their properties, and applications.

Unit: I WATER TECHNOLOGY 9

Sources and impurities in Water, Water quality parameters and its significance (color, odour, turbidity, PH, hardness, alkalinity, TDS, COD and BOD, flouride and arsenic). Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break–point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming &foaming. Treatment of boiler feed water: Internal treatment/conditioning (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT & Demonstration
RBT Level: L1, L2, L3

Unit: II PHASE RULE AND COMPOSITE MATERIALS 9

Phase rule: Introduction, definition of terms with examples. One component system: water system– Reduced phase rule; Construction of a simple eutectic phase diagram – Thermal analysis; Two component system: Lead–silver system, application: Pattinson process. Composites: Introduction: Definition & Need for composites; Constituents: Matrix materials, and Reinforcement. Classification of Matrix materials, properties, and its applications: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Types of Reinforcement, properties, and its applications: fiber, particulates, flakes, and whiskers. Properties and applications of: Hybrid composites – definition and examples.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: III ENERGY SOURCES AND STORAGE DEVICES 9

Energy sources: Nuclear fission and nuclear fusion. Nuclear energy: Light water nuclear power plant and breeder reactor. Solar energy: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy – Geothermal energy. Storage devices: Batteries – types of batteries – primary battery (dry cell), secondary battery (lead acid battery, lithium–ion–battery), fuel cells – H2 –O2 fuel cell, microbial-fuel cell, and super capacitors. E-Vehicle

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: IV FUELS AND COMBUSTION **9**

Fuels: Introduction and Classification. Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking, octane number, cetane number; Power alcohol and biodiesel. Gaseous fuels – Natural gas, CNG and LPG.
Combustion of fuels: Introduction: Calorific value – higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis – ORSAT Method. CO2 emission and carbon footprint.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT

RBT Level: L1, L2, L3

Unit: V NANOMATERIALS **9**

Introduction–Distinction between molecules, nanomaterials, and bulk materials; Size–dependent properties of nanomaterials: optical, electrical, mechanical, and magnetic properties; Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Synthesis of nanomaterials: sol–gel, solvo thermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics, and catalysis.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT

RBT Level: L1, L2, L3

Total **45**

Pedagogical Methods:

Unit 1:	Model Making – Municipal Water treatment
Unit 2:	Poster Presentation – Composite Materials
Unit 3:	Pick one and Talk More
Unit 4:	Problems – Theoretical Calculation of Calorific Value
Unit 5:	Seminar on Applications of Nanomaterials

PRACTICAL (Any seven experiments) **30**

1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in water sample.
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Determination of strength of given hydrochloric acid using pH meter.
8. Determination of strength of acids in a mixture of acids using conductivity meter.
9. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
10. Estimation of iron content of the given solution using potentiometer.

Equipment required

S.No	Description of Equipment	Required Numbers for Batch of 30 students
1	pH Meter	15
2	Conductivity Meter	15
3	Potentiometer	15
4	Electronic balance (Four Digit)	1
5	Hot Plate with Magnetic Stirrer	1
6	Hot Air Oven	1
7	Muffle Furnace	1
8	Burette, Pipette, Conical Flask & Other glassware.	30

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Summarize the water quality parameters and explain various methods to produce soft water for industrial and potable use.
CO2: Apply the knowledge of phase rule and composites for material selection requirements.
CO3: Discuss various energy resources, storage devices and their uses in household and industrial applications.
CO4: Differentiate various types of fuels based on their state, characteristics and calorific value for Engineering processes and applications.
CO5: Differentiate the nano and bulk materials, their synthesis and its applications in various fields.

Text Books:

T1: P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.ISBN 9789383186773.
T2: Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008. ISBN 9780070669321.
T3: S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018. ISBN 9788121903592.
T4: S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT. LTD, New Delhi, 2013.ISBN 9788126543342.

References

R1: B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018. ISBN 9783642280290.
R2: O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017. ISBN 9789352605774.
R3: Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014. ISBN 9789381714522.
R4: Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019. ISBN 9781108724449.
R5: O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013. ISBN 9781461442615.
R6: Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015. ISBN 9788131526699.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=ugDRuS8dtY4 – Unit 1
2. https://www.youtube.com/watch?v=SaJ749CkypA – Unit 3
3. https://www.youtube.com/watch?v=YSRs3PuYT_k – Unit 5

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	-	2	-	2	2	-	-	-	-	2	-	-	1
2	3	1	-	-	-	1	2	-	-	-	-	1	-	-	1
3	3	2	-	1	-	-	1	-	-	-	-	-	-	-	1
4	3	1	-	-	-	2	2	-	-	-	-	-	-	-	1
5	3	1	-	-	-	2	2	-	-	-	-	1	-	-	1
AVG	3	1.2	-	1.5	-	1.8	1.8	-	-	-	-	1.4	-	-	1

'1' – Low, '2' – Medium, '3'- High, '-' – No correlations

COMPUTATIONAL THINKING

(Common to CSE / IT / AIDS / CSBS / CSCS / AIML / EEE / ECE)

Course Code	24CS112	**Course Type**	Integrated
Teaching Periods/Week (L: T:P)	1:0:2	**Credits**	2
Total Teaching Periods	45	**IAT + ESE Marks**	50 + 50
Teaching Department	Computer Science and Engineering		

Course Objectives: To Equip the students with the Knowledge in

1. Problems in a way that enables a computer to solve them.
2. Organising and analysing data using logical approaches.
3. Developing solutions through algorithmic thinking.
4. Identifying, analysing, and implementing possible solutions to achieve the most efficient and effective combination of steps and resources.
5. Generalising and transferring the problem-solving process to a wide variety of problems.

Unit: I INTRODUCTION TO COMPUTATIONAL THINKING 1+4

Understanding the concepts: Decomposition, pattern recognition/data representation, generalization, abstraction, and algorithms, Representation, automation, Analysis, visualization. Logical thinking - reasoning

Teaching-Learning Process **Pedagogy:** Chalk and Talk

RBT Level: L1, L2, L3, L4

Unit: II UNDERSTANDING DATA 2+6

Performing analytics on numeric data using any spreadsheet software and representing the data using charts, histograms, scatter plots, graphs etc. Understanding patterns in data sequences, puzzles, and nonograms. Data Encryption – ciphering sentences and Compression.

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1, L2, L3, L4

Unit: III DECOMPOSITION AND PATTERN RECOGNITION 3+8

The divide and Conquer, pattern recognition, Algorithmic thinking - creating oral algorithms for everyday tasks – visualizing algorithms through sequence of steps, pseudocode, flow charts, selection, iteration, functions, procedures and parameters.

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1, L2, L3, L4

Unit: IV ABSTRACTIONS AND SCRATCH 3+6

Understanding Abstraction Object Description, Abstraction and Modeling, Objects and Objects based modeling -Repair, Reuse, Recycle, Scratch / equivalent - Motion, events, control

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1, L2, L3, L4

Unit: V FILES AND PREPROCESSOR UNDERSTANDING COMPLEXITY 6+6

Understanding complexity, sorting algorithms, search algorithms, AI and Turing Test, FSA (Finite State Automata), Debugging, Enhancing the clarity of a program - documentation, style, idioms, Automation and Simulation, generalizing a solution.

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1, L2, L3, L4

Total 45

Pedagogical Methods:

Unit 1:	Explore algorithm design by creating oral algorithms.
Unit 2:	Decompose a complex problem into discrete steps and Design a simple algorithm for solving the problem
Unit 3:	Programming implementation
Unit 4:	Develop algorithms for sorting and determine the complexity of the algorithm and how it scales as the number of items to sort increases
Unit 5:	External Learning: Study the best practices of documentation, style, idioms, etc that are used to ensure the code can be understood and maintained over a long period.

Practical Exercises:

MODULE I:	Algorithmic thinking - creating oral algorithms for everyday tasks - Data abstraction and representation - Abstraction and translation of everyday data for use on a computer.
MODULE II:	Decomposing a complex problem - Strategies for decomposition and algorithm design - Divide and conquer - Simple program implementations.
MODULE III:	Overall data representation, abstraction, analysis and algorithm design. Program implementations.
MODULE IV:	Measuring the complexity of an algorithm - sorting algorithms - the notion of unsolvable problems. Programming illustrations.
MODULE V:	Enhancing the clarity of a program - documentation, style, idioms.

System requirement

Sl. No.	Description of Equipment	Required numbers for batch of 30 students
1.	INTEL based desktop PC with min. 4GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse	30
2.	Windows 8 or higher operating system / Linux Ubuntu 20 or higher	30

Course Outcomes:

After successful completion of this course, the students will be able to

CO1:	Formulate problems for effective computer-based solutions.
CO2:	Systematically organize and analyse data.
CO3:	Develop solutions using algorithmic approaches.
CO4:	Identify, evaluate, and implement optimal solutions by efficiently utilizing steps and resources.
CO5:	Apply and adapt the problem-solving process across diverse scenarios.

Text Books:

T1: Karl Beecher, Computational Thinking - A Beginner's Guide to Problem-Solving and Programming, BCS Learning, 2017.

T2: Venkatesh G, Madhavan Mukund, Computational Thinking, Notion Press, 1st Edition, 2021.

T3: Hunt, Kenny A._ Riley, David D, Computational Thinking for the Modern Problem Solver, CRC Press, 2015

References

R1: David Clark, Computational and Algorithmic Thinking Book 2, AMT Publishing, 2016.

R2: Paul Curzon, "Computing Without Computers: A Gentle Introduction to Computer Programming, Data Structures, and Algorithms", 2014. https://teachinglondoncomputing.files.wordpress.com/2014/02/booklet-cwc-feb2014.pdf)

R3: Wang Paul S, From computing to computational thinking, CRC Press, 2016.

R4: Peter J. Denning, Matti Tedre, Computational Thinking, MIT Press, 2019.

R5: Paolo Ferragina, Fabrizio Luccio, Computational Thinking_ First Algorithms, Then Code, Springer International Publishing, 2018.

R6: Aman Yadav, Ulf Berthelsen, Computational Thinking in Education_ A Pedagogical Perspective, Routledge, 2021.

R7: Zhiwei Xu, Jialin Zhang, Computational Thinking_ A Perspective on Computer Science, Springer, 2021

R8: Exploring Computational Thinking.https://edu.google.com/resources/programs/exploring-computational- thinking/.

Web links and Video Lectures (e-Resources):

1. https://teachinglondoncomputing.org – Unit 1_
2. https://classic.csunplugged.org Unit 3 & Unit 5
3. http://Study.iitm.ac.in/D's/course_pages/bscs1001.html - Unit 3
4. http://Learning.com/blog/defining-computationalthinking - Unit 1
5. https://centre-for-humanities-computing.github.io – Unit 1
6. http://Nptel.ac.in/course/115106121 - All units

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	1	-	-	-	-	-	1	3	2	1
CO2	3	3	3	2	1	1	-	-	-	-	-	1	**3**	2	1
CO3	3	3	3	2	1	1	-	-	-	-	-	1	3	2	1
CO4	3	3	3	2	1	1	-	-	-	-	-	1	3	2	1
CO5	3	3	3	2	1	1	-	-	-	-	-	1	3	2	1
AVG	3	3	3	2	1	1	-	-	-	-	-	1	3	2	1

'1' – Low, '2' – Medium, '3'- High, '-' – No correlations

ENGINEERING VISUALIZATION

(Common to all branches)

Course Code	24GE121	**Course Type**	Integrated
Teaching Periods/Week (L:T:P)	1:0:4	**Credits**	3
Total Teaching Periods	75	**IAT + ESE Marks**	60 + 40
Teaching Department	Mechanical Engineering		

Course Objectives: To Equip the students with the knowledge in

1. BIS conventions and specifications for engineering drawing and constructing the conic curves, involutes, and cycloids
2. Projections of lines and planes.
3. Orthographic projection of solids and sections of solids.
4. Projection of sectioned solids and Development of surfaces
5. Isometric projections of simple solids.

Unit: I PLANE CURVES 3+12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of Ellipse, Parabola & Hyperbola using eccentricity method – Construction of Cycloid – Construction of Involutes of circle, Square and polygons – Tangent and Normal to the above curves.

Practical component: AutoCAD – Solid modeling tool - Basics.

Teaching-Learning Process **Pedagogy:** Lecture, PPT, NPTEL
RBT Level: L1-L4

Unit: II PROJECTION OF POINTS, LINES AND PLANE SURFACE 3+12

Orthographic projection - First angle projection –Principal planes - Projection of points – Projection of Lines (Only First angle projection) inclined to both principal planes – Determination of true length and true inclinations by rotating line method – Projection of planes (Circle and polygons) inclined both principal planes by rotating object method.

Practical component: AutoCAD – Lines and Plane.

Teaching-Learning Process **Pedagogy:** Lecture, PPT, NPTEL
RBT Level: L1-L4

Unit: III PROJECTION OF SOLIDS 3+12

Projection of simple solids like prisms, pyramids, cones and cylinders, and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

Practical component: AutoCAD – Projection of simple solids

Teaching-Learning Process **Pedagogy:** Lecture, PPT, NPTEL
RBT Level: L1-L4

Unit: IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 3+12

Sectioning of solids in the simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Obtaining the true shape of the section. Development of the lateral surfaces of simple sectioned solids – Prisms, Pyramid, Cylinder, and Cone.

Practical component: AutoCAD – Section of simple solids and surfaces

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT, NPTEL
RBT Level: L1, L2, L3, L4

Unit: V **ISOMETRIC PROJECTIONS** **3+12**

Principles of isometric projection – isometric scale - Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones – combination of two solid objects in simple vertical positions.

Practical component: AutoCAD – Isometric projections of simple solids and truncated solids

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT, NPTEL

RBT Level: L1,L2,L3,L4

Total **75**

System requirement

Sl. No.	Description of Equipment	Required numbers for batch of 30 students
1.	INTEL-based desktop PC with min. 4GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse	30
2.	Windows 8 or higher operating system	30
3.	Auto-CAD	30

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Use BIS conventions and specifications for engineering drawing and constructing the conic curves, involutes, and cycloid

CO2: Solve practical problems involving the projection of lines and Planes.

CO3: Sketch the orthographic projection of simple solids.

CO4: Draw the Sectional view of solids and development of simple surfaces.

CO5: Sketch the isometric projections of simple solids.

Text Books:

T1: Gopalakrishna K. R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27thEdition, 2017. ISBN – 9788184245686

T2: Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019. ISBN - 978-9380358963

References

R1: Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019. ISBN - 978-1259062889

R2: Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015. ISBN - 9780199455397

R3: Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 15th Edition, 2018.ISBN - 9788122430422

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/112103019 - Unit 1
2. https://www.youtube.com/watch?v=72EGcYdx7sA&t=16s - Unit 2
3. https://www.youtube.com/watch?v=8w--gcrCsuY – Unit 3
4. https://www.youtube.com/watch?v=yKYivtPembM – Unit 4
5. https://www.youtube.com/watch?v=qhOffFTIsV0 – Unit 5

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	2	2	-	-	-	-	1	-	2	2	1	-
2	3	2	1	2	2	-	-	-	-	1	-	2	2	1	-
3	3	2	1	2	2	-	-	-	-	1	-	2	2	1	-
4	3	2	3	2	2	-	-	-	-	1	-	2	2	1	-
5	3	2	1	2	2	-	-	-	-	1	-	2	2	1	-
AVG	3	2	1.4	2	2	-	-	-	-	1	-	2	2	1	-
'1' – Low , '2' – Medium , '3'- High, '-' – No correlations															

ENGLISH FOR ENHANCING SELF COMPETENCE

(Common to all branches)

Course Code:	24EN121	**Course Type:**	Practical
Teaching Periods/Week (L:T:P):	0:0:2	**Credits:**	1
Total Teaching Periods:	30	**IAT + ESE:**	60 + 40
Teaching Department:	English		

Course Objectives:

1. To articulate and learn various social behaviors and etiquette.
2. To develop writing and speaking skills for professional requirements.
3. To acquire techniques of fundamental communication skills.

Unit: I PERSONALITY TRAITS **6**

Self-Introduction, Ways to Identify Self (SWOT Analysis- Johari Window), Concepts of Self-Management and Self-Motivation, Self-Assessment.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT, YouTube videos

RBT Level: L1, L2, L3

Unit: II COMMUNICATION SKILLS **6**

Effective Communication Skills, Interpersonal & Social Skills

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1, L2, L3

Unit: III SOCIAL BEHAVIOUR **6**

Time Management, Personal Grooming, Making Small Talk, Inter-Cross-Cultural Communication, Professional Presentation Techniques.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT, YouTube videos

RBT Level: L1, L2, L3

Unit: IV CULTURAL ETIQUETTE **6**

Formal Presentation, Sensitivity towards multi-cultural work spaces, Presentation skills –Formal Presentation - Just a minute

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1, L2, L3

Unit: V JOB-RELATED COMMUNICATION **6**

Resume & Cover Letter, Formal E-mails, Framing Requests, Greetings, Salutations, Close, Interview-Types-Interview Questions-Techniques, Introduction to Interviews-FAQ's

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT, YouTube videos

RBT Level: L1, L2, L3

Total **30**

System requirement

Sl. No.	Description of Equipment	Required numbers for batch of 30 students
1.	INTEL based desktop PC with min. 4GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse	30
2.	Windows 8 or higher operating system	30
3.	Hot Potatoes / Globarina	30

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: To listen to and comprehend general as well as complex academic information
CO2: To speak fluently and accurately in formal and informal communicative contexts
CO3: To express their opinions effectively in both formal and informal discussions.

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	-	-	-	2	3	-	2	1	1	1
2	-	-	-	-	-	-	-	-	2	3	-	3	1	1	1
3	-	-	-	-	-	-	-	-	2	3	-	2	1	1	1
AVG	-	-	-	-	-	-	-	-	2	3	-	2.3	1	1	1

'1' – Low, '2' – Medium, '3'- High, '-' – No correlation

ELECTRICAL AND ELECTRONICS WORKSHOP PRACTICE

(Common to all branches)

Course Code	24GE221	**Course Type**	Practical
Teaching Periods/Week (L:T:P)	0:0:2	**Credits**	1
Total Teaching Periods	30	**IAT + ESE Marks**	60 +40
Teaching Department	Electrical and Electronics Engineering		

Course Objectives:

1. To equip students with a comprehensive understanding of electronic equipment and practical soldering skills.
2. To develop students' proficiency in making electrical wiring connections using appropriate techniques and perform energy audit.
3. To provide students with practical exposure in installation and maintenance of household electrical appliances.

PRACTICAL **30**

1. Study of components - R, L, C, Diode, Transistor and IC's.
2. Study of equipment's – RPS, Function Generator, CRO, Multimeter, Ammeter, Voltmeter, Wattmeter and Energy meter.
3. Measurement of voltage, current, frequency, time period for sine, square and triangular waves.
4. Soldering practice and breadboard practice.
5. Study of wires and cables.
6. Basic switchboard wiring with lamp, fan and three pin socket.
7. Fluorescent Lamp Wiring and Staircase Wiring.
8. Residential House wiring using Switches, Fuse, Indicator, Lamp and Energy meter.
9. Measurement of Energy and Earth Resistance.
10. Energy Audit.
11. Installation and Maintenance of Electrical Appliances –I Iron box, Emergency Lamp, Fan regulator.
12. Installation and Maintenance of Electrical Appliances –II Water heater, Stabilizer and UPS.

List of Equipment:

S.No	Name of the Equipment	Quantity
1	Single phase house wiring setup (Fuse, Lamp, Socket, Switch, PVC Pipe, Lamp Holder, Energy Meter)	2
2	Staircase wiring setup (Lamp, Two-way Switch, Socket, Switch, PVC Pipe, Lamp Holder)	2
3	Fluorescent lamp wiring setup (Fluorescent Lamp, Socket, Switch, PVC Pipe, Fluorescent Lamp Holder, Choke, Starter)	2
4	Water heater (1500W, 230V)	2
5	Stabilizer (500W, 160 – 290V)	2
6	UPS (600 VA)	2
7	Fan regulator	2
8	Iron box setup	2
9	Emergency lamp setup	2
10	Soldering Iron, Lead	15
11	Multi meter (0-600V, 10A)	15

12	Continuity tester	2
13	Resistors	Adequate Number
14	Capacitors	Adequate Number
15	Diodes	Adequate Number
16	Transistors	Adequate Number
17	Inductors	Adequate Number
18	IC's	Adequate Number
19	RPS (0-30V)	5
20	Function Generator (0-1MHz)	5
21	CRO (20MHz)	5
22	Ammeter (0-10A) MI	10
23	Voltmeter (0-300V) MI	10
24	Wattmeter (300V,10A, UPF)	5
25	Energy meter (single phase, two wire, (5-30A)/240V, 50Hz)	5
26	Wires, Cables	Adequate Number
27	Clamp meter (0-1000A), (0-750V)	2
28	Megger (500V, 100Mohms)	1

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Identify various electronic components and assemble simple electronic circuits using soldering.

CO2: Make wiring connections for household and conduct energy audit.

CO3: Install and maintain household electrical appliances.

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	2	1	1	1	-	-	-	-	1	2	1	1
2	3	2	1	2	1	1	1	-	-	-	-	1	2	1	1
3	3	2	1	2	1	1	1	-	-	-	-	1	2	1	1
AVG	3	2	1	2	1	1	1	-	-	-	-	1	2	1	1

1 –„Low“ , 2 – „Medium“ , 3- „High“, „-„ – No correlations

PRODUCT TINKERING LAB
(Common to all)

Course Code	24GE122	**Course Type**	Practical
Teaching Periods/Week (L: T:P)	0:0:2	**Credits**	1
Total Teaching Periods	30	**IAT + ESE Marks**	60 + 40
Teaching Department	Civil Engineering and Mechanical Engineering		

Course Objectives: To equip the students with

1. Hands-on experience in Mechanical Equipments.
2. Design of simple components using computer-aided design.
3. Basic concept of 3D Printing.
4. Hands-on training on basic plumbing works

Practical Exercises **30**

1. Exercise on the usage of a hand-drilling machine
2. Demonstration of Centrifugal pumps.
3. Demonstration of two-wheeler and four-wheeler maintenance and repairs,
4. 3D Modelling of a single component.
5. Exercise on CAD Data Exchange and Generation of .stl files.
6. Identification of a product for Additive Manufacturing and its AM process plan
7. Printing of identified product on an available AM machine.
8. Demonstration on how to change the Tap fittings.
9. Preparing plumbing line sketches.
10. Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows, and other components that are commonly used in households.
11. Laying pipe connection to the suction and delivery side of a pump
12. Connecting pipes of different materials: Metal, plastic, and flexible pipes used in household appliances.

Equipment required

Sl. No.	Description of Equipment	Required numbers for batch of 30 students
1.	Hand Drilling Machine	5 nos.
2.	Centrifugal pump Assembly	1 no.
3.	Two-Wheeler (Four Stroke Petrol Engine)	1 no.
4.	Four-Wheeler (Four Stroke Diesel Engine)	1 no.
5.	Pipe Vice	5 nos.
6.	Die Holder with Die set	5 nos.
7	Valves, Taps, Coupling, Unions, Reducers, and Elbows (Metal and Plastics)	5 nos. each
8	INTEL based desktop PC with min. 4GB RAM and 500 GB HDD, 17” or higher TFT Monitor, Keyboard and mouse	5 Nos
9	3D Printer	2 Nos

Course Outcomes:

After successful completion of this course, the students will be able to

CO1:	Perform the basic maintenance and servicing of mechanical equipments.
CO2:	Design simple components using computer-aided design.
CO3:	Develop a 3D component using additive manufacturing.
CO4:	Sketch and perform the plumping for the house's different connections.

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	-	-	-	2	-	-	-	-	-	-	1	2	-	1
2	2	-	-	-	3	-	-	-	-	-	-	1	2	-	1
3	2	-	-	-	3	-	-	-	-	-	-	1	2	1	1
4	2	-	-	-	2	-	-	-	-	-	-	1	2	-	1
AVG	2	-	-	-	2.5	-	-	-	-	-	-	1	2	1	1

'1' – Low , '2' – Medium , '3'- High, '-' – No correlations

TAMILS AND TECHNOLOGY

(Common to all branches)

Course Code	24TA201	**Course Type**	Theory
Teaching Periods/Week (L: T:P)	1:0:0	**Credits**	1
Total Teaching Periods	15	**IAT + ESE Marks**	40 + 60
Teaching Department	Tamil		

Course Objectives:

1. To familiarize about the Pottery, Weaving Technology in sangam age.
2. To teach about the Construction Technology of Ancient Tamils
3. To impart knowledge of ship building and manufacturing Technologies in ancient Tamil culture.
4. To teach about main features of ancient Tamils Agriculture, Agro-Processing and irrigation technology
5. To provide insight about the Tamil Software Development.

Unit: I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

Unit: II DESIGN AND CONSTRUCTION TECHNOLOGY 3

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

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

Unit: III MANUFACTURING TECHNOLOGY 3

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

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

Unit: IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

Unit: V **SCIENTIFIC TAMIL & TAMIL COMPUTING** **3**

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Teaching-Learning Process **Pedagogy:** Lecture, PPT

RBT Level: L1, L2, L3

Total **15**

Pedagogical Methods:

Unit 1:	Clay Modal Task
Unit 2:	Sculptures and Heritage Symbols Drawing task
Unit 3:	Group Discussion
Unit 4:	Debate about Ancient Irrigation Technology
Unit 5:	Thorough analysis of Scientific Tamil

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Describe the weaving technology and pottery making in sangam age
CO2: Explain the construction technologies used in ancient times
CO3: Discuss the technologies used by ancient Tamils in minting coins, ship, metallurgical areas.
CO4: Describe the methods used in our ancient Tamils agriculture and irrigation technologies
CO5: Summarize the development of scientific Tamil and Tamil computing

Text Books:

T1: 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)

T2: Dr.K.K.Pillay "Studies in the History of India with Special Reference to Tamil Nadu"

References

R1: Dr.K.K.Pillay "Social Life of Tamils A joint publication of TNTB & ESC and RMRL – (in print)

R2: Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

R3: Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies)

R4: The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

R5: Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

R6: Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

R7: Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

R8: Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

Web links and Video Lectures (e-Resources):

1. https://youtu.be/fecWlhoPPYY?feature=shared – Unit V
2. https://youtu.be/vsLuw8Q3vA?feature=shared – Unit III

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	3	-	3	-	3	-	-	-	-	-
2	-	-	-	-	-	3	-	3	-	3	-	-	-	-	-
3	-	-	-	-	-	3	-	3	-	3	-	-	-	-	-
4	-	-	-	-	-	3	-	3	-	3	-	-	-	-	-
5	-	-	-	-	-	3	-	3	-	3	-	-	-	-	-
AVG	-	-	-	-	-	3	-	3	-	3	-	-	-	-	-

'1' – Low, '2' – Medium, '3'- High, '-' – No correlations

தமிழரும் தொழில்நுட்பமும்

(Common to all branches)

Course Code	24TA201	**Course Type**	Theory
Teaching Periods/Week (L: T:P)	1:0:0	**Credits**	1
Total Teaching Periods	15	**IAT + ESE Marks**	40 + 60
Teaching Department	Tamil		

Course Objectives:

1. பழந்தமிழரின் பானை மற்றும் நெசவுத் தொழில் நுட்பம் குறித்து விளக்குவது
2. பண்டைய தமிழர்களின் கட்டுமான தொழில்நுட்பம் பற்றி தெரியப்படுத்துவது
3. பண்டைய நாட்களில் கப்பல் கட்டுதல் மற்றும் உற்பத்தி தொழில்நுட்பங்கள் பற்றிய அறிவை வழங்குதல்.
4. பண்டைய தமிழர்களின் விவசாயம் மற்றும் நீர்ப்பாசனத் தொழில்நுட்பத்தின் முக்கிய அம்சங்களைப் பற்றி கற்பித்தல்
5. தமிழ் மென்பொருள் மேம்பாடு பற்றிய நுண்ணறிவை வழங்குதல்.

அலகு 1 நெசவு மற்றும் பானைத் தொழில்நுட்பம் **3**

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பமும் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

அலகு - II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் **3**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத்த தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசோனிக் கட்டிடக் கலை

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

அலகு – III உற்பத்தித் தொழில் நுட்பம் **3**

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எ..கு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாகும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள், - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1, L2, L3

அலகு – IV வேளாண்மை மற்றும் நீர்பாசனத் தொழில் நுட்பம் 3

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக்கு முழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைக்களுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

Teaching-Learning Process **Pedagogy:** Lecture, PPT

RBT Level: L1, L2, L3

அலகு – V அறிவியல் தமிழ் மற்றும் கணித்தமிழ் 3

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

Teaching-Learning Process **Pedagogy:** Lecture, PPT

RBT Level: L1, L2, L3

Total 15

Pedagogical Methods:

Unit 1:	Clay Modal Task
Unit 2:	Sculptures and Heritage Symbols Drawing task
Unit 3:	Group Discussion
Unit 4:	Debate about Ancient Irrigation Technology
Unit 5:	Thorough analysis of Scientific Tamil

Course Outcomes:

இந்த பாடத்திட்டத்தை வெற்றிகரமாக முடித்த பிறகு, மாணவர்களால்

CO1: சங்க காலத்தில் நெசவுத் தொழில்நுட்பம் மற்றும் மட்பாண்டங்கள் செய்தல் ஆகியவற்றை விவரிக்க முடியும்

CO2: பண்டைய காலத்தில் பயன்படுத்தப்பட்ட கட்டுமான தொழில்நுட்பங்களை பற்றி விளக்க முடியும்

CO3: பண்டைய தமிழர்களின் மணிகள், கப்பல்கள், உலோகவியல் பகுதிகளில் பயன்படுத்தப்பட்ட தொழில்நுட்பங்களைப் பற்றி விவாதிக்க முடியும்.

CO4: பண்டைய தமிழர்களின் விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பங்களில் பயன்படுத்தப்பட்ட முறைகளை விவரிக்க முடியும்

CO5: அறிவியல் தமிழ் மற்றும் தமிழ் கணிப்பொறியின் வளர்ச்சியை கூற முடியும்

Text Books:

T1: 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)

T2: Dr.K.K.Pillay "Studies in the History of India with Special Reference to Tamil Nadu"

References

R1: Dr.K.K.Pillay "Social Life of Tamils A joint publication of TNTB & ESC and RMRL – (in print)

R2: Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

R3: Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies)

R4: The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

R5: Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

R6: Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

R7: Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

R8: Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

Web links and Video Lectures (e-Resources):

1. https://youtu.be/fecWlhoPPYY?feature=shared – Unit V
2. https://youtu.be/vsLuw8Q3vA?feature=shared – Unit III

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
2	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
3	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
4	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
5	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
AVG	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-

'1' – Low, '2' – Medium, '3'- High, '-' – No correlations

TECHNICAL COMMUNICATION -II

(Common to all branches)

Course Code	24EN201	**Course Type**	Theory
Teaching Periods/Week (L: T:P)	3:0:0	**Credits**	3
Total Teaching Periods	45	**IAT + ESE Marks**	40+60
Teaching Department	English		

Course Objectives:

1. To facilitate students to improve vocabulary for a better communication.
2. To enable learners to understand and reproduce language.
3. To aid students to write technical reports using appropriate formats and terminologies.
4. To expose students to different sentence structures.
5. To equip learners to present ideas in a required manner.

Unit: I VOCABULARY FOR BETTER COMMUNICATION 9

Listening: Telephonic Conversation and Telephonic Etiquette **Reading:** Newspapers and Magazines-Articles **Speaking**: Conversational Practice: Speaking in a given situation-Short Presentation **Writing:** Response to complaints / Complaints Letter, Permission Letter **Grammar:** Mixed Tenses- Use of Preposition **Vocabulary:** Guessing meanings of words in different contexts.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: II FUNCTIONAL LANGUAGE ASPECTS 9

Listening: Listening – Listening to Longer Dialogues / TED Talks **Reading**: Introduction to Reading Reports - Newspaper, Technical Journal **Speaking**: Using Polite Expressions Writing: Precis Writing - Summary Writing-Internship application, Essay **Grammar**: Subject and Verb Agreement, Regular and Irregular Verbs, Degrees of Comparison **Vocabulary**: Numerical Adjectives

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: III TECHNICAL REPORT WRITING 9

Listening: Listening to Speeches– Giving Solutions to Problems **Reading:** Deductive – Inductive Reading **Speaking:** Interviewing Celebrities / Leaders / Sports persons, Introduction to Small GD **Writing:** Job Application Letter and Resume , Email Writing- Email Etiquette, letter to Editor, Essay **Grammar:** Infinitives , Gerund, If conditionals **Vocabulary:** Modal Verbs

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: IV STRUCTURAL GRAMMAR 9

Listening: Listening for Comprehension **Reading:** Intensive Reading for specific information – Reading Technical Reports **Speaking:** Presenting oral report **Writing:** Report Writing-Survey, Accident report, Recommendations **Grammar:** Reported speech, Embedded Sentences **Vocabulary:** Synonyms and Antonym, Connotative and Denotative Words.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1, L2, L3

Unit: V **PRESENTATION SKILLS** **9**

Listening: Listening – Types **Reading:** Short Stories-Role Play **Speaking:** Paired Presentation **Writing:** Checklists**,** Data Interpretation- Picture, Chart, Graphs, Minutes of the meeting-Memos-Notices **Grammar:** Error Correction, Punctuation **Vocabulary:** Numerical Adjectives, Relative Clause **,** Conjunction

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT

RBT Level: L1, L2, L3

Total **45**

Pedagogical Methods:

Unit 1:	Speaking task
Unit 2:	Reading task
Unit 3:	Speaking task
Unit 4:	Speaking task
Unit 5:	Speaking task

Course Outcomes:

After successful completion of this course, the students will be able to

CO1:	Communicate using appropriate vocabulary in different situations.
CO2:	Use the acquired language skills to comprehend various types of language contents.
CO3:	Evaluate different texts and write effective technical content.
CO4:	Use appropriate sentence structures to convey thoughts in varied contexts.
CO5:	Express the concepts and ideas in a skillful manner

Text Books:

T1: Anna University English Department, "English for Engineers and Technologists", Orient Black Swan, ISBN-978-93-5442-067-2, Third Edition, 2022 –Vol-II.

T2: M.Raman & Sangeeta S., "Technical Communication" Third Edition, Oxford University Press, 2015

T3: Anne Burns and Christine ChuenMeng Goh, "Teaching Speaking: A Holistic Approach", Cambridge University Press 2012; ISBN-110701123X, 9781107011236; Length, 301 pages. 2012

References

R1: Addison Wesley Longman, "Technical English", Pearson, ISBN:978-1292042862, 8th Edition 2013.

R2: Dale Carnegie, "The Art of Public Speaking", Prabhat Prakashan Pvt. Ltd.; ISBN-978-8184302615, First Edition 31st December 2020

R3: Jack C. Richards & Theodore S. Rodgers, " Approaches and Methods in Language Teaching", Second Edition, Cambridge University Press, ISBN: 978-1107675964, 2017.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=Y4TbGPhQ7Ik&list=PLp02GGDX5DIoMkblgrYhq91rF7_JZsf4- - Unit I & Unit II
2. https://www.youtube.com/watch?v=nyXeDFq8&list=PLAyDjaXmCbog1yZWhMx0OdsUya_6YTfTG – Unit IV

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	-	-	-	1	3	-	2	1	1	1
2	-	-	-	-	-	-	-	-	1	3	-	2	1	1	1
3	-	-	-	-	-	-	-	-	1	3	-	2	1	1	1
4	-	-	-	-	-	-	-	-	1	3	-	3	1	1	1
5	-	-	-	-	-	-	-	-	1	3	-	3	1	1	1
AVG	-	-	-	-	-	-	-	-	1	3	-	2.4	1	1	1

'1' – Low , '2' – Medium , '3'- High, '-' – No correlations

TRANSFORMS AND FOURIER ANALYSIS

(Common to ECE, VLSI, ACT)

Course Code	24MA202	**Course Type**	Theory
Teaching Periods/Week (L: T:P)	3:1:0	**Credits**	4
Total Teaching Periods	60	**IAT + ESE Marks**	40 + 60
Teaching Department	Mathematics		

Course Objectives:

1. To introduce the concepts of Laplace transforms and inverse Laplace transform.
2. To introduce Z-transform techniques to solve difference equations.
3. To acquaint the student with the knowledge of solving differential equations.
4. To familiarize Fourier series analysis.
5. To acquaint the student with Fourier transform techniques and its properties.

Unit: I LAPLACE TRANSFORMS **12**

Laplace transforms – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions – Derivatives and integrals of transforms –Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform – Convolution theorem (Statement only). Solution of linear ordinary differential equation of second order with constant coefficients and first order simultaneous equations with constant coefficients using Laplace transform.

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL Videos
RBT Level: L1- L3

Unit: II Z – TRANSFORMS **12**

Z-transforms – Elementary properties – Inverse Z-transforms – partial fractions method –residues method – Convolution theorem. Solution of first and second order difference equations with constant coefficients using Z-transform.

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL Videos
RBT Level: L1 - L3

Unit: III SOLUTION OF DIFFERENTIAL EQUATIONS **12**

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1 - L3

Unit: IV FOURIER SERIES **12**

Dirichlet's conditions - General Fourier series - Odd and even functions - Half range sine and cosine series - Parseval's identity - Harmonic analysis.

Teaching-Learning Process **Pedagogy:** Lecture, PPT
RBT Level: L1 - L3

Unit: V **FOURIER TRANSFORMS** **12**

Statement of Fourier integral theorem - Fourier transform pair - Fourier sine and cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL Videos

RBT Level: L1 - L3

Total **60**

Pedagogical Methods:

Unit 1:	Apply Laplace transforms to a real-world problem
Unit 2:	Assignments.
Unit 3:	Present a real-world problem involving differential equations with solution. (e.g., electrical circuits, mechanical systems)
Unit 4:	Interactive Demonstrations of all the transforms.
Unit 5:	Case Study Problem-Fourier Transform.

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Apply Laplace transform, and inverse Laplace transform to solve linear ordinary differential equation and first order simultaneous equations with constant coefficients.

CO2: Apply Z- transform and its properties to solve difference equations.

CO3: Solve a variety of differential equations

CO4: Expand a given function into Fourier series

CO5: Calculate Fourier transform, Fourier cosine transform, and Fourier sine transform for a given function

Text Books:

T1: B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45th Edition, 2014.

T2: Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2015.

References

R1: Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 4th Edition, 2008. ISBN : 9788173198059

R2: Erwin. K., "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016. ISBN: 9788126567880

R3: Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics", Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012. ISBN: 9781259064917

R4: Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999. ISBN : 9780819433587

Web links and Video Lectures (e-Resources):

1. https://archive.nptel.ac.in/courses/111/106/111106139/ - Unit I
2. https://archive.nptel.ac.in/courses/111/106/111106111/ - Unit II
3. https://archive.nptel.ac.in/courses/111/106/111106100/ - Unit III
4. https://archive.nptel.ac.in/courses/111/101/111101164/ - Unit II & Unit IV
5. https://nptelvideos.com/video.php?id=119 – Unit V

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	-	-	-	-	-	-	-	-	1	2	1	-
2	3	2	1	-	-	-	-	-	-	-	-	1	2	1	-
3	3	2	1	-	-	-	-	-	-	-	-	1	2	1	-
4	3	2	1	-	-	-	-	-	-	-	-	1	2	1	-
5	3	2	1	-	-	-	-	-	-	-	-	1	2	1	-
AVG	3	2	1	-	-	-	-	-	-	-	-	1	2	1	-

'1' – Low , '2' – Medium , '3'- High, '-' – No correlations

ELECTRONIC DEVICES AND CIRCUITS

(Common to ECE ACT and EEE)

Course Code:	24EC201	**Course Type:**	Theory
Teaching Periods/Week (L:T:P):	3:0:0	**Credits:**	3
Total Teaching Periods:	45	**IAT + ESE Marks:**	40 + 60
Teaching Department:	Electronics and Communication Engineering		

Course Objectives: To equip the students with the knowledge in

1. The operation, characteristics of PN junction diode and Zener diode.
2. The operation, configuration, and linear /non-linear characteristics of BJT and MOSFET.
3. The need for biasing, various types of biasing and its effect on BJT and MOSFET.
4. The operation, characteristics and frequency response single stage and multistage amplifiers.
5. The working principle, characteristics and applications of special semiconductor devices.

Unit I SEMICONDUCTOR DIODES **9**

Basics of Semiconductor theory-Intrinsic and Extrinsic-Doping- PN junction diode- Generation and Recombination of Carriers - P-N Junction characteristics - Energy Band diagram, Biasing of P-N Junction - I-V characteristics of P-N Junction - Full Wave Rectifier, C & LC filter-Voltage Multiplier-Clippers & Clampers - Zener diode and its characteristics- Zener Diode as Regulator-Simple Problems

Teaching-Learning Process **Pedagogy:** Lecture, Peer Learning.
RBT Level: L1-L4

Unit II BIPOLAR JUNCTION TRANSISTORS **9**

Operation of npn and pnp Transistor - Types of BJT Configuration - Common Base Configuration - Common Emitter Configuration - Common Collector Configuration - Comparative analysis of CB, CE and CC Configuration - Biasing of Transistor - Need for Biasing -Q point - DC load line- Biasing Circuits- Stability factor - Ebers-Moll Model-Simple Problems.

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos.
RBT Level: L1-L4

Unit: III MOSFET **9**

MOS Capacitor -Energy-Band Diagram- Ideal C-V characteristics - Metal Oxide Semiconductor Field Effect Transistor (MOSFET) -Types of MOSFET - Construction of n-channel depletion MOSFET - Working principle of n-channel depletion MOSFET - p-channel depletion MOSFET -Enhancement MOSFET (E-MOSFET) -Comparison of D-MOSFET and E-MOSFET - I-V characteristics of MOSFET - Small Signal model of MOS transistor- Biasing Methods - Simple Problems.

Teaching-Learning Process **Pedagogy:** Lecture, PPT, YouTube videos,
RBT Level: L1-L4

Unit IV BASICS OF AMPLIFIERS **9**

BJT small signal Amplifiers – CE, CB and CC Performance measures – MOSFET Small signal amplifiers CS, CD and CG Performance measures-Cascade and Cascode amplifier - Differential amplifier, CMRR and Transfer Characteristics -Simple Problems.

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1-L4

Unit V SPECIAL SEMICONDUCTOR DEVICES **9**

Varactor diode –Tunnel diode- Gallium Arsenide device, LDR, UJT, SCR, LED, LCD, Photo transistor, Opto-coupler, Solar cell- Operation, Characteristics and applications.

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1-L4

Total **45**

Pedagogical Methods:

Unit 1:	Role Play Activity
Unit 2:	Tutorial problems
Unit 3:	Tutorial problems
Unit 4:	Z-A activity
Unit 5:	Flipped classroom and activity

Course Outcomes:

After successful completion of this course, the students will be able to

CO1:	Discuss the principle of operation, characteristics and applications of PN junction diode
CO2:	Explain the working and linear/non-linear characteristics of BJT and MOSFET
CO3:	Discuss the need for biasing, various types of biasing and its effect on BJT and MOSFET.
CO4:	Explain the principle of operation, characteristics and frequency response of single stage and multistage amplifiers
CO5:	Discuss working principle of operation, characteristics and applications of special semiconductor devices.

Text Books:

T1: N B Balamurugan, “Analog Electronic Devices: Theory And Practicals”, All India Council for Technical Education (AICTE), 2024. ISBN No. 978-81-963773-5-9.

T2: Donald A Neaman, “Electronic Circuits Analysis and Design”, McGraw Hill Education, 3rd Edition, ,7th Reprint, 2014. ISBN No. 978-0-07-063433-6

T3: G K Mithal, “Electronic Devices and Circuits”, Khanna Publishers, 23rd Edition, 2017. ISBN No. 978-81-7409-177-7.

References

R1: S Salivahanan, N.Suresh Kumar, “Electronic Devices and Circuits”, 3rd Edition, McGraw Hill Education, 2012. ISBN No. 978-1-25-900641-8.

R2: David A bell, " Electronic circuits" , Oxford University Press, 2011. ISBN No.978-0195693409.

R3: Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press, 7 th Edition, 2014. ISBN No.978-0-19-933913-6.

Web links and Video Lectures (e-Resources):

1. https://onlinecourses.nptel.ac.in/noc21_ee55/ - Unit 1
2. https://onlinecourses.nptel.ac.in/noc21_ee80/ - Unit 2
3. https://www.ee.iitm.ac.in/~ani/2012/ec5135/videos/ec5135_lec6/ec5135_lec6.html - Unit 3
4. https://www.ee.iitm.ac.in/~ani/2012/ec5135/videos/ec5135_lec34/ec5135_lec34.html - Unit 4
5. https://web.iitd.ac.in/~shouri/eel204/lectures.php - Unit 4

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	1	-	-	-	-	-	-	1	3	3	1
2	3	2	1	1	1	-	-	-	-	-	-	1	3	3	1
3	3	2	1	1	1	-	-	-	-	-	-	1	3	3	1
4	3	2	1	1	1	-	-	-	-	-	-	1	3	3	1
5	3	2	1	1	1	-	-	-	-	-	-	1	3	3	1
AVG	3	2	1	1	1	-	-	-	-	-	-	1	3	3	1

‘1’ – Low, ‘2’ – Medium, ‘3’- High, ‘-‘ – No correlations

ELECTRIC CIRCUIT ANALYSIS

(Common to ECE, ACT and VLSI)

Course Code:	24EE201	**Course Type:**	Theory
Teaching Periods/Week (L:T:P):	3:0:0	**Credits:**	3
Total Teaching Periods:	45	**IAT + ESE Marks:**	50 + 50
Teaching Department:	Electrical and Electronics Engineering		

Course Objectives:

1. To develop the skills for solving, simple electric circuits using fundamental network laws and theorems.
2. To impart basic knowledge for analyzing the single phase and three phase AC electrical circuits.
3. To educate on the fundamental concepts of transient analysis of electric circuits using Laplace transform.
4. To give insight on the basics of resonance and coupled circuits.
5. To impart the fundamental concepts of two-port networks using network parameters.
6. To impart the fundamental concepts of solving electric circuits using graph theory

UNIT I DC CIRCUITS **9**

Fundamentals concepts of R, L and C - Energy Sources - Ohm's Law -Kirchhoff 's Laws – Series and Parallel circuits – Star-delta transformation - Mesh current and Node Voltage Analysis - Superposition, Thevenin's and Norton's & Maximum power transfer theorem – Reciprocity Theorem - Simple Problems using dependent sources.

Teaching-Learning Process **Pedagogy:** Lectures, PPT, NPTEL
RBT Level: L1, L2, L3, L4

UNIT II AC CIRCUITS **9**

A.C Fundamentals – Average and RMS Value –Complex Impedance – Phasor diagram - Real and Reactive Power, Power Factor, Energy – Analysis of RL, RC and RLC Circuits.
Introduction to Three Phase Circuits -Phase Sequence – Star / Delta Connection - Relation between Line and Phase Voltages and Currents in Balanced Systems and Unbalanced Circuits - Measurement of Power using Two wattmeter method.

Teaching-Learning Process **Pedagogy:** Lectures, PPT, NPTEL
RBT Level: L1, L2, L3, L4

UNIT III TRANSIENT RESPONSE ANALYSIS **9**

Introduction – Laplace transforms and inverse Laplace transforms- standard test signals -Transient response of RL, RC and RLC circuits using Laplace transform for Source free, Step input, Sinusoidal input.

Teaching-Learning Process **Pedagogy:** Lectures, PPT, NPTEL
RBT Level: L1, L2, L3, L4

UNIT IV RESONANCE AND COUPLED CIRCUITS **9**

Series and parallel resonance –frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling – Dot rule-Analysis of coupled circuits– Single Tuned circuits.

Teaching-Learning Process **Pedagogy:** Lectures, PPT, NPTEL
RBT Level: L1, L2, L3, L4

UNIT V TWO PORT NETWORKS AND GRAPH THEORY 9

Network functions – Pole-Zero diagram – Driving point Impedance and Admittance-Transfer Impedance and Admittance –Necessary conditions of Transfer functions – Z-parameters - Y-parameters – Hybrid parameters- ABCD parameters - Conditions of Reciprocity and Symmetry in Two port parameter representation – Image and Iterative Impedance - Graph - Component of Graph - Types of Graph -Tree-CoTree - Tieset – Cutset - Matrix Representation of Graphs

Teaching-Learning Process **Pedagogy:** Lectures, PPT, NPTEL
RBT Level: L1, L2, L3, L4

Total 45

Pedagogical Methods:

Unit 1: Problems on Series and Parallel Circuits, Kirchhoff's and Ohm's Laws
Unit 2: Quiz on AC circuits
Unit 3: Role play on R, RC, RL and RLC loads
Unit 4: Seminar on Filters and attenuators
Unit 5: Charts on Two Port Networks

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Apply various laws and theorems to solve simple problems in electric circuits.
CO2: Compute various parameters like real and reactive power, power factor in single phase and three phase ac circuits.
CO3: Analyze the transient response of RL, RC and RLC circuits for step and sinusoidal input.
CO4: Explain the basic concepts of coupled circuits and frequency response of RLC circuit.
CO5: Describe the performance of electric circuits at its input and output ports.
CO6: Determine the behavior and characteristics of a networks using graph theory.

Text Books:

T1: William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, 9th Edition, New Delhi, 2020.
T2: Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2019.
T3: Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013

References

R1: Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpat Rai& Sons, New Delhi, 2020.
R2: Joseph A. Edminister, Mahmood Nahvi, "Electric circuits", Schaum's series, McGraw-Hill, First Edition, 2019.
R3: M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 2015
R4: Sudhakar A and Shyam Mohan SP, "Circuits and Networks Analysis and Synthesis", McGraHill, 2015.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=VXo0p_1z3Uw- Unit 1
2. https://www.youtube.com/watch?v=pBOLAEm1bfw- Unit 2
3. https://archive.nptel.ac.in/courses/108/102/108102185/- Unit 1 and 2
4. https://www.youtube.com/watch?v=JIFwqRn0LQk&list=PLbRMhDVUMngfNnABo5mre45ZbHqJE2sUn&index=45 – Unit 3
5. https://www.youtube.com/watch?v=u59IUA6uvjk- Unit 4
6. https://www.youtube.com/watch?v=GasWAlIvvD8- Unit 5

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	--	--	--	--	--	--	--	1	2	2	--
2	3	2	2	--	--	--	--	--	--	--	--	1	2	2	--
3	3	2	2	--	--	--	--	--	--	--	--	1	2	2	--
4	3	2	2	--	--	--	--	--	--	--	--	1	2	2	--
5	3	2	2	--	--	--	--	--	--	--	--	1	2	2	--
AVG	**3**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**2**	**--**

'1' – Low, '2' – Medium, '3'- High, '-' – No correlations

PROGRAMMING IN C

(Common to CSE / IT / AIDS / CSBS / CSCS / AIML / EEE / ECE)

Course Code	24CS111	**Course Type**	Integrated
Teaching Periods/Week (L:T:P)	2:0:4	**Credits**	4
Total Teaching Periods	90	**IAT + ESE Marks**	50 + 50
Teaching Department	Computer Science and Engineering		

Course Objectives: To equip the students with the knowledge in

1. C programs using fundamental programming structures.
2. C programs utilizing arrays and strings.
3. Applications of C using functions and pointers.
4. Advanced features of the C programming language, including structures and unions.
5. File operations in C

Unit: I INTRODUCTION AND BASICS OF C PROGRAMMING 6

Introduction - Structured programming - Problem solving techniques: Algorithms, Flowcharts, Pseudo code - Structure of a C program - Compiling and executing a C program - Data types and Variables – operators and expressions – Input and output functions -Control Structures: decision making and looping statements

Teaching-Learning Process **Pedagogy:** Chalk and Talk
RBT Level: L1, L2, L3, L4

Unit: II ARRAYS AND STRINGS 6

Arrays: One dimensional array: declaration, initialization and operations - Two & Multi-dimensional arrays. Strings: Strings vs Character arrays - String operations – String Functions – Arrays of Strings

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT
RBT Level: L1, L2, L3, L4

Unit: III FUNCTIONS AND POINTERS 6

Need for Modular programming - Functions: declaration and definition – Function call - Call by value - Call by reference - Recursive functions - Pointers: Introduction - Pointers to primitive data types – Arrays and pointers - Array of pointers - Storage classes - Dynamic Memory Allocation

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT
RBT Level: L1, L2, L3, L4

Unit: IV STRUCTURES AND UNIONS 6

Structures: Need, declaration, Accessing Structure elements – Nested structures - Arrays of structures – Self-referential structures – Pointers to structures - Unions: declaration and accessing

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT
RBT Level: L1, L2, L3, L4

Unit: V FILES AND PREPROCESSOR DIRECTIVES 6

Files: Introduction, Types of file processing – Sequential and Random Access - Read /Write of binary and text files. - Preprocessor directives – Command line arguments

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1, L2, L3, L4

Total 30

Pedagogical Methods:

Unit 1:	To draw a flowchart and a write algorithm for the following problems i) sum of two numbers ii) largest among three numbers
Unit 2:	Perform basic operations on arrays i) Find the largest element in the array ii) Calculate the sum of all elements in the matrix
Unit 3:	Program for swapping two integers using call by value and call by reference
Unit 4:	Create a student information system, i) Declare a structure Student with members: name, age and Roll number. ii) To calculate the GPA and CGPA from the student's marks
Unit 5:	Programs for file operations

Practical Exercises: 60

1. Programs for demonstrating the use of different types of operators like arithmetic, logical, relational, and ternary operators (Sequential structures)
    a) To find the area of a triangle
    b) To Convert temperatures from Celsius to Fahrenheit or vice versa using the appropriate formula
2. Write a C program to demonstrate the use of "scanf" and "printf" statements to "read" and "print" values of variables of different data types.
3. Programs using decision making statements like 'if', 'else if', 'switch', conditional and unconditional 'goto' (Selective structures)
    a) To find the Largest among three numbers
    b) To print day of the week by giving a integer using switch Statement
    c) To find Roman number of a given number
4. Programs for demonstrating repetitive control statements like 'for', 'while', and 'do-while' (Iterative structures):
    a) Check whether the given number is Armstrong or not.
    b) To find the Sum of squares of first n numbers.
    c) To Check the given number is prime or not.
    d) To print the Multiplication table
    e) To convert the Octal number to decimal number.
5. Implement the following programs in C using one-dimensional array
    a) To Calculate the sum and average of elements
    b) To Find the min and max values of the given set of numbers
    c) To Reverse the elements
    d) To arrange the given set of number by using Bubble sort
    e) To find the given number from the list of elements by using Linear Search.
6. Write a C program using two-dimensional arrays for a) Matric Addition b) Matrix Multiplication

7. Programs to demonstrate modular programming concepts using user-defined functions
    a) Swapping two integers using call by value and call by reference
    b) Create a recursive function to calculate the factorial of a number and for binary search
8. Implement various character and string operations with and without using built-in functions in C.
    a) Find length of a string
    b) String Concatenation
    c) To Check whether the given string is Palindrome or not
9. Write a C program using pointers for the following:
    a) Swapping two numbers
    b) Greatest and the smallest among three numbers
    c) Reverse of a string
    d) Linear searching in array
10. Programs to illustrate the use of user-defined data types using Structures:
    a) Employee Payroll
    b) Student information system
11. Write a C program to implement various file operations listed below:
    a) Copy the contents from one file to another file
    b) Merging two files
12. Programs to demonstrate the use of pre-processor directives and command line arguments for the following:
    a) Finding area of circle and area of a square using #define
    b) Simple arithmetic operations using #include
    c) Program that accepts two file names as command-line arguments and copy the contents from one file to another file.

System requirement

Sl. No.	Description of Equipment	Required numbers for batch of 30 students
1.	INTEL based desktop PC with min. 4GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse	30
2.	Windows 8 or higher operating system / Linux Ubuntu 20 or higher	30
3.	Systems with Linux Operating System with GNU Compiler / Windows with Turbo C compiler	30

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Develop simple applications in C using basic constructs
CO2: Design and implement applications using arrays and strings
CO3: Create applications in C using functions and pointers
CO4: Utilize advanced features of the C programming with structures and unions
CO5: Develop applications using file operations in C

Text Books:

T1: E. Balaguruswamy, "Programming in ANSI in C", Tata McGraw Hill, Eight Edition, 2019

T2: Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016

T3: Pradip Dey, Manas Ghosh, "Programming in C", First Edition, Oxford University Press, 2018

References

R1: R G Dromey, "How to Solve it using Computer", Pearson,2006

R2: Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition Pearson Education,2015

R3: Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011

R4: Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, Tata McGraw Hill, 2010

Web links and Video Lectures (e-Resources):

1. https://www.udemy.com/course/c-programming-for-beginners/ - All Units
2. https://en.wikibooks.org/wiki/C_Programming - Unit 1, 2 & 3
3. https://www.coursera.org/specializations/c-programming - Unit 2 & 3
4. https://onlinecourses.nptel.ac.in/noc22_cs40/preview - All units

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	-	-	-	-	-	-	3	2	1	1
2	3	2	2	2	2	-	-	-	-	-	-	3	2	1	1
3	3	2	2	2	2	-	-	-	-	-	-	3	2	1	1
4	3	2	2	2	2	-	-	-	-	-	-	3	2	1	1
5	3	2	2	2	2	-	-	-	-	-	-	3	2	1	1
AVG	3	2	2	2	2	-	-	-	-	-	-	3	2	1	1

'1' – Low, '2' – Medium, '3'- High, '-' – No correlations

BASIC CIVIL AND MECHANICAL ENGINEERING

(Common to CSE, IT, AIDS, CSBS, AIML, CSE-CYS, ECE, ACT, VLSI and EEE)

Course Code	24GE101	**Course Type**	Theory
Teaching Periods/Week (L: T:P)	3:0:0	**Credits**	3
Total Teaching Periods	45	**IAT + ESE Marks**	40+60
Teaching Department	Civil Engineering and Mechanical Engineering		

Course Objectives: To Equip the students with the knowledge in

1. Types of civil structures, civil engineering materials, and civil construction.
2. Different types of building plans, foundations, and infrastructures.
3. Parts of IC engines, pumps, and their working principles.
4. Components of the power plant and a detailed explanation of their working principles.
5. Parts of the Refrigeration & Air-conditioning system and their working principles and applications.
6. Additive manufacturing processes and their applications.

Unit: I INTRODUCTION OF CIVIL ENGINEERING AND CONSTRUCTION MATERIALS **9**

Civil Engineering – Specialized sub-disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation, and Water Resources Engineering Types of buildings: Residential buildings, Industrial buildings.

Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel – Timber – Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials. Modern uses of Gypsum, Pre-fabricated Building components (brief discussion only)

Teaching-Learning Process **Pedagogy:** Lecture, PPT

RBT Level: L1, L2, L3

Unit: II BUILDING COMPONENTS AND INFRASTRUCTURE **9**

Building plans – Setting out of a Building – Foundations: Types of foundations –Brick masonry – Stone Masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering. Types of Bridges and Dams – Water Supply Network –Introduction to Highways and Railways – Introduction to Green Buildings - Stress prediction by AIML.

Teaching-Learning Process **Pedagogy:** Lecture, PPT

RBT Level: L1, L2, L3

Unit: III INTERNAL COMBUSTION ENGINES **9**

Internal combustion engines as an automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two-stroke engines - Concept of hybrid engines - Electric Vehicles – Components, Accessories, and working of electric vehicles.

Teaching-Learning Process **Pedagogy:** Lecture, PPT, Youtube Videos

RBT Level: L1, L2, L3

Unit: IV POWER PLANTS, REFRIGERATION AND AIR CONDITIONING SYSTEM **9**

Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydroelectric, and Nuclear Power plants- Internal combustion engines as automobile power plants. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

Teaching-Learning Process **Pedagogy:** Lecture, PPT, YouTube Videos

RBT Level: L1, L2, L3

Unit: V ADDITIVE MANUFACTURING **9**

Additive Manufacturing Overview – VAT Photopolymerisation - Material Jetting - Binder Jetting - Material Extrusion - Powder Bed Fusion - Sheet Lamination - Directed Energy Deposition – Merits Demerits and its Applications.

Teaching-Learning Process **Pedagogy:** Lecture, PPT, YouTube Videos

RBT Level: L1, L2, L3

Total **45**

Pedagogical Methods:

Unit 1:	Poster presentation - Civil Engineering Materials
Unit 2:	Seminar – Types of Bridges and Dams
Unit 3:	Seminar on Components of IC Engines
Unit 4:	Role Play – Vapour Compression Refrigeration System
Unit 5:	Model Making

Course Outcomes:

After successful completion of this course, the students will be able to

CO1:	Explain the types of civil structures, civil engineering materials, civil construction.
CO2:	Discuss about the different types of building plans, foundations, and infrastructures.
CO3:	Explain the components of IC engines, pumps, and their working principles.
CO4:	Describe the parts of the power plant and a detailed explanation of their working principles.
CO5:	Summarize the parts and working principle of refrigeration & air-conditioning system
CO5:	Discuss the additive manufacturing processes and their applications

Text Books:

T1: G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018. ISBN - 9789387572317

References

R1: Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd, 2022. ISBN - 9788187433545

R2: Basic Mechanical Engineering, Pearson Education, 2018, ISBN: 978-9386873293

R3: Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, 2005.

R4: S.Shiva. Anuj K Shukla, “Additive Manufacturing Technologies” – Wiley Publications, 2024, ISBN - 9789357462419

R5: Basic Civil Engineering by Sateesh Gopi, Pearson Education, 2023, 978-8131729885

R6: Basic Mechanical Engineering, Basant Agrawal, and C.M. Agrawal, Wiley India pvt ltd, 2008 ISBN: 978-81-265-1878-4

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=m4m2AVqQtmk – Unit 1
2. https://www.youtube.com/watch?v=amxCBv2-5b4 – Unit 2
3. https://www.youtube.com/watch?v=8dAbcbAJRw8 – Unit 3
4. https://www.youtube.com/watch?v=IdPTuwKEfmA – Unit 4
5. https://archive.nptel.ac.in/courses/112/103/112103306/ - Unit 5

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
2	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
3	2	-	-	-	-	-	1	-	-	-	-	-	1	1	-
4	2	-	-	-	-	-	1	-	-	-	-	-	1	1	-
5	2	-	-	-	-	-	1	-	-	-	-	-	1	1	-
6	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
AVG	2	-	-	-	-	-	1	-	-	-	-	-	1	1	-

"1" – Low, "2" – Medium, "3"- High, "-" – No correlations

ENGLISH FOR PROFESSIONAL COMPETENCE

(Common to all branches)

Course Code	24EN221	**Course Type**	Practical
Teaching Periods/Week (L: T:P)	0:0:2	**Credits**	1
Total Teaching Periods	30	**IAT + ESE Marks**	60 + 40
Teaching Department	English		

Course Objectives:

1. To enhance employability and career skills.
2. To develop confidence and provide adequate soft skills required for work place.
3. To inculcate professional and corporate skills to compete with workplace challenges.

Unit: I RECEPTIVE SKILLS **6**

Listening – Comprehensive Listening – Watching the news – Listening to a peer giving presentation – Critical Listening – Watching a televised debate – Reading – Extensive Reading – One- act Plays – Intensive Reading – Articles, Blog posts on topics like science and technology, arts, etc.

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1, L2, L3

Unit: II PRODUCTIVE SKILLS **6**

Speaking – Demonstrative Speaking – Process description through visual aids – Persuasive Speaking – Writing – Descriptive Writing - Subjective Writing – Autobiography, Opinion Essay – Describing a Product or Mechanisms and interpretations.

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1, L2, L3

Unit: III ENGLISH FOR COMPETITIVE EXAMS **6**

Verbal aptitude- Close test- Error correction- Homonyms and homophones- Spelling British and American words-word order.

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1, L2, L3

Unit: IV CORPORATE SKILLS **6**

Critical Thinking and Problem Solving – Brainstorming, Q & A Discussion – Team work and Collaboration – Activities like Office Debates, Group discussion – Professionalism and Strong Work Ethics –Soft Skills, Teamwork, Adaptability, Empathy and Growth Mind set.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT, YouTube videos

RBT Level: L1, L2, L3

Unit: V PROJECT WORK **6**

Project Writing- Methodology- Bibliography- Reference- Presentation Techniques- Mini Project

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT, YouTube videos

RBT Level: L1, L2, L3

Total **30**

System requirement

Sl. No.	Description of Equipment	Required numbers for batch of 30 students
1.	INTEL based desktop PC with min. 4GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse	30
2.	Windows 8 or higher operating system	30
3.	Hot Potatoes / Globarina	30

Course Outcomes:

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

CO1: Interpret and respond appropriately in listening and reading contexts.

CO2: Express proficiently in spoken and written communication.

CO3: Apply acquired language skills in professional and corporate discussions.

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	-	-	-	2	3	-	2	1	1	1
2	-	-	-	-	-	-	-	-	2	3	-	3	1	1	1
3	-	-	-	-	-	-	-	-	2	3	-	2	1	1	1
AVG	-	-	-	-	-	-	-	-	2	3	-	2.4	1	1	1
"1" – Low, "2 " – Medium, "3" - High, "-" – No correlation															

ENGINEERING MATHEMATICS LABORATORY
(Common to ECE, VLSI, ACS)

Course Code	24MA222	**Course Type**	Practical
Teaching Periods/Week (L: T:P)	0:0:2	**Credits**	1
Total Teaching Periods	30	**IAT + ESE Marks**	60 + 40
Teaching Department	Mathematics		

Course Objectives

1. To demonstrate basic and advanced matrix operations and eigenvalue computation using Sci Lab
2. To demonstrate differentiation and integration techniques using Sci Lab.
3. To familiarize Laplace Transform, Z-transforms, Fourier series and Fourier transform using Sci Lab.

PRACTICAL **30**

1. Introduction to SCI LAB through matrices and general syntax.
2. Finding the Eigenvalues and Eigenvectors.
3. Plotting the graph of a quadratic form.
4. Evaluating area using double integral.
5. Evaluating Volume using Triple Integral
6. Plot the graph f(t) and Laplace Transform of f(t)
7. Finding the Laplace transform and its inverse of a given function.
8. Transform the function F(s) into linear fraction by partial fraction method by using Laplace Transform
9. Transform the function into linear fraction by partial fraction method by using Z-Transform
10. Find the convolution between two functions using Laplace transform and Z-transform
11. Find the Fourier Series co-efficient for the given function.
12. Compute the half-range sine and cosine series for the given functions
13. Evaluate the Harmonic Analysis Using Fourier Series
14. Find the convolution between two functions using Fourier Transform
15. Compute the Fourier sine and cosine transform for a given function

System requirement

Sl. No.	**Description of Equipment**	**Required numbers for batch of 30 students**
1.	INTEL based desktop PC with min. 4GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse	30
2.	Windows 8 or higher operating system / Linux Ubuntu 20 or higher	30

3.	Scilab 6.0 or later	30

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Solve complex problems involving matrices using Sci lab.

CO2: Utilize Sci lab to solve integration and differentiation problems.

CO3: Apply fourier series and transforms in SCI lab and find the series and its coefficients.

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	2	2	-	-	-	-	-	-	-	2	1	1
2	3	2	1	2	2	-	-	-	-	-	-	-	2	1	1
3	3	2	1	2	2	-	-	-	-	-	-	-	2	1	1
AVG	3	2	1	2	2	-	-	-	-	-	-	-	2	1	1

"1" – Low, "2" – Medium, "3"- High, "-" – No correlation

ELECTRONIC DEVICES AND ELECTRIC CIRCUITS LABORATORY

Course Code :	24EC221	**Course Type:**	Practical
Teaching Periods/Week (L:T:P):	0:0:3	**Credits:**	1
Total Teaching Periods:	45	**IAT + ESE Marks:**	60 + 40
Teaching Department:	Electronics and Communication Engineering		

Course Objectives:

To equip the students with the knowledge in

1. The operation of electronic devices and their characteristics.
2. The functionality of electronic circuits and their characteristics.
3. The application of the basic electrical circuit laws and theorems.

Practical Exercises: **45**

1. Characteristics of PN Junction Diode &Zener diode
2. Common Emitter input-output Characteristics
3. Common Base input-output Characteristics
4. MOSFET Characteristics
5. SCR and UJT Characteristics
6. Clipper, Clamper and Voltage multiplier
7. Verification of Thevenin & Norton theorems
8. Verification of KVL & KCL
9. Verification of Super Position Theorem
10. Verification of Maximum Power Transfer.
11. Determination of Resonant Frequency of Series RLC Circuits
12. Transient analysis of RL and RC circuits

Sl. No.	Description of Equipment	Required numbers (for batch of 30 students)
1	Resistors, Capacitors, Inductors – Discrete Component	Adequate quantity
2	Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box	10 No each
3	Voltmeter (0-5 V),(0-10 V), (0- 30 V),(0- 300 V)	Each 5 quantity
4	Ammeter (0- 1mA), (0- 10 mA), (0-25 mA), (0-50 mA), (0- 100 mA), (0-500 µA)	Each 5 quantity
5	Power Meter	2 Nos
6	BC107/ BC547, IN4001/ IN4007, IN 4734A/4732A/4730A, IC 741, 2N2646,2N7000 / 2N470, TYN 604 / C106	Adequate quantity
7	CRO/DSO (30 MHz)	15 Nos
8	Signal Generators / Function Generators (3 MHz)	15 Nos
9	Dual Regulated Power Supplies (0-30 V)	15 Nos
10	Bread Boards	15 Nos
11	Multimeters	15 Nos
12	Connecting Wires	Adequate quantity
13	SPICE Simulator - Pspice 9.1version	10 Users
14	INTEL based desktop PC with min. 4GB RAM and 500 GB HDD, 17” or higher TFT Monitor, Keyboard and mouse	10 Users

Course Outcomes:

After successful completion of this course, the students will be able to

CO1:	Measure, record and validate the characteristics of electronic devices
CO2:	Measure, record and validate the characteristics of electronic circuits
CO3:	Apply the circuit laws and theorems and verify the output.

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	2	1	-	-	-	-	-	-	1	3	3	1
2	3	1	1	2	1	-	-	-	-	-	-	1	3	3	1
3	3	1	1	2	1	-	-	-	-	-	-	1	3	3	1
AVG	3	1	1	2	1	-	-	-	-	-	-	1	3	3	1
"1" – Low, "2" – Medium, "3" - High, "-" – No correlation															

IT ESSENTIAL SKILLS

(Common to all branches)

Course Code	24IT121	**Course Type**	Practical
Teaching Periods/Week (L: T:P)	0:0:2	**Credits**	1
Total Teaching Periods	30	**IAT + ESE Marks**	60 + 40
Teaching Department	Information Technology		

Course Objectives: To equip students with the knowledge in:

1. PC components, diagnose and resolve common issues to maintain optimal performance.
2. PowerPoint and Word for crafting compelling presentations and professional documents with advanced formatting, multimedia integration, and design techniques.
3. Spreadsheets for the creation, management, and analysis of data across various tasks.
4. Use of ChatGPT for prompt engineering, creative writing, and language translation to enhance communication and content creation.
5. HTML and CSS to design and build well-structured, visually appealing, and interactive web pages.

Practical Exercises **30**

PC Hardware & Software Installation **6**

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

WORD **6**

Word Orientation: The mentor needs to give an overview of Microsoft (MS) office or equivalent (FOSS) tool word: Importance of MS office or equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that would be covered in each, using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 1: Using Word to create a project certificate. Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

Task 2: Creating project abstract Features to be covered: -Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 3: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL **6**

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered: - Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,
Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"
Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."
Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT **4**

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

T**ask 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc.,), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS –Chat GPT **4**

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas.

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?"

HTML AND CSS

HTML & CSS Orientation: The mentor needs to tell the importance of HTML tags as a design tool, give the details of the three tasks and features that would be covered in each. Using HTML – Formatting, List, Header, Table, insert image Using help and resources.

Task 1: Create a simple webpage with a title, header, paragraph, and footer for institution.

Task 2: Create a form with fields for name, email, password, and a submit button Include radio buttons, checkboxes, and a dropdown menu.

Task 3: Create and Apply an External CSS to an HTML Document for your profile.

System Requirement

Sl. No.	Description of Equipment	Required numbers (for batch of 30 students)
1.	INTEL based desktop PC with min. 4GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse	30
2.	Office tools – Word processor, Spread sheet, Presentation tool	30
3.	AI TOOLS: Chat GPT	30
4.	Mozilla Firefox / Chrome / Microsoft Edge, Notepad ++	30

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Identify the components of a PC and troubleshoot PC malfunctions.

CO2: Develop essential skills in PowerPoint and Word to create engaging presentations and professional documents with advanced formatting, multimedia integration, and layout techniques.

CO3: Acquire the ability to create, manage, and analyze data using spreadsheets for various tasks.

CO4: Attain knowledge in using Chat GPT for prompt engineering, creative writing, and language translation, enhancing interaction and content generation capabilities.

CO5: Build foundational skills in HTML and CSS to create structured, styled, and interactive web pages

References

R1: Kate J. Chase , PC Hardware - A Handbook, , PHI (Microsoft)

R2: David Anfins on and Ken Quamme, IT Essentials PC Hardware and Software Companion Guide, CISCO Press, Pearson Education, 3rd edition

R3: Patrick Regan, IT Essentials PC Hardware and Software Labs and Study Guide, CISCO Press, Pearson Education, 3rd edition

R4: Vikas Gupta, Comdex Information Technology course tool kit, WILEY Dream tech, 2003

R5: Cheryl A Schmidt, The Complete Computer upgrade and repair book, WILEY Dream tech, 2013, 3rd edition

R6: Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition

R7: Prashant Joshi Introduction to IT Systems, Khanna Book Publishing Co.(P) Limited, New Delhi, 2021 First Edition

CO-PO & PSO Mapping:															
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
1	3	2	2	2	2	-	-	-	-	-	-	-	2	-	-
2	3	2	2	2	2	-	-	-	-	-	-	-	2	-	-
3	3	2	2	2	2	-	-	-	-	-	-	-	2	-	-
4	3	2	2	2	2	-	-	-	-	-	-	-	2	-	-
5	3	2	2	2	2	-	-	-	-	-	-	-	2	-	-
AVG	3	2	2	2	2	-	-	-	-	-	-	-	2	-	-
'1' – Low, '2' – Medium, '3'- High, '-' – No correlations															

LINEAR ALGEBRA AND NUMERICAL METHODS

Course Code	24MA302	Course Type		THEORY	
Course Offered to	ECE, VLSI & ACT				
Total Teaching Periods	45	L:T:P	2:1:0	Credits	3
Handled by	MATHEMATICS	Assessment Methods		IAT	ESE
				40 Marks	60 Marks

Prerequisite: Basic knowledge of matrices, determinants, functions, and calculus**.**

Course Objectives: To enhance the knowledge of

1. Vector spaces, subspaces, linear dependence, bases, and dimension.
2. Linear transformations, eigenvalues, eigenvectors, and diagonalization techniques.
3. Inner product spaces and orthogonalization methods used in mathematical computations.
4. Numerical techniques for solving systems of linear equations and eigenvalue problems.
5. Numerical interpolation, differentiation, and integration methods for solving engineering problems.

Unit: I VECTOR SPACES **9**

Vector spaces – Subspaces – Linear combinations - Linear Span – Linear dependence - Linear independence – Bases and Dimension

Teaching-Learning Process **Pedagogy:** Lecture,NPTELVideos
RBT Level: L1-L3

Unit: II LINEAR TRANSFORMATIONS **9**

Linear Transformation – Null space, Range space - dimension theorem - Matrix and representation of Linear Transformation – Eigenvalues Eigenvectors of linear transformation – Diagonalization of linear transformation – Application of diagonalization in linear system of differential equations.

Teaching-Learning Process **Pedagogy:** Lecture,NPTELVideos
RBT Level: L1-L3

Unit: III INNER PRODUCT SPACES **9**

Inner Products and norms - Inner Product Spaces - Orthogonal vectors – Gram Schmidt orthogonalization process – Orthogonal complement – Least square Approximations.

Teaching-Learning Process **Pedagogy:** Lecture,PPT
RBTLevel: L1-L3

Unit: IV NUMERICAL SOLUTION OF LINEAR SYSTEM OF EQUATIONS AND EIGEN VALUE PROBLEM **9**

Solution of linear system of equations – Direct methods: Gauss elimination method – Pivoting, Gauss Jordan method, LU decomposition method . Iterative methods: Gauss-Jacobi Method, Gauss-Seidel Method. Eigen values of a matrix by Power method.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1-L3

Unit: V NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Finite differences – Forward and Backward differences – Interpolation – Newton's forward and backward interpolation formulae - Lagrange's interpolation for unequal intervals - Numerical Differentiation - Newton's and Lagrange's formulae-Numerical integration using Trapezoidal and Simpson's1/3rules–Evaluation of double Integrals by Trapezoidal and Simpson's1/3 rules.

Teaching-Learning Process **Pedagogy:** Lecture,NPTELVideos

RBT Level: L1 **-**L3

Total 45

Suggested Activities: Flipped classroom, Role Play , (Gate related questions),Case study Students performance ,Student presentations

Evaluation Methods: Performance in Suggested Activites and End Semester Examinations

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Understand vector spaces, subspaces, linear independence, bases, and dimension.

CO2: Apply linear transformations, eigenvalues, eigenvectors, and diagonalization in mathematical problems.

CO3: Analyze inner product spaces and apply orthogonalization methods such as Gram–Schmidt process.

CO4: Apply numerical methods such as Gauss elimination, LU decomposition, Jacobi and Gauss–Seidel methods to solve linear systems and eigenvalue problems.

CO5: Use numerical techniques for interpolation, differentiation, and integration to approximate solutions of mathematical problems.

Text Books:

T1: Friedberg, S.H., Insel, A.J. and Spence, E., "Linear Algebra", Pearson Education, New Delhi, 5th Edition,2008.

T2: Williams, G, "Linear Algebra with Applications", Jones & Bartlett Learning, First Indian Edition, New Delhi, 2019.

T3: Grewal,B.S.,andGrewal,J.S.,"Numerical Methods in Engineering and Science", Khanna Publishers,10th Edition, New Delhi, 2015.

References

R1: Bernard Kolman, David R. Hill, "Introductory Linear Algebra", Pearson Education, First Reprint, New Delhi, 2010.

R2: Gerald, C.F, and Wheatley, P.O., "Applied Numerical Analysis", Pearson Education, 7th Edition, New Delhi, 2004.

R3: Kumaresan, S., "Linear Algebra – A geometric approach", Prentice – Hall of India, Reprint, New Delhi, 2010.

Web links and Video Lectures (e-Resources):

1. https://archive.nptel.ac.in/courses/111/106/111106139/
2. https://archive.nptel.ac.in/courses/111/106/111106111/
3. https://archive.nptel.ac.in/courses/111/106/111106100/
4. https://archive.nptel.ac.in/courses/111/101/111101164/
5. http://acl.digimat.in/nptel/courses/video/111107105/L01.html

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	–	–	–	–	–	–	–	–	–	2	–	–
2	3	3	1	–	–	–	–	–	–	–	–	2	1	–
3	3	3	–	1	–	–	–	–	–	–	–	2	–	–
4	3	3	2	2	1	–	–	–	–	–	–	3	2	1
5	3	3	2	2	1	–	–	–	–	–	–	3	2	1
AVG	3	2	–	–	–	–	–	–	–	–	–	2	–	–
1– “Low”,2– “Medium”,3- “High’, – “No correlations”														

SIGNALS AND SYSTEMS

Course Code	24EC301	Course Type		THEORY	
Course Offered to	Common to ECE				
Total Teaching Periods	45	L:T:P	2: 1 :0	Credits	3
Handled by	ECE	Assessment Methods		IAT	ESE
				40 Marks	60 Marks

Prerequisite: Basic knowledge of engineering mathematics and signals and systems concepts.

Course Objectives: To impart knowledge of

1. Continuous-time and discrete-time signals and their fundamental properties and operations.
2. Fourier series and Fourier transform techniques for analyzing signals in the frequency domain.
3. Laplace and Z-transforms for analyzing continuous and discrete-time signals and systems.
4. Continuous-time and discrete-time system characteristics including convolution, stability, and frequency response.
5. Discrete Fourier transform (DFT) and fast Fourier transform (FFT) for efficient signal processing and analysis.

Unit: I CONTINUOUS TIME AND DISCRETE TIME SIGNALS 9

Analogy between Vector and Signals - Classification of Signals – CT and DT Signals, Periodic and Aperiodic signals, Even and Odd signals, Deterministic and Random signals, Energy and Power signals – Operation on Signals – Standard Signals-Step, Ramp, Pulse, Impulse, Sinusoidal, Real and Complex exponentials Signals

Sampling Theorem - Graphical and analytical proof for Band Limited Signals - Impulse Sampling, Natural and Flat Top Sampling, - Reconstruction of signal from its samples - Effects of under Sampling-Aliasing effect.

PRACTICALS:

1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy, Power even and odd signals.
3. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
4. Demonstrate that a band-limited signal can be reconstructed if sampled at ≥ twice its highest frequency.

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL/YouTube videos, Peer Learning, Tutorials

RBT Level: L1-L3

Unit: II FOURIER SERIES AND FOURIER TRANSFORM 9

Fourier series Analysis - Trigonometric and Exponential Fourier series - Fourier Transforms - Properties of Fourier transform - Fourier Transforms in CT signal analysis - Solution for differential equation using Fourier transforms – DTFT – Properties.

PRACTICALS :

1. Write a program to find the trigonometric / exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings- Plot the discrete spectrum of the signal.
2. Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos, Peer Learning, Tutorials

RBT Level:L1-L4

Unit: III LAPLACE AND Z TRANSFORMS 9

Laplace Transforms – ROC - Properties of Laplace transform, Laplace Transforms in CT signal analysis,- Solution for differential equations - Laplace Transform of certain signals using waveform synthesis - Constraints on ROC for various classes of signals. Z-Transforms - ROC - Properties of Z-transform - Inverse Z- Transform - Z-transforms in analysis of DT signals and systems

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos, Peer Learning, Tutorials

RBT Level:L1-L4

Unit: IV CONTINUOUS TIME AND DISCRETE TIME SYSTEMS 9

Classification of Systems - CT system and DT Systems - Linear and Non-Linear, Time variant and Time invariant, Causal and Non-Causal, Stable and Unstable system – Representation of CT LTI System using differential equation & DT LTI system by difference equation - System function - Impulse response – Convolution integrals and Convolution sum – Frequency response analysis.

PRACTICALS :

1. Write a program to verify Linearity and Time Invariance properties of a given Continuous / Discrete System.
2. Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
3. Write a program to find the system response of a low pass filter and high pass filter, when a speech signal is passed through these filters
4. To plot pole-zero diagram in S-plane of given signal / sequence and verify its stability

Teaching-Learning Process **Pedagogy:**Lecture, NPTEL videos, Peer Learning, Tutorials, Case studies

RBT Level:L1-L4

Unit: V ANALYSIS OF DFT AND FFT **9**

Discrete Fourier Transform (DFT) - deriving DFT from DTFT - properties of DFT - periodicity, symmetry, circular convolution, Linear filtering using DFT , Linear convolution,- Filtering long data sequences overlap save and overlap add method - Fast computation of DFT - Radix-2 Decimation –in-time (DIT) and Decimation –in-frequency (DIF) FFT – Realization Structures – Direct, Cascade and Parallel realization.

PRACTICALS:

1. Write a program to convolve two discrete time sequences. Plot all the sequences.
2. Implement and verify autocorrelation and cross correlation between two given signals.
3. Compute and implement the N-point DFT of a given sequence and compute the power density spectrum of the sequence.
4. Implement and verify N-point DIT-FFT of a given sequence and find the frequency response (magnitude and phase).
5. Implement and verify N-point DIF-FFT of a given sequence and find the frequency response (magnitude and phase).

6.Implement and verify N-point IFFT of a given sequence

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos, Peer Learning, Tutorials, Case studies
RBT Level:L1-L4

Total **45**

Suggested Activities & Flipped classroom, Role Play , (Gate related questions),Case study Students performance ,Student presentations

Evaluation Methods: Performance in Suggested Activites and End Semester Examinations

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Interpret CT and DT Signals and analyze CT and DT signals using various transforms

CO2: Analyze the characteristics of CT and DT systems using Fourier and Z-transform.

CO3: Apply DFT and find the frequency response of DT signals

CO4: Discuss the effects of Sampling and reconstruction of signals

CO5: Characterize the effects of finite precision representation on digital filters..

Text Books:

T1: Allan V. Oppenheim, S.Wilsky and S.H.Nawab, Signals and Systems, Second Edition,Pearson, 2015.

T2: John Proakis J G and Manolakis D G, "Digital Signal Processing", Pearson Education India

T3: Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010

References

R1: M.J.Roberts, Signals & Systems Analysis using Transform Methods & MATLAB, 3rd Edition, Tata McGraw Hill, 2019.

R2: Oppenheim A V and Schafer R W, "Discrete Time Signal Processing", Prentice Hall (1989)

R3: Haykin and B.Van Veen, Signals and Systems,Wiley, 2003

Web links and Video Lectures (e-Resources):

. 1. https://nptel.ac.in/courses/108/106/108106163/

2. http://vlabs.iitkgp.ac.in/dsp/index.html#

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	2	1	0	0	0	0	0	0	0	3	1	2
2	3	3	3	2	0	0	0	0	0	0	0	3	2	1
3	3	2	3	2	1	0	0	0	0	0	0	3	2	3
4	2	2	2	3	1	0	0	0	0	0	0	2	3	2
5	2	2	2	2	3	0	0	0	0	0	0	2	3	2
AVG	3	2	2	1	0	0	0	0	0	0	0	**3**	**2**	**2**

'1' – Low , '2' – Medium , '3'- High, '-' – No correlations

ANALOG CIRCURITS-I

Course Code	24EC311	Course Type		INTEGRATED	
Course Offered to	ECE & VLSI				
Total Teaching Periods	75	L:T:P	2:1:2	Credits	4
Handled by	ECE	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite: Basic knowledge of Electronic Devices and Circuits and semiconductor fundamentals.

Course Objectives: To impart knowledge of

1. Small signal amplifiers using BJT and MOSFET and their biasing and stabilization techniques.
2. Frequency response analysis of amplifiers including single-stage and multistage configurations.
3. IC MOSFET amplifier circuits and current source techniques used in integrated circuit design.
4. Feedback concepts and multistage amplifiers for improving amplifier stability and performance.
5. Power amplifier configurations and power converters used in electronic and communication systems.

Unit: I SMALL SIGNAL AMPLIFIERS 13

Review of BJT and MOSFET - Operating Point - Biasing and Stabilization of BJT and MOSFET – H parameter model - Analysis of BJT Small signal Amplifiers (CE, CB and CC) - Analysis of MOSFET Small signal Amplifiers (CS, CD and CG) – Simple Problems.

PRACTICALS:

- Simulation of Biasing methods of BJT and MOSFET.
- Design, test and study the characteristics of Common Emitter Amplifier
- Design, test and study the characteristics MOSFET - CS amplifier.
- Design, test and study the characteristics Emitter / Source follower

Teaching-Learning Process **Pedagogy:** Lecture, Peer Learning.

RBT Level: L1-L4

Unit: II FREQUENCY ANALYSIS OF SINGLE STAGE AND MULTISTAGE AMPLIFIERS. 19

Basic Terminologies of frequency response analysis – Hybrid π model – Miller effect - Short circuit current gain - Unity Gain Bandwidth. -.Low frequency and High frequency response of BJT CE and MOSFET CS amplifiers - Emitter follower / Source follower at high frequency – Single Tuned Amplifier - Instability of tuned amplifiers – Neutralization, Uni-lateralization – Mismatching techniques

PRACTICALS :

- Design, test and obtain the frequency response of Single Tuned Amplifier.
- Design, test and obtain the frequency response of Common Emitter Amplifier
- Design, test and obtain the frequency response of MOSFET - CS amplifier

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos.

RBT Level: L1-L4

Unit: III IC MOSFET AMPLIFIERS 13

IC biasing - Basic MOSFET Current Source – MOS Current steering circuits – Multi MOSFET current source circuits – Active load circuits – CS amplifiers with various loads – Source followers amplifiers – CMOS Differential Amplifier with active load – Simple Problems.

PRACTICALS:

- Simulation of CS, CG, and CD configuration of MOSFET amplifiers with various load

Teaching-Learning Process **Pedagogy:** Lecture, PPT, YouTube videos,

RBT Level: L1-L4

Unit: IV FEEDBACK AMPLIFIERS AND MULTISTAGE AMPLIFIERS 13

Basic feedback concepts – Properties of negative feedback Performance measures of – feedback topologies –Stability analysis on amplifier – Gain and phase -margins – frequency compensation.

Introduction to Multistage Amplifiers : Cascade, Cascode Amplifier and Darlington Pair .

PRACTICALS :

- Design, test and obtain the frequency response of
    1. Voltage Series / Shunt Feedback amplifiers.
    2. Current Series / Shunt Feedback amplifiers
    3. Cascade Amplifier

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1-L4

Unit: V POWER AMPLIFIERS AND POWER CONVERTERS 17

Class A Power Amplifier - Series fed and Transformer coupled - Conversion Efficiency - Class B Power Amplifier - Push Pull and Complimentary Symmetry configurations - Conversion Efficiency, Principle of operation of Class AB and Class –Distortions in Power Amplifier – Class C and D Power Amplifiers - Power Converters – DC / DC convertors – Buck, Boost and Buck-Boost Converter.

PRACTICALS:

- Design , test and obtain the characteristics of

1. Class A Power amplifiers.
2. Complementary Symmetry amplifier.
3. Simulation and Testing of Power converters.

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1-L4

Total 75

Suggested activities : Case study, Review Gate questions , Tutorial , Puzzle Activity, Role play

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Analyze the operating principles, biasing methods, and frequency response of BJT and MOSFET small signal amplifiers.

CO2: Evaluate the low-frequency and high-frequency performance of single-stage and multistage amplifier configurations.

CO3: Analyze and design IC MOSFET amplifier circuits using current sources, active loads, and differential amplifier structures.

CO4: Explain the principles of feedback and multistage Amplifier

CO5: Classify and analyze the performance, efficiency, and applications of power amplifiers and DC–DC power converters.

Text Books:

T1: K.S.Srinivasan, "Electronic Devices and Circuits", Anuradha Publications, 7th Edition, 2022.

T2: S.Salivahanan and N.Suresh Kumar, "Electronic Devices and Circuits", 5th Edition, 2022. TMH, New Delhi.

T3: S.Sedra and Kenneth C.Smith "Microelectronic circuits" , Oxford university press publisher, 8th Edition 2020.

References

R1: **R1 :** Jacob Millman & Christos C.Halkias, "Integrated Circuits" Mc Gaw Hill Education publisher 2nd Edition 2009.

R2: Robert L. Boylestad & Louis Nashelsky "Electronic Devices and circuit theory" , Pearson education publisher 11th edition 2013 .

R3: Behzad Razavi "Design of Analog CMOS integrated circuits" , MGH Education , 1st edition 2001.

Web links and Video Lectures (e-Resources):

1. https://www.vlab.co.in/
2. https://nptel.ac.in/courses/108106084
3. https://www.youtube.com/watch?v=wT8fZJIl3Nk
4. https://www.youtube.com/watch?v=T60-8SlRw4o
5. https://www.youtube.com/watch?v=m4sjTt7rhow

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	2	2	2	–	–	–	–	–	2	3	2	-
2	3	3	2	3	2	–	–	–	–	–	2	3	3	-
3	3	2	2	2	3	–	–	–	–	–	2	3	3	-
4	3	3	3	2	2	–	–	–	–	–	2	3	2	–
5	3	3	3	3	3	2	2	–	–	2	2	3	3	-
AVG	3	3	2	2	2	–	–	–	–	–	2	**3**	**2**	**-**

'1' – Low , '2' – Medium , '3'- High, '-' – No correlations

DIGITAL SYSTEM DESIGN

Course Code	24EC312	Course Type		INTEGRATED	
Course Offered to	Common to ISE, ECE & EEE				
Total Teaching Periods	75	L:T:P	2:1:2	Credits	4
Handled by	ECE	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite: Basic knowledge of mathematics, digital electronics, and programming concepts.

Course Objectives: To impart the knowledge of

1. Number systems, Boolean algebra, and basic digital logic design using Verilog HDL
2. Realization of logic circuits using different logic families (TTL, CMOS) and Verilog HDL modeling..
3. Design and operation of combinational and sequential digital circuits.
4. Design and operation of registers, counters, and synchronous sequential machines
5. Finite state machines (FSM), minimization and asynchronous circuit design techniques.

Unit: I **DIGITAL LOGIC DESIGN AND VERILOG HDL FUNDAMENTALS** **11+4**

Number Systems: Number systems - Complements of Numbers - Codes- Weighted and Non-weighted codes and its Properties - Parity check code and Hamming code.

Boolean algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations. **Verilog HDL –** Structural Modeling – Data flow modeling – Behavioral Modelling.

PRACTICALS:

1. Simulation of basic gates, Universal gates and Multi level NAND / NOR realization using HDL.
2. Simulation of Boolean equation using gates.

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL/YouTube videos, Peer Learning, Tutorials
RBT Level: L1-L4

Unit: II **PHASE RULE AND COMPOSITE MATERIAL BOOLEAN FUNCTION MINIMIZATION AND LOGIC FAMILY REALIZATIONS** **8+2**

Minimization of Boolean functions: Karnaugh Map Method - Up to five Variables, Don't Care Map Entries.

Realization of Logic Gates Using Diodes & Transistors: AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL, CML and CMOS Logic Families and its Comparison, standard TTL NAND Gate-Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tri-state outputs interfacing- TTL driving CMOS & CMOS driving TTL.

PRACTICALS:

1. Characteristics of TTL and CMOS logic families.

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos, Peer Learning, Tutorials
RBT Level: L1-L4

Unit: III COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS 10+8

Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, De-multiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

PRACTICALS:

1. Design and Simulation of Shift Register
2. Design and Simulation of Synchronous and Asynchronous Counters
3. Design and Simulation of Sequence Detector and Parity Bit generator.
4. Design and Simulation of Modulo N Counter

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos, Peer Learning, Tutorials
RBT Level: L1-L4

Unit: IV REGISTERS, COUNTERS, AND SEQUENTIAL MACHINE DESIGN 12+8

Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

Sequential Machines: Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N –Counters.

PRACTICALS:

1. Design and Simulation of Shift Register
2. Design and Simulation of Synchronous and Asynchronous Counters
3. Design and Simulation of Sequence Detector and Parity Bit generator.
4. Design and Simulation of Modulo N Counter

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos, Peer Learning, Tutorials, Case studies
RBT Level: L1-L4

Unit: V FINITE STATE MACHINES AND ASYNCHRONOUS CIRCUIT DESIGN 10+2

Finite state machine: capabilities and limitations, Mealy and Moore models, State equivalence and machine minimization, simplification of incompletely specified machines, Merger graphs. Asynchronous design-modes of operation, Hazards, synthesis of SIC fundamental mode circuits, synthesis of burst mode circuits. Introduction to ASM Charts.

PRACTICALS:

1. Design and Simulation of Mealy and Moore models

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos, Peer Learning, Tutorials, Case studies
RBT Level: L1-L4

Total 75

Suggested activities : Review of GATE questions, Case study, Mini Project.

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Develop and simulate basic digital circuits using HDL effectively
CO2: Analyze the optimizing Boolean functions and implementing circuits using TTL, CMOS, and other logic families.
CO3: Design and analyze circuits like adders, multiplexers, and flip-flops for practical applications
CO4: Implement and simulate shift registers, counters, and sequence detection circuits.
CO5: Design, simplify, and simulate Mealy/Moore models and asynchronous circuits

Text Books:

T1: S.Salivahanan and S.Arivazhagan, "Digital Circuits and Design" 5th Edition 2022. Oxford University Press.
T2: M.Morris Mano, Michael D.Clietti, "Digital Design", 6th Edition, 2022, Pearson India Education Pvt Ltd
T3: Thomas L.Floyd, "Digital Fundamentals" 11th Edition, 2023, Pearson India Education Pvt Ltd

References

R1: Samir Palnitkar, "Verilog HDL". 2nd Edition, 2011, Pearson Education.
R2: Botros, "HDL Programming Fundamentals"1st Edition, 2014, Da Vinci Engineering Press (Cengage).
R3: Malvino, and Leach, "Digital Principles and Applications" 7th Edition, 2013, TMH, New Delhi

Web links and Video Lectures (e-Resources):

1. https://www.vlab.co.in
2. https://nptel.ac.in/courses/117105080
3. https://www.youtube.com/watch?v=Qzi5j3jOgNw
4. https://www.youtube.com/watch?v=AnAQ-o0d_i4
5. https://www.youtube.com/watch?v=8S1kvCJRfvc

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	2	–	–	–	–	–	–	–	1	3	2	3
2	3	3	2	–	–	–	–	–	–	–	1	3	2	2
3	3	3	3	–	2	–	–	–	–	–	1	3	3	2
4	3	3	3	–	2	–	–	–	–	–	1	3	3	2
5	3	3	3	–	2	–	–	–	–	–	1	2	3	2
AVG	**3**	**2**	**2**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**1**	**3**	**2**	**3**
1 – “Low”, 2 – “Medium”, 3 – “High”, – “No correlations”														

PRINCIPLES OF ELECTRICAL ENGINEERING

Course Code	24EE311	Course Type		INTEGRATED	
Course Offered to	ECE, ACT & VLSI				
Total Teaching Periods	75	L:T:P	2:1:2	Credits	4
Handled by	EEE	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite : Basic knowledge of electrical circuits, mathematics, and physics.

Course Objectives: To provide knowledge of

1. The basic concepts, construction, working, and applications of electrical machines..
2. Measurement systems, transducers, and techniques used to measure physical parameters.
3. Control system components and mathematical modeling of electrical and mechanical system
4. Time response analysis and stability of control systems..
5. Frequency response analysis and compensator techniques for control systems.

Unit: I ELECTRICAL MACHINES 15

Classification - Construction, Working principle and Characteristics of DC machines, Transformers, Synchronous machines and Induction machines with necessary EMF equation, Torque Equation, losses, efficiency and Applications.

PRACTICALS:

1. No load and load characteristics of DC Shunt generator
2. Speed control of DC Shunt motor
3. Load Test on DC Series motor
4. OC and SC test on single phase Transformer
5. Load test on single phase induction motor
6. OCC and load test on three phase Alternator

Teaching-Learning Process **Pedagogy:** Lectures, PPT, NPTEL/YouTube videos
RBT Level: L1-L4

Unit: II INTRODUCTION TO MEASUREMENT AND TRANSDUCERS 15

Definition – Basic principles of measurement – Measurement systems - generalized configuration and functional descriptions of measuring instruments – examples. Dynamic performance characteristics – sources of error, Classification and elimination of error. Functional elements of an instrument – Standards and Calibration - Measurement of force - Pressure – Torque – Displacement – Velocity – Vibration – Acceleration – Temperature – Flow -- Measurement of liquid level – Humidity – Sound

PRACTICALS:

1. Characteristics of LVDT
2. Characteristics of Temperature Sensors (RTD and Thermocouple)
3. Characteristics of torque sensor
4. Characteristics of vibration sensor

Teaching-Learning Process **Pedagogy:** Lectures, PPT, NPTEL/YouTube videos
RBT Level: L1-L4

Unit: III SYSTEMS COMPONENTS AND THEIR REPRESENTATION 15

Control System: Terminology and Basic Structure - Feed forward and Feedback control system –Mathematical representation of Physical systems - Electrical and Mechanical system - Translational and rotational models - Transfer function models-Block diagram models - Signal flow graphs models.

Teaching-Learning Process **Pedagogy:** Lectures, PPT, NPTEL/YouTube videos
RBT Level: L1-L4

Unit: IV TIME RESPONSE ANALYSIS 15

Standard test inputs – Time response – Time domain specifications – Stability analysis: Concept of stability – Routh Hurwitz stability criterion – Root locus: Construction and Interpretation. Effect of adding poles and zeros, Analytical design for PD, PI, PID control systems

PRACTICALS:

Root Locus based analysis in simulation platform. **(Matlab / Sci Lab)**

Teaching-Learning Process **Pedagogy:** Lectures & PPT
RBT Level: L1-L4

Unit: V FREQUENCY RESPONSE ANALYSIS 15

Frequency domain specifications, Bode plot, Polar plot and Nyquist plot - Introduction to closed loop Frequency Response, Effect of adding lag and lead compensators.

PRACTICALS:

Stability analysis using Bode plot / Nyquist Plot of Linear Time Invariant system. **(Matlab / Sci Lab)**

Teaching-Learning Process **Pedagogy:** Lectures, PPT, NPTEL/YouTube videos
RBT Level: L1-L4

Total 75

Suggested activities : Review of GATE questions, Case study, Mini Project.

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Summarize the fundamental principles of electrical machines
CO2: Describe various transducers and instrumentation techniques used to measure displacement, temperature,and pressure.
CO3: Describe the fundamental blocks of control system and transfer function
CO4: Analyze the steady state and transient response of second order system
CO5: Analyze the frequency response of second order system by various techniques

Text Books:

T1: K Padma Raju, Y J Reddy, “Instrumentation and Control Systems”, McGraw Hill Education, 1st Edition, 2016.
T2: I J Nagrath and M Gopal, “Control System Engineering”, New Age International Publishers, 7th edition, 2021
T3: V K Mehta and Rohit Mehta, “Principles of Electrical Engineering”, S Chand Publications, Revised Edition, 2016

References

R1: K Singh, "Industrial Instrumentation and Control", McGraw Hill Education, 3rd Edition, 2015.
R2: S N Sivanandam & S N Deepa, "Control Systems Engineering using MATLAB", Vikas Publishing, 2nd edition 2021

Web links and Video Lectures (e-Resources):

1. https://auceipi.files.wordpress.com/2010/04/measurement-of-control-basics.pdf
2. https://instrumentationtools.com/category/books/
3. https://onlinecourses.nptel.ac.in/noc21ee24/preview
4. https://nptel.ac.in/courses/108105155
5. https://onlinecourses.nptel.ac.in/noc20ee90/preview

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	-	-	-	–	–	–	–	–	–	1	2	1
2	3	2	-	-	-	–	1	–	–	–	–	1	2	1
3	3	2	2	2	3	–	–	–	–	–	–	1	2	1
4	3	2	2	2	3	–	–	–	–	–	–	1	2	1
5	3	2	2	2	3	–	–	–	–	–	–	1	2	1
AVG	**3**	**2**	**2**	**2**	**3**	–	1	–	–	–	–	**1**	**2**	**1**
1 – "Low", 2 – "Medium", 3 – "High", – "No correlations"														

UNIVERSAL HUMAN VALUES AND ETHICS

Course Code	24GE311		Course Type		INTEGRATED
Course Offered to	Common to All				
Total Teaching Periods	45	L:T:P	1:0:2	Credits	2
Handled by	MECH	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite: Basic awareness of human values, ethical behavior, and social responsibility**.**

Course Objectives: To enhance knowledge of

1. Universal human values and develop the ability for self-exploration and right understanding.
2. Harmony within the human being, including the relationship between the self ('I') and the body.
3. Harmony in family and society through values such as trust, respect, justice, and cooperation.
4. Harmony in nature and existence, promoting sustainable and responsible living.
5. Applying human values and ethical principles in professional life for socially responsible and environmentally conscious decision-making.

Unit: I INTRODUCTION 3+6

Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration – Its content and process; 'Natural acceptance' and Experiential Validation- as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

PRACTICALS:

- Include sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

  PS-1: Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcomings in your life? Observe and analyze them.

  PS-2: Now-a-days, there is a lot of voice about many techno-genic maladies such as energy and natural resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. — all these seem to be man-made problems threatening the survival of life on Earth — What is the root cause of these maladies & what is the way out in your opinion?

  On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships,

generation gap, depression & suicidal attempts, etc — what do you think, is the root cause of these threats to human happiness and peace — what could be the way out in your opinion?

PS 3: Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of

- What is Naturally Acceptable to you in relationship- Feeling of respect or disrespect?
- What is Naturally Acceptable to you — to nurture or to exploit others?
- Is your living the same as your natural acceptance or different?

Teaching-Learning Process **Pedagogy:** Lecture, PPT

RBT Level: L1 – L4

Unit: II HARMONY IN THE HUMAN BEING 3+6

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.

PRACTICALS :

- Include sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

PS-4: List down all your desires. Observe whether the desire is related to Self (I) or Body. If it appears to be related to both, see which part of it is related to Self (I) and which part is related to Body.

PS-5:

- Observe that any physical facility you use, follows the given sequence with time: Necessary and tasteful unnecessary and tasteful unnecessary and tasteless intolerable.
- In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If naturally acceptable, you want it continuously and if not acceptable, you do not want it any moment!

PS-6:

- Chalk out programs to ensure that you are responsible to your body- for free nurturing, protection and right utilization of the body.
- Find out the plants and shrubs growing in and around your campus and residence. Find out their use for curing different diseases. If not, what initiative has been taken by you to implant the shrubs?

Teaching-Learning Process **Pedagogy:** Lecture, PPT

RBT Level: L1 – L4

Unit: III HARMONY IN THE FAMILY AND SOCIETY 3+6

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and coexistence as comprehensive Human Goals, Visualizing a universal harmonious order in society, Undivided Society, Universal Order-from family to world family.

PRACTICALS :

- Include sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

PS 7: Form small groups in the class and in that group initiate dialogue and ask the eight questions related to trust. The eight questions are:

1. Do I want to make myself happy?
2. Do I want to make the other happy?
3. Does the other want to make him happy?
4. Does the other want to make me happy?
    - What is the answer?
    - Intention (Natural Acceptance)

1. Am I able to make myself always happy?
2. Am I able to make the other always happy?
3. Is the other able to make him always happy?
4. Is the other able to make me always happy?
    - What is the answer?
    - Competence

PS 8:

- Observe on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under-evaluation, over-evaluation or otherwise evaluation.
- Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

PS 9:

- Write a note in the form of story, poem, skit, essay, narration, dialogue to educate a child. Evaluate it in a group.
- Develop three chapters to introduce 'social science- its need, scope and content in the primary education of children

Teaching-Learning Process **Pedagogy:** Lecture, PPT

RBT Level: L1 – L4

Unit: IV HARMONY IN THE NATURE AND EXISTENCE 3+6

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Coexistence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence.

PRACTICALS :

- Include sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

  PS 10: List down units (things) around you. Classify them in four orders. Observe and explain the mutual fulfillment of each unit with other orders.

  PS 11:

  - Make a chart for the whole existence. List down different courses of studies and relate them to different units or levels in the existence.
  - Choose any one subject being taught today. Evaluate it and suggest suitable modifications to make it appropriate and holistic.

Teaching-Learning Process **Pedagogy:** Lecture, PPT

RBT Level: L1 – L4

Unit: V IMPLICATIONS OF HARMONY ON PROFESSIONAL ETHICS 3+6

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order.
b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems.
c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers.
b. At the level of society: as mutually enriching institutions and organizations, Sum up.

PRACTICALS :

Include Exercises and Case Studies will be taken up in Sessions E.g. To discuss the conduct as an engineer or scientist etc

PS 12: Choose any two current problems of different kind in the society and suggest how they can be solved on the basis of natural acceptance of human values. Suggest steps you will take in present conditions.

PS 13:

- Suggest ways in which you can use your knowledge of Technology/Engineering/Management for universal human order, from your family to the world family.
- Suggest one format of humanistic constitution at the level of nation from your side.

PS 14: The course is going to be over now. Evaluate your state before and after the course in terms of

- Thought
- Behavior and
- Work
- Realization

Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

Teaching-Learning Process **Pedagogy:** Lecture, PPT

RBT Level: L1 – L4

Total **45**

Suggested Activities : Group Discussion, Presentation, Quiz, Case study, Review of GATE questions.

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Become more aware of themselves, and their surroundings (family, society, nature);

CO2: Have more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO3: Have better critical ability.

CO4: Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

CO5: Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Text Books:

T1: A Foundation Course in Human Values and Professional Ethics by GP Bagaria Rr Gaur R Sangal, 2023

References

R1: Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 3rd revised edition, 2023

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/playlist?list=PLFW6lRTa1g83uYgRiZEy_F4pzedPNWpew

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	1	1	-	-	-	-	2	-	-	-	1	1	-	-
2	1	1	-	-	-	-	2	-	-	-	1	1	-	-
3	-	1	-	-	-	-	3	2	1	-	-	-	1	1
4	-	1	-	-	-	3	2	-	-	-	-	-	1	-
5	-	1	-	-	2	2	3	1	1	-	-	1	1	2
AVG	1	1	-	-	-	-	2	-	-	-	1	1	-	-

'1' – Low , '2' – Medium , '3'- High, '-' – No correlations

INNOVATION AND DESIGN THINKING

Course Code	24ES321	Course Type		INTEGRATED	
Course Offered to	Common to all				
Total Teaching Periods	45	L:T:P	1:0:2	Credits	2
Handled by	Training & Placement	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite : Basic problem-solving and creative thinking skills.

Course Objectives: To enhance knowledge on

1. The principles and stages of **Design Thinking** for identifying and solving real-world problems.
2. Empathetic research methods to understand user needs through observation, interviews, and fieldwork.
3. Problem definition techniques and framing design challenges using user insights.
4. Creative ideation methods to generate and evaluate innovative solutions.
5. Prototyping, testing, and presenting solutions effectively through project demonstrations and presentations.

Module: I THE DESIGNER'S MINDSET & PROBLEM SCOPING **9**

Objective: Cultivate a growth mindset and launch the real-world project.

1. Introduction to Design Thinking: From Problem to Solution.
2. Fixed vs. Growth Mindset for Innovators (Toolkit: Mindset Reflection Worksheet).
3. Launching the Capstone Project: Team Formation & Problem Context Selection (Local Panchayat, NGO, Small Industry, Campus Community).
4. Project Planning & Introduction to Field Research (Toolkit: Project Brief Canvas).

Teaching-Learning Process **Pedagogy:** Chalk and Talk

RBT Level: L1- L4

Module: II EMPATHISE — DEEP USER UNDERSTANDING **9**

Objective: Learn and apply empathetic methods in a real-world context.

1. The Art of Empathy and User-Centricity.
2. Planning Field Research (Toolkit: Research Plan Template).
3. Conducting Empathetic Interviews & Observations (Toolkit: Interview Guide, Observation Log).
4. FIELDWORK: Students conduct research in their chosen context. (Video recording of key interactions is encouraged).
5. Synthesising Data: Finding Insights (Toolkit: Empathy Map Canvas).
6. Visualising the User Experience (Toolkit: Journey Map Template).

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1- L4

Module: III DEFINE — FRAMING THE CORE PROBLEM **9**

Objective: Synthesise research findings into a powerful and focused problem statement.

1. From Insights to User Needs.
2. Creating User Personas (Toolkit: Persona Canvas).
3. Unpacking the Problem Root Cause (Toolkit: 5 Whys Worksheet).
4. Crafting a Point-of-View (POV) (Toolkit: POV Statement Template).
5. Framing the Design Challenge (Toolkit: "How Might We..." Questions

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1- L4

Module: IV IDEATE — GENERATING CREATIVE SOLUTIONS **9**

Objective: Generate a wide range of innovative solutions and select the most promising one.

1. Principles of Divergent and Convergent Thinking.
2. Brainstorming for Quantity and Creativity (Toolkit: Brainstorming Rules).
3. Structured Ideation Techniques (Toolkit: SCAMPER, Crazy 8s).
4. Clustering and Evaluating Ideas (Toolkit: Affinity Clustering).
5. Selecting the Winning Idea (Toolkit: Feasibility-Impact Matrix).

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1- L4

Module: V PROTOTYPE & TEST — LEARNING BY MAKING **9**

Objective: Build tangible representations of the idea and learn from user feedback.

1. The Purpose of Prototyping: To Learn, Not to Perfect.
2. Building Low-Fidelity Prototypes (Toolkit: Paper Prototyping, Storyboarding).
3. Planning and Conducting User Tests (Toolkit: User Test Script).
4. Gathering and Interpreting Feedback (Toolkit: Feedback Capture Grid).
5. The Iteration Cycle: Using feedback to refine the solution.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT

RBT Level: L1-L3

Module: VI INTEGRATE & PITCH — FROM IDEA TO IMPACT

Objective: Prepare for implementation and communicate the solution persuasively.

1. Storytelling for Innovation: Crafting a Compelling Narrative.
2. Building a Persuasive Pitch (Toolkit: Pitch Deck Structure).
3. Ethical, Societal, and Sustainability Check (Toolkit: Ethics & Sustainability Checklist).
4. Introduction to Scalability and Intellectual Property (Overview only).
5. Capstone Project Consolidation & Presentation Rehearsal.

Assessment Framework :

a) Formative Assessments (Continuous)

1. Field Research & Deliverable: **20 Marks**

- A documented research report including Empathy Maps, Journey Maps, and supporting evidence (e.g., key quotes, photos, short video clips).
- Focus: Depth of user understanding, quality of research, and synthesis of insights.

2. Ideation & Concept Selection Assessment : 20 Marks

- Deliverable: An "Ideation Logbook" showing the breadth of ideas generated (using SCAMPER, Crazy 8s, etc.) and a rationale for the final selected concept using the Feasibility-Impact Matrix.
- Focus: Creativity, diversity of ideas, and logical selection process.

b) Summative Assessment (End-of-Term)

3. Capstone Project Portfolio & Viva Voce : 60 Marks

This is the core of the course evaluation, assessing the end-to-end project.

- **Comprehensive Project Portfolio - 30 Marks**: A single document walking through the entire process for the team's real-world problem—from initial research and POV to final prototype and iteration plan.
- **Final Pitch Presentation & Demo - 20 Marks:** A compelling live presentation (10-12 mins per team) of their solution, including a demo of their prototype and their proposed implementation plan.
- **Viva Voce - 10 Marks:** A brief individual interview to assess personal contribution, understanding of the process, and ability to reflect on the learning journey.

Total **45**

Suggested Activities : Case Study, Quiz, Coding Task, Group Task, Coding Challenge

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the principles of design thinking and identify real-world problems using a designer's mindset.

CO2: Apply empathy-based research methods to collect user insights through interviews, observations, and field studies.

CO3: Analyze research findings and formulate clear problem statements using design thinking tools.

CO4: Generate and evaluate innovative ideas using structured ideation techniques to select feasible solutions.

CO5: Develop prototypes, test solutions with users, and present innovative solutions through demonstrations and project presentations.

Text Books:

T1: Jain, A. The science and art of design thinking. Penguin Enterprise, 2021

T2: Jain, A. From teenager to achiever: The power of 5 minds. Penguin Enterprise,2022

References

R1: Liedtka, J., Ogilvie, T., & Brozenske, R. Designing for growth: A design thinking toolkit for managers. Columbia Business School Publishing, 2020

R2: Lewrick, M., Link, P., & Leifer, L. The design thinking toolbox: A guide to mastering the most popular and valuable innovation methods. Wiley, 2020

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses
2. https://designthinking.ideo.com/
3. https://www.interaction-design.org/literature/topics/design-thinking
4. https://dschool.stanford.edu/resources/design-thinking-bootleg

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	–	–	–	–	–	–	–	–	2	2	–	–
2	2	3	–	2	–	–	–	2	–	–	–	2	2	–
3	–	3	2	2	–	–	–	2	–	–	–	3	2	–
4	–	2	3	–	2	–	–	3	–	–	–	3	2	2
5	–	–	3	2	2	2	2	3	3	–	2	3	3	2
AVG	3	2	–	–	–	–	–	–	–	–	2	2	–	–

‘1’ – Low , ‘2’ – Medium , ‘3’- High, ‘-‘ – No correlations

APPLICATIONS OF PYTHON PROGRAMMING

Course Code	24ES323	Course Type		PRACTICAL	
Course Offered to	ECE, VLSI & ACT				
Total Teaching Periods	30	L:T:P	0: 0:2	Credits	1
Handled by	CSE	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite : Basic knowledge of computers and programming concepts.

Course Objectives: To impart knowledge of

1. Fundamental Python concepts including syntax, data types, operators, and control structures.
2. Problem-solving techniques using Python constructs such as loops, functions, and data structures.
3. Python collections like lists, tuples, sets, and dictionaries for real-world applications.
4. File handling, modules, and external libraries such as NumPy, Pandas, and Matplotlib.
5. Object-Oriented Programming concepts and the development of Python-based computational and data processing applications.

PYTHON PROGRAMMING:

Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements, Looping statements

.

Python Data Structures: Lists, Dictionaries, Tuples.

Strings: Creating strings and basic operations on strings, string testing methods.

Functions: Defining a function- Calling a function- Types of functions-Function Arguments-Anonymous functions- Global and local variables - Dictionaries - Reading and Writing Files – Modules – Debugging - Introduction to Numpy – Matplotlib - Scipy.

OOPS Concepts; Classes and objects- Attributes- Inheritance- Overloading- Overriding- Data hiding

Modules and Packages: Standard modules-Importing own module as well as external modules Understanding Packages Powerful Lamda function in python Programming using functions, modules and external packages

Working with Data in Python: Printing on screen- Reading data from keyboard- Opening and closing file- Reading and writing files- Functions-Loading Data with Pandas-Numpy.

Tasks:

1. OPERATORS

a. Read a list of numbers and write a program to check whether a particular element is present or not using membership operators.

b. Read your name and age and write a program to display the year in which you will turn 100 years old.

c. Read radius and height of a cone and write a program to find the volume of a cone.
d. Write a program to compute distance between two points taking input from the user (Hint: use Pythagorean theorem)

2. CONTROL STRUCTURES

a. Read your email id and write a program to display the no of vowels, consonants, digits and white spaces in it using if…elif…else statement.
b. Write a program to create and display a dictionary by storing the antonyms of words. Find the antonym of a particular word given by the user from the dictionary using while loop.
c. Write a Program to find the sum of a Series 1/1! + 2/2! + 3/3! + 4/4! +…….+ n/n!.(Input :n = 5, Output : 2.70833)
d. In number theory, an abundant number or excessive number is a number for which the sum of its proper divisors is greater than the number itself. Write a program to find out, if the given number is abundant. (Input: 12, Sum of divisors of 12 = 1 + 2 + 3 + 4 + 6 = 16, sum of divisors 16 > original number 12)

3: LIST

a. Read a list of numbers and print the numbers divisible by x but not by y (Assume x = 4 and y = 5).
b. Read a list of numbers and print the sum of odd integers and even integers from the list.(Ex: [23, 10, 15, 14, 63], odd numbers sum = 101, even numbers sum = 24)
c. Read a list of numbers and print numbers present in odd index position. (Ex: [10, 25, 30, 47, 56, 84, 96], The numbers in odd index position: 25 47 84).
d. Read a list of numbers and remove the duplicate numbers from it. (Ex: Enter a list with duplicate elements: 10 20 40 10 50 30 20 10 80, The unique list is: [10, 20, 30, 40, 50, 80])

4: TUPLE

a. Given a list of tuples. Write a program to find tuples which have all elements divisible by K from a list of tuples. test_list = [(6, 24, 12), (60, 12, 6), (12, 18, 21)], K = 6, Output : [(6, 24, 12), (60, 12, 6)]
b. Given a list of tuples. Write a program to filter all uppercase characters tuples from given list of tuples. (Input: test_list = [(“GFG”, “IS”, “BEST”), (“GFg”, “AVERAGE”), (“GfG”,), (“Gfg”, “CS”)], Output : [(„GFG‟ , „IS‟ , „BEST‟)]).
c. Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input : tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output : 3)

5: SET

a. Write a program to generate and print a dictionary that contains a number (between 1 and n) in the form (x, x*x).
b. Write a program to perform union, intersection and difference using Set A and Set B.
c. Write a program to count number of vowels using sets in given string (Input : “Hello World”, Output: No. of vowels : 3)
d. Write a program to form concatenated string by taking uncommon characters from two strings using set concept (Input : S1 = "aacdb", S2 = "gafd", Output : "cbgf").

6: DICTIONARY

a. Write a program to do the following operations:
   i. Create a empty dictionary with dict() method
   ii. Add elements one at a time
   iii. Update existing key" s value
   iv. Access an element using a key and also get() method
   v. Deleting a key value using del() method
b. Write a program to create a dictionary and apply the following methods:
   i) pop() method ii) popitem() method iii) clear() method
c. Given a dictionary, write a program to find the sum of all items in the dictionary.
d. Write a program to merge two dictionaries using update() method.

7: STRINGS

a. Given a string, write a program to check if the string is symmetrical and palindrome or not. A string is said to be symmetrical if both the halves of the string are the same and a string is said to be a palindrome string if one half of the string is the reverse of the other half or if a string appears same when read forward or backward.
b. Write a program to read a string and count the number of vowel letters and print all letters except 'e' and 's'.
c. Write a program to read a line of text and remove the initial word from given text. (Hint: Use split() method, Input : India is my country. Output : is my country)
d. Write a program to read a string and count how many times each letter appears. (Histogram).

8: USER DEFINED FUNCTIONS

a. A generator is a function that produces a sequence of results instead of a single value. Write a generator function for Fibonacci numbers up to n.
b. Write a function merge_dict(dict1, dict2) to merge two Python dictionaries.
c. Write a fact() function to compute the factorial of a given positive number.
d. Given a list of n elements, write a linear_search() function to search a given element x in a list.

9: BUILT-IN FUNCTIONS

a. Write a program to demonstrate the working of built-in statistical functions mean(), mode(), median() by importing statistics library.
b. Write a program to demonstrate the working of built-in trignometric functions sin(), cos(), tan(), hypot(), degrees(), radians() by importing math module.
c. Write a program to demonstrate the working of built-in Logarithmic and Power functions exp(), log(), log2(), log10(), pow() by importing math module.
d. Write a program to demonstrate the working of built-in numeric functions ceil(), floor(), fabs(), factorial(), gcd() by importing math module.

10. CLASS AND OBJECTS

i) Write a program to create a Bank Account class. Your class should support the following methods for i) Depositii) Withdraw iii) Get Balance iv) Pin Change

b. Create a Savings Account class that behaves just like a Bank Account, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint: use Inheritance).
c. Write a program to create an employee class and store the employee name, id, age, and salary using the constructor. Display the employee details by invoking employee_info() method and also using dictionary (__dict__).
d. Access modifiers in Python are used to modify the default scope of variables. Write a program to demonstrate the 3 types of access modifiers: public, private and protected.

11. FILE HANDLING

a. . Write a program to read a filename from the user, open the file (say firstFile.txt) and then perform the following operations:
   i. Count the sentences in the file.
   ii. Count the words in the file.
   iii. Count the characters in the file.
b. Create a new file (Hello.txt) and copy the text to other file called target.txt. The target.txt file should store only lower case alphabets and display the number of lines copied.
c. Write a Python program to store N student" s records containing name, roll number and branch. Print the given branch student" s details only.

ADDITIONAL EXPERIMENTS:

1. Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2. Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3. Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86,89.
4. Writeaprogramthatasksthe userfortheirnameandhowmanytimestoprintit.The program should print out the user's name the specified number of times.
5. Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.
   *
   **
   ***
   ****
6. Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7. Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and Not close otherwise.
8. Write a program that asks the user to enter a word and prints out whether that word contains any vowels.

9. Write a program that asks the user to enter two strings of the same length. The program should

then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.

10. Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be1,000,000.
11. In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
12. Write a program that generates a list of 20 random numbers between 1 and100.
    (a) Print the list.
    (b) Print the average of the elements in the list.
    (c) Print the largest and smallest values in the list.
    (d) Print the second largest and second smallest entries in the list
    (e) Print how many even numbers are in the list.
13. Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
14. Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is4.
15. Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become[1,2,3,4,0].
16. Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, hen the program converts to yards, etc. While this can be done with if statements, itis much shorter with lists and it is also easier to add new conversions if you use lists.
17. Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
18. Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return-1.
19. Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.
20 Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.
21. Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to2.
22. Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be100.
23. Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
    Do this using the sort method. (b) Do this without using the sort method.

24. Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
25. Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
26. Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.
27, Write a class called Product. The class should have fields called name, amount, and holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.
28. Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
29 Write a class called Converter. The user will pass a length and a unit when declaring an object from the class for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c. feet() and should get 0.75 as the result.
30 Write a Python class to implement pow(x,n).
31. Write a Python class to reverse a string word byword.
32. Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
33. Write a program to demonstrate Try/except/else.
34. Write a program to demonstrate try/finally and with/as.
35. Statistics using Python
36. Linear combination of vectors and Computation of determinant, rank of a matrix
37. Lower - Upper Decomposition of vectors
38. Gauss-Seidel Method
39. Solve Systems of Linear Equations in Python
40. Eigenvalues and eigenvectors in Python
41. Generation of basic sequences using Python
42. Spectral analysis of signals.
45. Sampling of continuous-time signals

Teaching-Learning Process **Pedagogy:** Chalk and Talk

RBT Level: L1- L4

Total **30**

Suggested activities: Case Study, Quiz, Coding Task, Group Task, Coding Challenge, Mini project/content beyond syllabus

Evaluation Methods: Performance in Suggested day to day activities, Model practical and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the basic concepts, syntax, and data structures of Python programming

CO2: Apply decision-making, looping, and functions to design efficient Python programs

CO3: Implement Object-Oriented Programming concepts such as classes, inheritance, and overloading in Python

CO4: Use Python modules and packages for file operations, debugging, and modular program design.

CO5: Apply data analysis and visualization techniques using NumPy, Pandas, and Matplotlib for real-world problems.

Text Books:

T1: Allen B. Downey – Think Python: How to Think Like a Computer Scientist, 2nd Edition, O'Reilly Publications.

T2: Reema Thareja – Python Programming: Using Problem Solving Approach, Oxford University Press.

References

R1: Reema Thareja, "Python Programming - Using Problem Solving Approach", Oxford Press, 1st Edition, 2017

R2: Larry Lutz, "Python for Beginners: Step-By-Step Guide to Learning Python Programming", CreateSpac Independent Publishing Platform, First edition, 2018

R3: Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition

R4: Qingkai Kong, Timmy Siauw and Alexandre M. Bayen, "Python Programming and Numerical Methods", Elsevier Academic Press, 2021

R5: Fatos Tunay Yarman Vural, and Emre Akbas, "Signals and Systems: Theory and Practical Explorations with Python", John Wiley, 2024

Web links and Video Lectures (e-Resources):

1. http://vlabs.iitkgp.ernet.in/se/
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php
3. https://python-iitk.vlabs.ac.in
4. http://vlabs.iitkgp.ernet.in/se/
5. http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php
6. https://python-iitk.vlabs.ac.in

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	-	-	1	-	-	-	1	-	1	2	1	1
2	3	3	2	1	2	-	-	1	1	-	1	3	2	1
3	3	3	2	2	3	-	-	1	1	-	1	3	2	2
4	3	3	3	2	3	-	-	2	1	-	1	3	3	2
5	3	3	2	3	3	-	-	1	1	-	2	3	3	3
AVG	3	3	3	3	3	-	-	2	2	1	2	2	1	1
1 – "Low", 2 – "Medium", 3 – "High", – "No correlations"														

ELECTROMAGNETIC THEORY

Course Code	24EE301	Course Type		THEORY	
Course Offered to	EEE, ECE & ACT				
Total Teaching Periods	45	L:T:P	2:1:0	Credits	3
Handled by	ECE	Assessment Methods		IAT	ESE
				40 Marks	60 Marks

Prerequisite : Basic understanding of Engineering Mathematics (vector calculus), Physics (electricity and magnetism), and fundamentals of electrical circuits.

Course Objectives: To impart the knowledge of

1. Vector algebra and coordinate systems used in electromagnetic field analysis.
2. Electrostatic fields, electric potential, capacitance, and boundary value problems.
3. Magnetic field concepts, magnetic materials, and inductance in electromagnetic systems.
4. Maxwell's equations and electromagnetic wave propagation principles.
5. Electromagnetic wave behavior in different media including reflection, refraction, and transmission.

Unit: I VECTOR ALGEBRA 9

Electromagnetic model - Units and constants - Review of vector algebra – Rectangular - cylindrical and spherical coordinate systems - Line, surface and volume integrals - Gradient of a scalar field, Divergence of a vector field - Divergence theorem - Curl of a vector field - Stoke's theorem - Null identities - Helmholtz's theorem - Verify theorems for different path - surface and volume.

PRACTICALS:

1. Graphical Representation and interpretation of fields (using Mathematical Development Tool)
2. Computation, graphical representation and interpretation of Vector addition, subtraction, multiplication
3. Dot product and cross product in 2-D and 3-D Gradient fields Divergence fields Curl fields.

Teaching-Learning Process **Pedagogy:** Lecture, Peer Learning.

RBT Level: Theory: L1,L2,L3 Practical: L4

Unit: II ELECTROSTATICS 9

Electric field - Coulomb's law - Gauss's law and applications - Electric potential - Conductors and Dielectrics in static electric field - Electric flux density and dielectric constant - Boundary conditions, Electrostatics boundary value problems - Capacitance - Parallel, cylindrical - spherical capacitors and two wire transmission line - Electrostatic energy and energy density - Poisson's and Laplace's equations - Uniqueness of electrostatic solutions - Current density and Ohm's law - Electromotive force and Kirchhoff's voltage law - Equation of continuity and Kirchhoff's current law

PRACTICALS:

Computation of Electric (E) and Magnetic (H) fields (using FEM packages) Problem formulation and Concepts of Finite Element method.

1. Simulate and plot electric field vectors from single and system of charges.
2. Computation of Electric field intensity, voltage distribution and capacitance in Parallel plate capacitor with Single dielectric, Two dielectrics ,Two dielectrics with different angles of interface
3. Computation of Electric field intensity, voltage distribution and capacitance in Coaxial Cable With Single dielectric and Two dielectrics

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos.

RBT Level: Theory: L1,L2,L3 Practical: L4

Unit: III MAGNETIC FIELD **9**

Lorentz force equation - Ampere's law - Vector magnetic potential - Biot-Savart law and applications, - Magnetic field intensity - Calculation of magnetic field intensity for various current distributions - Magnetic circuits – Torque – force between two current carrying wires - Behaviour of magnetic materials - Boundary conditions - Faraday's law, Displacement current – Self and mutual inductance- Inductance due solenoid, toroid, coaxial cable and two wire transmission lines - magnetic energy and energy density.

PRACTICALS:

1. Computation of Magnetic field intensity,
2. Computation of Force between two current carrying conductors
3. Computation of Inductance due to Circular conductor, ring, and Solenoid, coaxial cable.
4.

Teaching-Learning Process **Pedagogy:** Lecture, PPT, YouTube videos,

RBT Level: Theory: L1,L2,L3 Practical: L4

Unit: IV MAXWELL`S EQUATION AND TRAVELLING WAVES **9**

Conduction and Displacement Current - Maxwell equations in Point form and integral form for free space, harmonically varying fields, steady fields and static case – Relation between circuit theory and field theory - Wave equations and solutions, Time-harmonic fields - Observing the Phenomenon of wave propagation with the aid of Maxwell's equations - Electromagnetic power flow - Poynting Theorem and Poynting vector.

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1-L3

Unit: V NANOMATERIALS **9**

Wave Propagation in lossy dielectric – Plane wave in lossless dielectric, free space and good conductors - Characteristics of plane waves – Reflection and Refraction – Normal and Oblique incidence - Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary – Total Internal reflection and Brewster angle.

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: Theory: L1,L2,L3

Total **45**

Suggested Activities : Tutorials, Seminar, Quiz / MCQ (Gate related questions), Peer learning, Group discussion, case study

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Analyze electromagnetic fields using vector operations and theorems.

CO2: Ability to solve and interpret electrostatic field, capacitance, and current continuity problems using basic laws and equations

CO3: Apply magnetic field laws and inductance concepts to analyze forces, energy, and behavior of magnetic materials

CO4: Analyze electromagnetic waves and compute power flow using Maxwell's equations

CO5: Analyze and predict electromagnetic wave behavior such as reflection, refraction, and transmission at boundaries.

Text Books:

T1: K A Gangadhar and PM Ramanathan, "Electromagnetic Field Theory" 16th Edition,2015, Khanna Publishers, New Delhi.

T2: M.N.O.Sadiku and S.V. Kulkarni, Principles of Electromagnetics, 6th edition 2021., Oxford University Press(Asian Edition).

References

R1: W.H. Hayt and J.A. Buck, Engineering electromagnetics, 7th ed., McGraw-Hill (India), 2006

R2: Edward C. Jordan & Keith G. Balmain,Electromagnetic waves and Radiating Systems, Second Edition, Prentice-Hall Electrical Engineering Series, 2012.

R3: Dr.J.P.Tiwari. "Engineering Electromagnetics" 2nd Edition. 2009. Khanna Publishers, New Delhi

Web links and Video Lectures (e-Resources):

1. https://www.vlab.co.in
2. **https://nptel.ac.in/courses/108106073**
3. **https://nptel.ac.in/courses/115101005**
4. **https://www.youtube.com/watch?v=aaWG_6WCkTA**
5. **https://www.youtube.com/watch?v=2WiMeh1Dxl8**

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	2	–	–	–	–	–	–	–	1	3	2	3
2	3	2	2	–	–	–	–	–	–	–	1	3	3	2
3	3	2	2	–	–	–	–	–	–	–	1	3	3	2
4	3	2	2	–	–	–	–	–	–	–	1	3	2	2
5	3	2	2	–	–	–	–	–	–	–	1	3	3	2
AVG	3	2	2	–	–	–	–	–	–	–	1	3	2	3

'1' – Low , '2' – Medium , '3'- High, '-' – No correlations

STATISTICS, PROBABILITY AND LINEAR ALGEBRA

Course Code	24MA413	Course Type		INTEGRATED	
Course Offered to	EEE,CIVIL & MECH				
Total Teaching Periods	75	L:T:P	2:1:2	Credits	4
Handled by	Mathematics	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite: Basic knowledge of probability, statistics, and matrix algebra.

Course Objectives: To impart knowledge on

1. Sampling distributions and hypothesis testing methods used in statistical analysis.
2. Design of experiments and analysis of variance techniques.
3. Probability theory and one-dimensional random variables with standard distributions.
4. Joint distributions, correlation, regression, and two-dimensional random variables.
5. Vector spaces, linear transformations, and eigenvalues/eigenvectors in linear algebra.

Unit: I TESTING OF HYPOTHESIS **15**

Sampling distributions – Test for Single Mean and difference of two means (Large and small samples) – Tests for Single Variance and Equality of Variances - F -Test - Chi-square test for Goodness of fit- Test of Independent Attributes.

PRACTICALS:

1. Perform Z-test for single mean and difference of means.
2. Perform F-test for equality of variances.
3. Perform Chi-square goodness of fit test and test of independent attributes.

Teaching-Learning Process **Pedagogy:** Lecture , NPTEL Videos

RBT Level: L1- L3

Unit: II DESIGN OF EXPERIMENTS **15**

One-way classifications (Completely randomized design) two-way classifications (Randomized block design) and three-way classifications (Latin square design).

PRACTICALS:

1. Compute the treatment means and block means in randomized block design.
2. Analyze data using two-way classification by computing row and column means.
3. Compute the grand mean for data arranged in a Latin square design.

Teaching-Learning Process **Pedagogy:** Lecture , NPTEL Videos

RBT Level: L1- L3

Unit: III ONE DIMENSIONAL RANDOM VARIABLES 15

Random Variables — Moments — Moment generating function — Discrete Random Variables: Binomial, Poisson and Geometric Distributions — Continuous Random Variables: Uniform, Exponential and Normal Distributions.

PRACTICALS:

1. Compute the PMF of a Binomial, Geometric and Poisson Distributions.
2. Compute and plot the PDF of a Uniform, Exponential and Normal Distributions.
3. Compute the mean and variance of a Binomial, Geometric and Poisson Distributions.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT

RBT Level: L1- L3

Unit: IV TWO-DIMENSIONAL RANDOM VARIABLES 15

Joint distributions —JPMF and JPDF - Marginal and conditional distributions — Covariance — Correlation coefficient and regression.

PRACTICALS:

1. Find the marginal distribution from joint distributions.
2. Compute conditional probability distributions.
3. Compute the covariance and correlation.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT

RBT Level: L1- L3

Unit: V LINEAR ALGEBRA 15

Vector Spaces- Subspaces- Linear Transformation – Null space, Range space - dimension theorem - Matrix and representation of Linear Transformation – Eigen values Eigen vectors of linear transformation.

PRACTICALS:

1. Find the image, null space and range space of a vector under a linear transformation.
2. Compute the eigenvectors corresponding to the eigenvalues of a matrix and also find its characteristic polynomial.
3. Find the matrix representation of a linear transformation and verify the Rank-Nullity Theorem for a given matrix.

Teaching-Learning Process **Pedagogy:** Lecture Method, NPTEL Videos

RBT Level: L1- L3

Total 75

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Apply sampling distributions and perform hypothesis testing for means, variances, and attributes

CO2: Analyze experimental data using CRD, RBD, and Latin Square Design.

CO3: Apply one-dimensional random variable concepts and standard probability distributions to compute statistical measures.

CO4: Evaluate joint probability distributions and analyze relationships using covariance, correlation, and regression techniques.

CO5: Apply linear algebra concepts including vector spaces, linear transformations, eigenvalues, eigenvectors, and verify the Rank–Nullity theorem using computational tools.

Text Books:

T1: Grewal, B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi, 2020.

T2: Gilbert Strang, "Introduction to Linear Algebra", 6th Edition, Wellesley–Cambridge Press, 2023

T3: Montgomery, D.C., "Design and Analysis of Experiments", 9th Edition, Wiley, 2017.

T4: Lehmann, E.L. and Romano, J.P., "Testing Statistical Hypotheses", 3rd Edition, Springer, 2005.

References

R1: Bernard Kolman and David R. Hill, "Introductory Linear Algebra", Pearson Education, New Delhi, 2010.

R2: Gerald, C.F. and Wheatley, P.O., "Applied Numerical Analysis", 7th Edition, Pearson Education, 2004.

R3: Kumaresan, S., "Linear Algebra – A Geometric Approach", PHI Learning, New Delhi, 2010.

R4: Lipschutz, S., *Schaum's Outline of Linear Algebra*, McGraw-Hill, New York, 1989.

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/111105090
2. https://nptel.ac.in/courses/111102112
3. https://nptel.ac.in/courses/111102160
4. https://nptel.ac.in/courses/111101115
5. https://nptel.ac.in/courses/111106415

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	–	2	2	–	–	–	–	–	1	3	3	1	2
2	3	2	2	2	–	–	–	–	–	1	3	2	3	2
3	2	–	2	2	–	–	–	–	–	1	2	3	1	2
4	3	–	2	2	–	–	–	–	–	1	3	3	2	2
5	3	2	2	3	–	–	–	–	2	1	3	3	1	3
AVG	3	–	2	2	–	–	–	–	–	1	3	3	1	2

'1' – Low , '2' – Medium , '3'- High, '-' – No correlations

ANALOG AND DIGITAL COMMUNICATION

Course Code	24AC411	Course Type		INTEGRATED	
Course Offered to	ECE & VLSI				
Total Teaching Periods	75	L:T:P	2:1:2	Credits	4
Handled by	ECE	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite: Basic understanding of Signals and Systems, Electronic Devices and Circuits, and fundamentals of communication systems.

Course Objectives: To impart knowledge of

1. Amplitude modulation techniques including generation, detection, and applications in communication systems.
2. Angle modulation techniques such as frequency and phase modulation along with their generation and detection methods.
3. Noise sources and their effects on the performance of analog communication systems.
4. Pulse modulation techniques and digital pulse transmission methods used in communication systems.
5. Digital modulation techniques and baseband signal reception for reliable data transmission.

Unit: I AMPLITUDE MODULATION 17

Need for modulation - Amplitude Modulation - Time and frequency domain description of Single tone AM with carrier, DSB- SC AM , SSB – SC AM , VSB AM - Power relations in AM waves, Generation of AM waves - Switching modulator and Balanced modulator - Frequency discrimination and Phase discrimination methods for generating SSB - Detection of, AM Waves - Envelope detector - Coherent detection of DSB-SC Modulated waves - COSTAS Loop - Demodulation of SSB Waves – FDM – AM Transmitter and Super hetrodyne Receiver

.

PRACTICALS :

1. Generation of AM waves and its spectral analysis.
2. Envelope Detection of AM Waves
3. Characteristics of Receiver Parameters
4. Frequency division Multiplexing

Teaching-Learning Process **Pedagogy:** Lecture, Peer Learning.

RBT Level: L1- L4

Unit: II ANGLE MODULATION 17

Basic concepts of Frequency and Phase Modulation: Single tone and multi tone frequency modulation- Spectrum Analysis - Narrow band FM, Wide band FM - Constant Average Power - Transmission bandwidth of FM Wave - Generation of FM Signal- Reactance tube and Armstrong Method - Detection of FM Signal: Foster seely and Ratio detector - Phase locked loop - Comparison of FM and AM. - Concept of Pre-emphasis and de-emphasis – TDM – FM Transmitter and Receiver.

PRACTICALS :

1. FM generation and Detection
2. Time Division Multiplexing
3. Pre- emphasis and De-emphasis

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos.

RBT Level: L1- L4

Unit: III Noise Analysis 9

Introduction to Noise – Internal and External noise – Noise figure and Noise factor – Frii`s formula – Noise of cascaded stages – Narrow band noise – Noise performance in AM with carrier system , DSB-SC –AM system, SSB-SC-AM System – Noise performance in FM and PM system – FMFB Technique.

Teaching-Learning Process **Pedagogy:** Lecture, PPT, YouTube videos.

RBT Level: L1- L3

Unit: IV PULSE MODULATION 15

Principle of PAM, PWM and PPM. - Pulse Code Modulation - Quantization Noise, Non-Uniform Quantization and Companding – Differential PCM - Adaptive DPCM – Delta Modulation and Adaptive Delta Modulation.

PRACTICALS :

1. Generation and Detection of PAM,PWM and PPM.
2. PCM, DPCM and Adaptive DPCM
3. Delta Modulation and Adaptive Delta Modulation.

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1- L4

Unit: V DIGITAL MODULATION TECHNIQUES 17

FSK- Modulator and Coherent Detector - BPSK- Modulator and Coherent BPSK Detection - Principles of QPSK - Differential PSK and QAM - Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver.

PRACTICALS:

1. FSK Modulation and De modulation
2. BPSK, DPSK and QPSK Modulation and De modulation
3. Quadrature Amplitude Modulation

CONTENT BEYOND SYLLABUS:

1. Line Coding and Decoding
2. Signal Sampling and Reconstruction

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1- L4

Total 75

Suggested activities: Flipped class room, Seminar, Quiz / MCQ (Gate related questions), Peer learning, Group discussion, Review of GATE questions

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Design and analyze various Analog and Digital Modulation and Demodulation techniques.

CO2: Model the noise present in continuous wave Modulation techniques.

CO3: Implement the Super heterodyne Receiver concept and Pulse Modulation Techniques in various applications

CO4: Analyze and design the base band Transmission

Text Books:

T1: T1 B.P.Lathi - Modern Digital and Analog Communication Systems , 4th Edition- 2020, Oxford University Press, India, Ltd.

T2: Herbert Taub, Donald L Schilling, Goutam Saha, -Principles of Communication Systems, 4th Edition-2016., McGraw-Hill, 2008.

T3: Dr.Sanjay Sharma, “Communication Systems” 7th Edition 2018, SK Kataria and Sons, NewDelhi.

References

R1: R1 Dennis Roddy and John Coolean - Electronic Communications, 4th Ed., PEA, 2004

R2: George Kennedy and Bernard Davis - Electronics & Communication System, TMH, 2004

R3 Wayne Tomasi – Advanced Electronics Communication Systems-6th Edition-2015., PHI..

Web links and Video Lectures (e-Resources):

1. https://www.vlab.co.in
2. https://youtu.be/YS9I2U6z4cA?feature=shared
3. https://youtu.be/CYZrDR5YiOY?feature=shared
4. https://youtu.be/jXWo9BXK4Vw?feature=shared
5. https://youtu.be/_gopb4vshnk?feature=shared
6. https://youtu.be/Ce-qQ_jB6Dc?feature=shared
7.

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	2	2	2	–	–	–	–	–	2	3	2	2
2	3	3	2	3	3	–	–	–	–	–	2	3	3	2
3	3	3	2	3	2	–	–	–	–	–	2	3	2	3
4	3	3	3	3	3	–	–	–	–	–	2	3	3	3
AVG	3	3	2	2	2	–	–	–	–	–	2	3	2	2

‘1’ – Low , ‘2’ – Medium , ‘3’- High, ‘-‘ – No correlations

ANALOG CIRCUITS – II

Course Code	24EC411	Course Type		INTEGRATED	
Course Offered to	ECE & VLSI				
Total Teaching Periods	75	L:T:P	2:1:2	Credits	4
Handled by	ECE	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite: Basic understanding of Electronic Devices and Circuits, network analysis, and fundamentals of analog electronics**.**

Course Objectives: To impart the knowledge of

1. Principles and characteristics of ideal and practical operational amplifiers.
2. Various applications of operational amplifiers in analog signal processing circuits.
3. Waveform generators, oscillators, and active filter circuits using operational amplifiers.
4. Special function ICs such as 555 Timer and Phase Locked Loop and their practical applications.
5. Voltage regulators and data converters including DAC and ADC techniques used in electronic systems.

Unit: I Operational Amplifier and its Characteristics 15

Introduction – Basic information of OP-AMP – Ideal OP-AMP - Open loop operation – feedback in ideal OP-AMP – Inverting amplifier – Non-inverting amplifier – Voltage follower – Differential amplifier – difference mode and common mode gains – common mode rejection ratio – OP-AMP Internal circuit – Transfer characteristics – low frequency small signal analysis of differential amplifiers – Circuit for improving CMRR – Input resistance – Active load – level translator – output stage - Op-Amp – DC Characteristics – input bias current – input offset current – input offset voltage – total output offset voltage- Thermal drift – AC Characteristics – frequency response – stability – Frequency compensation – slew rate – Simple Problems.

PRACTICALS:

1. Design and testing of Inverting and Non Inverting Amplifier
2. Measurements of AC and DC Characteristics of Op - Amp.
3. Design, test and obtain the frequency response of Voltage follower and Differential Amplifier

Teaching-Learning Process **Pedagogy:** Lecture, Peer Learning.

RBT Level: L1- L4

Unit: II Applications of Operational Amplifier 17

Introduction – Basic Op-Amp Applications – Scale Changer / Inverter – Adder and Subtractor – Inverting and Non – Inverting AC Amplifier – V to I And I to V Convertor – Rectifier – Peak Detector – Clipper – Clamper – Sample and Hold Circuit – Integrator – Differentiator - Instrumentation Amplifier – Comparator – zero crossing Detector – Window detector – Analog Multipliers and its applications - Simple Problems.

PRACTICALS:

1. Design, test and obtain the frequency of Integrator, Differentiator.
2. Design and test the FWR Rectifier with and Without filters
3. Design and test V / I and I / V Converter, Clipper, Clamper, Sample and Hold Circuits
4. Applications of Instrumentation Amplifier.
5. Multiplier and Comparator.

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos.

RBT Level: L1- L4

Unit: III Waveform Generators and Active Filters **17**

Wave form generators - Regenerative comparator (Schmitt trigger) – Square wave generator (Astable Multivibrator) – Monostable Multivibrator – Triangular Wave generator - Basic principles of sine wave oscillations – Barkhausen criterion - RC Phase shift oscillators - Wien bridge oscillator –Hartley and Colpits Oscillator – Crystal Oscillator Function generator – RC Active filters (LPF, HPF, BPF and BSF) - State variable filter – Switched capacitor filters – Simple Problems

PRACTICALS:

1. Design ,test and frequency response of Active filters (LPF, HPF, BPF and BSF)
2. Design and testing of Multivibrators (Astable and Monostable) and Schmitt trigger
3. Design and testing RC and LC Oscillator
4. Design and testing of Function generator.

Teaching-Learning Process **Pedagogy:** Lecture, PPT, YouTube videos.

RBT Level: L1- L4

Unit: IV Special Function ICs **13**

Introduction – Description and functional Diagram IC 555 Timer – Monostable operation and its applications – Astable operation and its application – Introduction to PLL – Basic principles of PLL - Phase detector / comparator – Analog and digital phase detector – Voltage controlled oscillator (VCO) — Derivation of lock in range – derivation of capture range – PLL Applications – Frequency multiplication/division – Frequency translation – AM Detection – FM Demodulation – Frequency Shift Keying (FSK) –- Simple Problems

PRACTICALS:

1. Design and testing of Voltage Controlled Oscillator using PLL IC.
2. Design and Testing of Frequency multiplier and Frequency Synthesizer.
3. Design and testing of Waveform generator

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1- L4

Unit: V Voltage Regulators and Data Convertors **13**

Introduction – Series Op Amp Regulator- IC Voltage Regulators – Fixed Voltage series Regulator – Line / Input regulation – Load Regulations – Ripple Rejection – Fixed Regulator used as Adjustable Regulator – Dual Voltage supply – 723 General purpose regulator – Current Limit Protection – Current Foldback – Current Boosting – Switching Regulator - V /F and F / V Converter - Basic DAC Techniques – Weighted Resistor DAC – R-2R Ladder DAC – Inverted R-2R Ladder – Multiplying DACs – Monolithic DAC – A / D Converters - Direct Type ADCs – The parallel Comparator (Flash) A / D Converter – The counter type A / D Converter – Servo tracking A/D Converter – Successive Approximation Converter – Integrating Type of ADCs – Charge Balancing ADC – Dual- slope ADC – DAC/ADC Specifications – Simple Problems .

PRACTICALS:

1. Design and testing of Digital to Analog converter and Analog to Digital converters.
2. Design and testing of IC Voltage regulator.

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: L1- L4

Total **75**

Suggested Activities : Gate questions, Tutorial, Mini project, case study

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the characteristics of Ideal and Practical Op Amp.

CO2: Describe linear and Non-Linear analog circuits using Op Amp.

CO3: Analyze and design active filters based on given specifications.

CO4: Explain the working of special purpose ICs and design circuits for real-time applications.

CO5: Analyze voltage regulators and different types of DAC and ADC circuits with specifications.

Text Books:

T1: Roy Choudhury, Shail B Jain, "Linear Integrated Circuits" **,** New age International Private Ltd.,4th Edition, 2017

T2: Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits",| Fourth Edition, Pearson,2021.

References

R1: Brijesh Iyer, "Basic of Electronics", All India Council for Technical Education (AICTE), 2023.

R2: G K Mithal, "Electronic Devices and Circuits", Khanna Publishers, 23rd Edition, 2017.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=WYKsYvLJ7HE
2. https://www.vlab.co.in
3. https://www.youtube.com/watch?v=xki9taCqsWY
4. https://onlinecourses.nptel.ac.in/noc24_ee81/preview

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	
1	3	2	–	–	–	–	–	–	–	–	1	3	1	1	
2	3	3	2	–	–	–	–	–	–	–	1	3	2	1	
3	3	3	2	–	2	–	–	–	–	–	1	3	2	2	
4	3	2	2	–	2	–	–	–	–	–	1	2	3	2	
5	3	3	2	–	3	–	–	–	–	–	1	2	2	3	
AVG	3	2	–	–	–	–	–	–	–	–	1	3	1	1	

‘1’ – Low , ‘2’ – Medium , ‘3’- High, ‘-‘ – No correlations

DIGITAL SIGNAL PROCESSING

Course Code	24AC413	Course Type		INTEGRATED	
Course Offered to	ECE & ACT				
Total Teaching Periods	75	L:T:P	2:1:2	Credits	4
Teaching Department	ECE	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite : Basic understanding of Signals and Systems, Digital Signal Processing fundamentals, and C programming.

Course Objectives: To impart knowledge of

1. DSP architecture, number formats, and programming concepts used in digital signal processors.
2. Design and implementation of Infinite Impulse Response (IIR) digital filters.
3. Design and implementation of Finite Impulse Response (FIR) digital filters using various techniques.
4. Finite word length effects and their impact on digital signal processing systems.
5. Applications of DSP such as multirate signal processing, filter banks, and adaptive noise cancellation.

Unit: I DSP ARCHITECTURE AND PROGRAMMING 24

DSP functionalities - DSP architecture – circular buffering - Fixed point format, Floating point Format, IEEE Floating point formats - TMS320C5X and TMS320C6X architecture principles – Programming – Application examples.

PRACTICALS:

1. Perform MAC (Add, Sub, Multiply, Divide & Logical) operation using various addressing modes.
2. Sorting Technique (Median, Min and Max values)
3. Fibonacci Series and Factorial of a given number
4. Matrix Operation
5. Serial Communication, ADC & DAC Interfacing
6. Timer and Interrupt Handling.
7. Signal Sampling and Reconstruction
8. Generation of elementary signals and noise.
9. Convolution and Correlation between two sequences.
10. Computation of DFT and FFT

Teaching-Learning Process

Pedagogy: Lecture

RBT Level: Theory: L1, L2, L3, Practical: L4

Unit: II INFINITE IMPULSE RESPONSE FILTER 12

Characteristics of practical frequency selective filters, characteristics of commonly used analog filters - Butterworth filters and Chebyshev filters - Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) Impulse invariance method- Bilinear transformation method - Frequency transformation in the analog domain.

PRACTICALS:
IIR filter implementation (LPF / HPF / BPF /BSF)

Teaching-Learning Process
Pedagogy: Lecture
RBT Level: Theory: L1, L2, L3, Practical: L4

Unit: III FINITE IMPULSE RESPONSE FILTER **12**

Design of FIR filters - symmetric and Anti-symmetric FIR filters - Design of linear phase FIR filters using Fourier series method S FIR filter design using windows (Rectangular, Hamming and Hanning window)- Frequency sampling method-FIR filter structures - linear phase structure.

PRACTICALS:
FIR filter implementation (LPF / HPF / BPF / BSF)

Teaching-Learning Process **Pedagogy: Lecture**
RBT Level: Theory: L1, L2, L3, Practical: L4

Unit: IV FINITE WORD LENGTH EFFECT **9**

Fixed point and floating point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization -coefficient quantization error - product quantization error - overflow error -limit cycle oscillations due to product quantization and summation - scaling to prevent overflow

Teaching-Learning Process **Pedagogy: Lecture**
RBT Level: Theory L1, L3, L3

Unit: V APPLICATIONS OF DSP **18**

Introduction - Decimation by a factor D - Interpolation by a factor I - Sampling rate conversion by a rational factor I/D- Applications of Multirate signal Processing - Digital filter bank - Sub-band coding of speech signals - Quadrature Mirror Filter – Adaptive Noise Cancellation.

PRACTICALS:
1. Decimation and Interpolation.
2. Adaptive Noise Cancellation.
3. Real time Audio Processing.
4. Digital Oscillator and Digital PLL implementation.

Teaching-Learning Process **Pedagogy: Lecture**
RBT Level: Theory : L1, L2, L3 Practical: L4

Total **75**

Suggested Activities : Tutorials, Seminar, Quiz / MCQ (Gate related questions), Peer learning, Group discussion, case study

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain DSP processor architecture and implement basic DSP operations using DSP processors

CO2: Design IIR Filter for given specification and obtain their impulse response

CO3: Design FIR Filter for given specification and obtain their impulse response.

CO4: Examine and analyze finite word length effects in digital signal processing systems.

CO5: Apply DSP techniques to practical applications such as multirate processing, decimation/interpolation, adaptive noise cancellation, and real-time audio processing

Text Books:

T1: Salivahanan R, Digital Signal Processing, McGraw Hill Publishing, 2019, 4th edition.

T2: Proakis J G and Manolakis D G, "Digital Signal Processing", Pearson Education India.

T3: Phil Lapsley, Jeff Bier, et al "DSP Processor Fundamentals: Architectures and Features". Wiley India Pvt Ltd 2009

T4: Keshab K. Parhi. VLSI Digital Signal Processing Systems, Wiley-Inter Sciences, 1999.9

References

R1: Emmanuel C. Ifeachor & Barrie W. Jervis, Digital Signal Processing*:* A Practical Approach, Pearson Education India, 2nd Edition (2014).

R2: Alan V. Oppenheim & Ronald W. Schafer, Discrete-Time Signal Processing, Prentice Hall, 3rd Edition (2009; updated with a 2021 ISBN: 978-0137549771)

R3: De Fatta D J, Lucas J G and Hodgkiss W S, "Digital Signal Processing", J Wiley and Sons, Singapore, 1988.

R4: Sanjit K. Mitra, Digital Signal Processing, Tata McGraw-Hill (India).

Web links and Video Lectures (e-Resources):

1. https://www.vlab.co.in/
2. https://www.slideshare.net/laxmikantprmceam/dsp-processor
3. https://vemu.org/uploads/ppt/15_02_2023_97755708.pdf
4. https://nptel.ac.in/courses/108106151
5. https://nptel.ac.in/courses/117102060

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	2	–	–	–	–	–	–	–	1	3	2	3
2	3	3	2	–	–	–	–	–	–	–	1	3	2	2
3	3	3	2	–	–	–	–	–	–	–	1	3	2	2
4	3	2	3	–	–	–	–	–	–	–	1	3	2	2
5	3	2	2	–	–	–	–	–	–	–	1	2	3	2
AVG	3	2	2	–	–	–	–	–	–	–	1	3	2	3

‘1’ – Low , ‘2’ – Medium , ‘3’- High, ‘-‘ – No correlations

MICROCONTROLLER AND INTERFACING

Course Code	24EC412	Course Type		INTEGRATED	
Course Offered to	ECE, ACT , VLSI & EEE				
Total Teaching Periods	75	L:T:P	3:0:2	Credits	4
Handled by	ECE	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite: Basic understanding of digital electronics, microprocessor fundamentals, and programming in C.

Course Objectives: To impart the knowledge of

1. Microcontroller architecture and programming concepts using the 8051 microcontroller.
2. PIC microcontroller architecture, peripherals, and embedded programming techniques.
3. ARM Cortex-M microcontroller architecture and programming for embedded applications
4. Interfacing techniques for sensors, actuators, and peripheral devices in embedded systems.
5. Modern embedded platforms such as Arduino and Raspberry Pi for developing IoT and real-time applications.

Unit: I 8051 MICROCONTROLLER 15

Introduction to microcontrollers and embedded systems – 8051 architecture and block diagram – Pin configuration and functional description – Memory organization: Program memory, Data memory, SFRs – I/O ports and port programming – Timers and counters – Serial communication – Interrupts and interrupt handling – Instruction set and addressing modes – Programming 8051 using Embedded C.

PRACTICALS :

1. Programming using arithmetic, logical and bit manipulation instructions of 8051
2. Configuring and programming Timer and Interrupts in 8051 microcontrollers

Teaching-Learning Process **Pedagogy:** Lecture, Peer Learning.

RBT Level: Theory: L1,L2,L3 Practical: L4

Unit: II PIC MICROCONTROLLER 15

Overview of PIC microcontroller family – Harvard architecture and RISC features – PIC16F/18F architecture – Memory organization and register set – I/O port programming – Timers and CCP modules – ADC and PWM – Interrupt system – PIC instruction set – Programming using Embedded C and MPLAB

PRACTICALS:

1. Simple Programming Using PIC Microcontroller (LCD interfacing, Switch interfacing, ADC interfacing)

Teaching-Learning Process **Pedagogy:** Lecture, NPTEL videos.

RBT Level: Theory: L1,L2,L3 Practical: L4

Unit: III ARM MICROCONTROLLER (CORTEX-M SERIES 15

Introduction to ARM architecture and evolution – ARM Cortex-M0/M3/M4 overview – Register set and memory map – Exception and interrupt handling (NVIC) – GPIO programming – Timers and SysTick – Serial interfaces: UART, SPI, I2C – Power management and low-power modes – Introduction to CMSIS – Embedded C programming for ARM

PRACTICALS:

1. Simple Programming using ARM Processor
2. Interfacing LED, LCD, Switch and 4x4 Keypad with ARM processor.
3. Interfacing Sensor and Actuator with ARM processor

Teaching-Learning Process **Pedagogy:** Lecture, PPT, YouTube videos.

RBT Level: Theory:L1,L2,L3 Practical: L4

Unit: IV INTERFACING DEVICES AND PERIPHERALS 15

Interfacing concepts and standards – LED, switch and relay interfacing – Seven-segment and LCD interfacing – Keypad interfacing – ADC and DAC interfacing – Sensor interfacing (temperature, proximity, IR) – Motor interfacing (DC, stepper, servo) – Communication interface devices – Case study: Embedded monitoring and control system.

PRACTICAL:

1. Temperature Control System
2. Stepper motor Control
3. DC Motor with Speed Control using PWM

Memory Interfacing

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: Theory:L1,L2,L3 Practical: L4

Unit: V ARDUINO AND RASPBERRY Pi 15

Part A: Arduino

Arduino architecture and variants – ATMEGA vs ARM-based Arduino boards – Arduino IDE and program structure – Digital and analog I/O programming – Sensor and actuator interfacing – Serial communication and libraries

Part B: Raspberry Pi

Raspberry Pi architecture and SoC – ARM processor overview – GPIO programming – Interfacing sensors and displays – Linux OS basics – Python programming introduction – Arduino vs Raspberry Pi comparison

PRACTICAL:

1. Introduction to Arduino platform and programming
2. Introduction to Raspberry PI platform and python programming.
3. Interfacing sensors with Raspberry PI.
4. Communicate between Arduino and Raspberry PI using any wireless medium.
5. Setup a cloud platform to log the data.
6. Log Data using Raspberry PI and upload to the cloud platform

Teaching-Learning Process **Pedagogy:** PPT, YouTube videos

RBT Level: Theory:L1,L2,L3 Practical: L4

Total **75**

Suggested Activities : Gate questions, Tutorial, Mini project, case study

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the internal architecture and functional blocks of a microcontroller.

CO2: Develop assembly/C programs using appropriate instruction sets and addressing modes

CO3: Interface peripheral devices with microcontrollers for real-time applications.

CO4: Utilize timers, interrupts, and communication protocols in embedded systems.

CO5: Design microcontroller-based systems to solve practical engineering problems.

Text Books:

T1: Raj Kamal "Embedded Systems- Architecture, Programming and Design" 3rd Edition McGraw Hill,– 1 July 2017

T2: Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin Mc Kinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011.

T3: Joseph Yiu "The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors"3rd Edition Newnes (Elsevier) 2013

T4: Kenneth J Ayala, "The 8051 Microcontroller – Architecture, Programming and Applications", Penram International Publications, India, 2016.

T5: Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.

T6: Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM Systems Developer's Guide- Designing & Optimizing System Software", 2008, Elsevier

References

R1: Krishna Kant, "Micro-processors & Micro-controllers", Prentice Hall of India, 2007.

R2: Simon Monk "Raspberry Pi Cookbook: Software and Hardware Problems and Solutions", Second Edition Shroff publishers 2015

R3: Jonathan W. Valvano "Embedded Systems: Introduction to ARM® Cortex-M Microcontrollers" 2nd Edition Cengage Learning 2014

R4: Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/108103157
2. https://nptel.ac.in/courses/108105102
3. https://youtu.be/rDvLaOe5_Ws
4. https://www.google.com/search?q=arduino+nptel+course&rlz=1C1CHBF_enIN1188IN1188&
5. https://www.youtube.com/watch?v=YGcQONNIQB4
6. https://www.youtube.com/watch?v=fJWR7dBuc18

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	1	–	–	–	–	–	–	–	1	3	2	1
2	3	3	2	–	–	–	–	–	–	–	1	3	3	2
3	3	3	2	–	–	–	–	–	–	–	1	3	3	2
4	3	2	2	–	–	–	–	–	–	–	1	3	2	2
5	3	3	2	–	–	–	–	–	–	–	1	3	3	3
AVG	3	2	1	–	–	–	–	–	–	–	1	3	2	1

‘1’ – Low , ‘2’ – Medium , ‘3’- High, ‘-‘ – No correlations

IDEA TO PRODUCT

Course Code	24PC411	Course Type		INTEGRATED	
Course Offered to	Common to ECE, EEE, MECH & CIVIL				
Total Teaching Periods	45	L:T:P	1:0:2	Credits	2
Handled by	MECH	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite: Basic knowledge of engineering graphics and design concepts.

Course Objectives: To provide knowledge of

1. Global trends, product development concepts, methodologies, and product life cycle used in modern product development.
2. Rapid prototyping techniques, tools, and methods used for mechanical and electronic prototype development.
3. Industrial design principles including sketching, CAD modeling, product visualization, and reverse engineering strategies.
4. UI/UX design principles, human factors, information architecture, and design practices for digital products.
5. Application development concepts including SDLC, web and mobile technologies, databases, APIs, cloud services, and deployment of applications.

Module: I BASICS OF PRODUCT DEVELOPMENT 6

Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends Environmental Trends - Political/Policy Trends - Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview o Product Development methodologies - Product Life Cycle – Product Development Planning and Management.

Teaching-Learning Process **Pedagogy:** Chalk and Talk

RBT Level: L1- L4

Module: II RAPID PROTOTYPING 6

Need for prototyping - Domains in prototyping - Difference between actual manufacturing and prototyping - Rapid prototyping methods - Tools used in different domains.

Mechanical Prototyping: 3D Printing and classification - Laser Cutting and engraving - RD Works – Additive manufacturing.

Electronic Prototyping: Basics of electronic circuit design - - Working with simulation tool - simple PCB design with EDA.

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1- L4

Module: III INDUSTRIAL DESIGN 6

Introduction to Industrial Design - Points, lines, and planes - Sketching and concept generation - Sketch to CAD - Introduction to CAD tools - Types of 3D modeling - Basic 3D Modeling Tools - Part creation – Assembly - Product design and rendering basics – Dimensioning & Tolerance – Basics of reverse Engineering and its strategies

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1- L4

Module: IV UI / UX 6

Fundamental concepts in UI & UX - Tools - Fundamentals of design principles - Psychology and Human Factors for User Interface Design - Layout and composition for Web, Mobile and Devices - Typography - Information architecture - Color theory - Design process flow, wireframes, best practices in the industry -User engagement ethics - Design alternatives

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1- L4

Module: V APP DEVELOPMENT 6

SDLC - Introduction to App Development - Types of Apps - web Development -understanding Stack - Frontend - backend - Working with Databases - Introduction to API - Introduction to Cloud services - Cloud environment Setup- Reading and writing data to cloud - Embedding ML models to Apps - Deploying application

Important Note :

It is considered as a lab, observation is to be submitted every week starting from block diagram, Design, Circuit Diagram, Simulation Results, Implementation results and Analysis. Finally, a Report is to be submitted for the System Design, End Semester Exam is a Demo.

The main objective of this laboratory is to understand and apply the principles and concepts in Product Design for Innovative Product with hands on training. Each student group (not more than three) have to develop digital and physical prototype models of a new product / existing product with enhanced feature.

The fabricated models (For Mech & Civil students) may be in the form of RP models, clay models, sheet metal models or cardboard models etc. The design and development of the product will be reviewed in two stages for awarding internal marks. The end semester examination mark will be based on the project report (Introduction; Literature survey; Methodology; Simulation; Experimentation; Analysis and Discussion; and Conclusion) and their demonstration followed by oral examination of their new product by internal examiner.

S.No	ECE, EEE, ACT & VLSI Design	Mech & Civil
1	VLSI Subsystem Design	Automotive / Aerospace
2	Embedded System Design	Medical components.
3	IoT based System Design	Industrial components
4	AI based System Design	Machining / Forming
5	Energy Innovative Design	Casting tool, fixtures, & supplementary components.
6	Power / Industrial Electronics	Consumer products

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT

RBT Level: L1-L4

Total **75**

Suggested Activities: Case Study, Quiz, Group Task**,** Review of GATE questions

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain global trends, product development concepts, methodologies, and the product life cycle involved in product development.

CO2: Apply rapid prototyping techniques and tools to develop mechanical and electronic prototypes.

CO3: Develop basic industrial product designs using sketching, CAD modeling, assembly, and rendering techniques.

CO4: Design user interfaces by applying UI/UX principles, design elements, and human–computer interaction concepts

CO5: Develop and deploy basic applications by applying software development concepts, databases, APIs, and cloud services for product implementation

Text Books:

T1: Product Design and Development, McGraw-Hill Education, 6th Edition

T2: Engineering Design: A Project-Based Introduction, John Wiley & Sons, 4th Edition.

References

R1: The Design of Everyday Things, Basic Books, Revised and Expanded Edition.

R2: Rapid Prototyping: Principles and Applications, World Scientific Publishing.

R3: Sketching: Drawing Techniques for Product Designers, BIS Publishers.

Web links and Video Lectures (e-Resources):

1.https://www.adobe.com/products/xd/learn/get-star ted.html
2. https://developer.android.com/guide
3. https://help.autodesk.com/view/fusion360/ENU/courses/
4. https://help.prusa3d.com/en/categor y/prusaslicer_204

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	2	2	1	1	1	–	–	–	1	1	1	2	1	1
2	2	2	2	2	3	–	–	1	1	1	1	2	2	2
3	2	2	3	2	3	–	–	1	1	1	1	3	2	2
4	1	2	2	1	2	–	–	2	2	1	1	2	2	2
5	2	2	3	2	3	–	–	1	2	2	1	3	3	3
AVG	2	2	1	1	1	–	–	–	1	1	1	2	1	1

‘1’ – Low , ‘2’ – Medium , ‘3’- High, ‘-‘ – No correlations

DISASTER MANAGEMENT

Course Code	24AE401	Course Type		THEORY	
Course Offered to	Common to All				
Total Teaching Periods	30	L:T:P	2:0:0	Credits	0
Handled by	MECH	Assessment Methods		IAT	ESE
				40 Marks	60 Marks

Prerequisite : Basic awareness of environmental and disaster-related issues.

Course Objectives: To provide knowledge of

1. The fundamental concepts of disasters, hazards, vulnerability, resilience, and risk.
2. Different types of disasters and their social, economic, environmental, and health impacts.
3. Disaster risk reduction strategies and the roles of institutions at local, state, and national levels.
4. The relationship between disasters, development activities, and climate change.
5. Disaster management practices using case studies, hazard assessment, and GIS-based technologies.

Unit: I INTRODUCTION TO DISASTERS 6

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1-L3

Unit: II APPROACHES TO DISASTER RISK REDUCTION (DRR) 6

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1-L3

Unit: III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 6

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1-L3

Unit: IV DISASTER RISK MANAGEMENT IN INDIA 6

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1-L3

Unit: V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 6

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1-L3

Total 30

Suggested Activities : Case Study, Quiz, Assignment topics, Class Presentation

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the concepts of ethical management, managerial ethics, professional ethics, and social responsibility.

CO2: Analyze ethical decision-making processes and apply ethical principles in crisis management situations.

CO3: Evaluate stakeholder relationships and sustainability issues in ethical management. *(L2, L3)*

CO4: Analyze individual variables such as ethical awareness, judgment, courage, and emotions in managerial decision-making.

CO5: Apply ethical management techniques and skills to resolve dilemmas and promote an ethical organizational culture.

Text Books:

T1: Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011.

T2: Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

T3: Singhal J.P. "Disaster Management", Laxmi Publications, 2019. ISBN-10: 9380386427 ISBN-13: 978-9380386423

T4: Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]

References

R1: Govt. of India: Disaster Management Act, Government of India, New Delhi, 2025

R2: Government of India, National Disaster Management Policy,2009.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=TB97oX7ANGo
2. https://www.youtube.com/watch?v=xA6_X74SYEk

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	-	-	-	2	2	-	1	-	1	2	1	1
2	3	3	2	-	1	2	2	-	1	-	1	2	2	2
3	2	3	2	-	-	3	3	-	1	-	1	2	2	3
4	3	3	2	2	2	3	3	-	1	-	1	3	3	3
5	2	3	3	3	3	3	3	2	2	1	2	3	3	3
AVG	3	3	2	-	-	2	2	-	1	-	1	2	2	2
'1' – Low , '2' – Medium , '3'- High, '-' – No correlations														

INDUSTRIAL SAFETY

Course Code	24AU402	Course Type		THEORY	
Course Offered to	Common to All				
Total Teaching Periods	30	L:T:P	2:0:0	Credits	-
Handled by	MECH	Assessment Methods		IAT	ESE
				40 Marks	60 Marks

Prerequisite : Basic knowledge of engineering workshop practices and mechanical equipment.

Course Objectives: To provide knowledge of

1. Industrial safety practices, accident causes, hazard control measures, fire prevention methods, and safety regulations in industrial environments.
2. Maintenance engineering concepts, functions of maintenance departments, types of maintenance, and maintenance cost considerations.
3. Wear and corrosion mechanisms and their prevention using suitable lubrication and protection techniques.
4. Systematic fault tracing methods and diagnostic procedures used in mechanical and electrical equipment.
5. Periodic inspection and preventive maintenance procedures for machine tools, pumps, compressors, motors, and DG sets.

Unit: I INDUSTRIAL SAFETY 6

Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc., Safety color codes. Fire prevention and firefighting, equipment and methods.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1-L3

Unit: II MAINTENANCE ENGINEERING 6

Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1-L3

Unit: III WEAR AND CORROSION AND THEIR PREVENTION 6

Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1-L3

Unit: IV FAULT TRACING **6**

Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1-L3

Unit: V PERIODIC AND PREVENTIVE MAINTENANCE **6**

Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, Advantages of preventive maintenance. Repair cycle concept and importance.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT
RBT Level: L1-L3

Total **30**

Suggested Activities: Case Study, Quiz, Assignment topics, Class Presentation, Review of GATE questions.

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain industrial safety concepts, accident causes, hazards, fire prevention methods, and relevant provisions of the Factories Act, 1948.

CO2: Describe maintenance engineering principles, types of maintenance, tools used, and cost-replacement analysis.

CO3: Analyze wear and corrosion mechanisms and recommend suitable prevention and lubrication methods.

CO4: Apply fault tracing techniques using decision tree methods for mechanical, hydraulic, pneumatic, thermal, and electrical systems.

CO5: Develop periodic and preventive maintenance plans for industrial equipment and evaluate their effectiveness.

Text Books:

T1: L. M. Deshmukh, Industrial Safety Management, Tata McGraw-Hill Education, 1st Edition, 2005.

T2: Charles D. Reese, Occupational Health and Safety Management: A Practical Approach, CRC Press, 3rd Edition, 2015.

References

R1: Edward Ghali, V. S. Sastri, M. Elboujdaini, Corrosion Prevention and Protection: Practical Solutions, John Wiley & Sons, 2007.

R2: Garg, HP, Maintenance Engineering, S. Chand Publishing, 2012.

R3: J Maiti, Pradip Kumar Ray, Industrial Safety Management: 21st Century Perspectives of Asia, Springer, 2017

R4: R. Keith Mobley, Maintenance Fundamentals, Elsevier, 2011.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=v-eltsixu4I
2. https://www.youtube.com/watch?v=jFDWlKayrTc&list=PLbRMhDVUMngdXebaRB59KdKwstzuAovua
3. https://www.youtube.com/watch?v=ZEShNJX3kcg&list=PLbRMhDVUMngdXebaRB59KdKwstzuAovua&index=12

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	-	-	3	2	3	-	1	-	1	3	3	2
2	3	3	2	-	2	1	-	-	1	2	1	3	3	2
3	3	3	2	1	2	3	-	-	1	-	1	3	2	3
4	3	3	3	2	2	1	-	1	1	-	1	3	3	3
5	3	3	3	2	2	2	-	1	2	2	2	2	3	1
AVG	3	2	-	-	3	2	3	-	1	-	1	3	3	2
'1' – Low , '2' – Medium , '3'- High, '-' – No correlations														

GENDER SENSITIZATION

Course Code	24AU403	Course Type		THEORY	
Course Offered to	Common ton All				
Total Teaching Periods	30	L:T:P	2:0:0	Credits	2
Handled by	MECH	Assessment Methods		IAT	ESE
				50 Marks	50 Marks

Prerequisite : Basic awareness of societal values, ethics, and human relationships.

Course Objectives: To provide knowledge of

1. Fundamental concepts of gender studies, gender identity, gender roles, and the social construction of gender in society.
2. Gender relations in society, including patriarchy, intersectionality, and gender representation in education, media, and professional environments.
3. Gender issues and challenges in workplaces and industries, particularly in science, technology, and engineering sectors.
4. Legal provisions, constitutional rights, and policy frameworks that promote gender equality and protect individuals from discrimination and harassment.
5. Inclusive practices, ethical responsibilities, and leadership approaches that support gender diversity and equality in engineering and professional spaces.

Module: I INTRODUCTION TO GENDER STUDIES

- Sex and Gender: Conceptual differences
- Gender identity and gender expression
- Social construction of gender
- Gender roles and stereotypes
- Gender and culture
- Overview of global equality principles promoted by the United Nations

Teaching-Learning Process **Pedagogy:** Chalk and Talk

RBT Level: L1- L4

Module: II GENDER AND SOCIETY **6**

- Patriarchy and power structures
- Intersectionality (caste, class, disability, race)
- Gender representation in media
- Gender and education
- Women in STEM fields
- Gender bias in academic institutions
- Case studies from engineering education environments.

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1- L4

Module: III GENDER IN WORKPLACE & INDUSTRY **6**

- Gender diversity in corporate environments
- Equal opportunity and pay equity
- Gender bias in recruitment and promotion
- Workplace harassment and prevention
- Role of the International Labour Organization in promoting workplace equality
- Inclusive team building in engineering organizations

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1- L4

MODULE: IV LEGAL & POLICY FRAMEWORK **6**

- Constitutional provisions for equality
- Prevention of Sexual Harassment (POSH) guidelines
- Rights of LGBTQ+ individuals
- Institutional grievance redressal mechanisms
- Regulatory framework guidance from the University Grants Commission (where applicable)
- Students should understand institutional compliance standards aligned with bodies such as the University Grants Commission (if applicable in Indian context).

Teaching-Learning Process **Pedagogy:** Chalk and Talk, PPT

RBT Level: L1- L4

Module: V BUILDING INCLUSIVE ENGINEERING SPACES **6**

- Gender-sensitive communication
- Ethical responsibility of engineers
- Creating inclusive campus culture organizations
- Leadership and ally ship
- Diversity and innovation,
- Case studies from global technology
- Discussion on how inclusive teams improve innovation in tech companies like Google and Microsoft.

Teaching-Learning Process **Pedagogy:** Lecture Method, PPT

RBT Level: L1,L2,L3

Total **30**

Suggested activities : Case studies, Group discussions, Role play exercises; Industry case analysis, assignments.

Evaluation Methods: Performance in Suggested activities, IAT and End Semester Examinations.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the concepts of sex, gender, gender identity, gender roles, and the social construction of gender.

CO2: Analyze gender issues in society, including patriarchy, intersectionality, and gender representation in education and media.

CO3: Examine gender challenges and biases in workplaces, particularly in engineering and technology sectors.

CO4: Explain legal provisions, institutional policies, and regulatory frameworks that support gender equality and protection.

CO5: Apply inclusive practices and ethical principles to promote gender-sensitive communication and inclusive professional environments.

Text Books:

T1: Gender in Engineering: Interdisciplinary Approaches, Routledge Publications

T2: Gender Issues in Science and Technology, Allied Publishers.

T3: Gender: Ideas, Interactions, Institutions, W.W. Norton & Company

References

R1: Nivedita Menon – Seeing Like a Feminist

R2: Judith Butler – Gender Trouble

R3: UN Women – Gender Equality Reports

R4: Government policy documents on workplace equality

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses
2. https://onlinecourses.nptel.ac.in/
3. https://www.un.org/sustainabledevelopment/gender-equality/

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	1	1	–	–	2	2	2	1	1	–	1	–	–	–
2	1	2	–	–	2	2	2	2	1	–	1	–	–	–
3	1	2	1	–	2	2	2	2	2	–	1	1	1	1
4	1	1	–	–	3	2	2	2	1	–	1	–	–	–
5	1	2	1	–	2	2	3	3	2	–	1	1	1	1
AVG	1	1	–	–	2	2	2	1	1	–	1	–	–	–

‘1’ – Low , ‘2’ – Medium , ‘3’- High, ‘-‘ – No correlations