ANNA UNIVERSITY, CHENNAI

UNDERGRADUATE CURRICULUM (NON-AUTONOMOUS AFFILIATED INSTITUTIONS)

Programme: B.E., Electrical and Electronics Engineering **Regulations:** 2025

Abbreviations:

HUM – Humanities (Languages, Management, Heritage, and others)

BS – Basic Science (Mathematics, Physics, Chemistry)

ES – Engineering Science (General (**G**), Programme Core (**PC**), Programme Elective (**PE**) & Emerging Technology (**ET**))

SD – Skill Development

SL – Self Learning

CDP – Capstone Design Project

OE – Open Elective

L – Laboratory Course

T – Theory

LIT – Laboratory Integrated Theory

PW – Project Work

IPW – Internship cum Project Work

DIC – Department Introductory Course

TCP – Total Contact Period(s)

Program Outcomes

1. **Engineering Knowledge**: Apply math, science, and engineering fundamentals to complex problems.
2. **Problem Analysis**: Identify and analyze complex problems using research and sustainability principles.
3. **Design Solutions**: Design systems and processes considering health, safety, cost, culture, and environment.
4. **Investigations**: Use experiments, modelling, and data analysis to reach valid conclusions.
5. **Engineering Tools**: Apply modern tools for modelling and problem-solving, recognizing their limits.
6. **Society & Environment**: Assess societal, legal, and environmental impacts of engineering solutions.
7. **Ethics**: Commit to ethics, human values, diversity, and legal compliance.
8. **Teamwork**: Work effectively as an individual and in multidisciplinary teams.
9. **Communication**: Communicate clearly in reports, presentations, and documentation across diverse groups.

10. **Management & Finance**: Apply management and economic principles in projects and teamwork.
11. **Lifelong Learning**: Engage in continuous learning, adapt to new technologies, and think critically.

Programme Specific Outcomes

PSO1 Analyze, design, and develop electrical circuits and systems for various industrial and societal requirements.

PSO2 Utilize modern tools and techniques for solving complex problems in electrical and electronic systems and provide sustainable solutions.

PSO3 Upskill with rapid advancements in the field of Electrical Engineering and exhibit research aptitude, work effectively as team and uphold ethical practices.

Semester – I							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1.	MA25C01	Applied Calculus	T	3-1-0	4	4	BS
2.	EE25C03	Fundamentals of Electrical and Electronics Engineering	T	2-1-0	3	3	ES (PC) – DIC
3.	UC25H01	தமிழர் மரபு / Heritage of Tamils	T	1-0-0	1	1	HUM
4.	EN25C01	English Essentials – I	T	2-0-0	2	2	HUM
5.	PH25C01	Applied Physics – I	LIT	2-0-2	4	3	BS
6.	CY25C01	Applied Chemistry – I	LIT	2-0-2	4	3	BS
7.	CS25C01	Computer Programming:C	LIT	2-0-2	4	3	ES (PC)
8.	ME25C04	Makerspace	L	0-0-4	4	2	SD
9.	UC25A01	Life Skills for Engineers – I*	---	1-0-2	3	1	HUM
10.	UC25A02	Physical Education – I*	---	0-0-4	4	1	HUM
11.		NCC / NSS / NSO	---	---	---	---	---
				Total Credits	**33**	**23**	

*Audit Course

Semester– II							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1.	MA25C03	Transforms and its Applications	T	3-1-0	4	4	BS
2.	UC25H02	தமிழர்களும் தொழில்நுட்பமும்/ Tamils and Technology	T	1-0-0	1	1	HUM
3.	GE25C01	Basic Civil and Mechanical Engineering	T	3-0-0	3	3	ES (G)
4.	PH25C04	Applied Physics (EE) – II	T	2-1-0	3	3	BS
5.	ME25C01	Engineering Drawing	LIT	2-0-4	6	3	ES (G)
6.	EN25C02	English Essentials – II	LIT	1-0-2	3	2	HUM
7.	CS25C04	Data Structures and Algorithms	LIT	3-0-2	5	4	ES (PC)
8.	ME25C05	Re-Engineering for Innovation	L	0-0-4	4	2	SD
9.	UC25A03	Life Skills for Engineers – II*	---	1-0-2	3	1	HUM
10.	UC25A04	Physical Education – II*	---	0-0-4	4	1	HUM
11.		Foreign Language^	LIT	1-0-2	3	1	HUM
			Total Credits		**39**	**25**	

^ Deutsch / Japanese / Korean *Audit Course

Semester – III							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods /Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1.	MA25C10	Matrices for Engineers	T	2-0-0	2	2	BS
2.	EE25C10	Electromagnetic Theory	T	3-1-0	4	4	ES (PC)
3.	EE25301	Digital Electronics	T	3-0-0	3	3	ES (PC)
4.	EE25302	Electric Circuit Analysis	T	3-0-0	3	3	ES (PC)
5.	EE25C05	Electronic Devices and Circuits	T	3-0-0	3	3	ES (PC)
6.	EE25303	Electric Circuit Laboratory	L	0-0-3	3	1.5	ES (PC)
7.		Skill Development Course – I	LIT	1-0-2	3	2	SD
8.	EE25C06	Electronics Laboratory	L	0-0-3	3	1.5	ES (PC)
9.	EN25C03	English Communication Skills Laboratory – I	L	0-0-2	2	1	HUM
			Total Credits		**26**	**21**	

Semester – IV							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1.	MA25C13	Probability and Statistics	T	3-1-0	4	4	BS
2.	EE25401	Transmission and Distribution	T	3-0-0	3	3	ES (PC)
3.	EE25C07	Control Systems	T	3-0-0	3	3	ES (PC)
4.	EE25C08	Applied Data Science	T	3-0-0	3	3	ES (ET)
5.	EE25402	DC Machines and Transformers	T	3-0-0	3	3	ES (PC)
6.	EE25C09	Linear Integrated Circuits	T	3-0-0	3	3	ES (PC)
7.		Skill Development Course – II	LIT	1-0-2	3	2	SD
8.	EN25C04	English Communication Skills Laboratory – II	L	0-0-2	2	1	HUM
9.	EE25403	DC Machines and Transformers Laboratory	L	0-0-4	4	2	ES (PC)
10.	EE25404	Linear Integrated Circuits Laboratory	L	0-0-4	4	2	ES (PC)
Total Credits					**32**	**26**	

Semester – V							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.		Programme Elective – I	T	3-0-0	3	3	ES (PE)
2.		Programme Elective – II	T	3-0-0	3	3	ES (PE)
3.		AC Machines	T	3-0-0	3	3	ES (PC)
4.		Power System Analysis	T	3-0-0	3	3	ES (PC)
5.		Measurements and Instrumentation	T	3-0-0	3	3	ES (PC)
6.		Skill Development Course – III	LIT	1-0-2	3	2	SD
7.		Industry Oriented Course – I	LIT	1-0-2	3	1	SD
8.		AC Machines Laboratory	L	0-0-4	4	2	ES (PC)
9.		Control and Instrumentation Laboratory	L	0-0-4	4	2	ES (PC)
Total Credits					**29**	**22**	
For Honours Degree							
1.		Capstone Design Project – Level I	CDP	0-0-12	12	6	SD

Semester – V							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T- P	TCP		
OR							
1.		Honours Elective – I	T	3-0-0	3	3	
2.		Honours Elective – II	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – I	T	3-0-0	3	3	
2.		Minor Elective – II	T	3-0-0	3	3	

Semester – VI							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1.		Electrical Machine Design	T	3-1-0	4	4	ES (PC)
2.		Microprocessors & Microcontrollers	T	3-0-0	3	3	ES (PC)
3.		Power System Protection and Switch Gear	T	3-0-0	3	3	ES (PC)
4.		Programme Elective – III (from Emerging Technology)	T	3-0-0	3	3	ES (PE)
5.		Open Elective	T	3-0-0	3	3	--
6.		Introduction to Standards in Electrical Engineering	T	1-0-0	1	1	ES (PC)
7.		Power Electronics	T	3-0-0	3	3	ES (PC)
8.		Industry Oriented Course – II	LIT	1-0-2	3	1	SD
9.		Self-Learning Course	T	1-0-0	0	1	--
10.		Microprocessors & Microcontrollers Laboratory	L	0-0-3	3	1.5	ES (PC)
11.		Power Electronics Laboratory	L	0-0-3	3	1.5	ES (PC)
			Total Credits		**29**	**25**	
For Honours Degree							
1.		Capstone Design Project – Level II	CDP	0-0-12	12	6	SD
OR							
1.		Honours Elective – III	T	3-0-0	3	3	

Semester – VI							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
2.		Honours Elective – IV	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – III	T	3-0-0	3	3	
2.		Minor Elective – IV	T	3-0-0	3	3	

Semester – VII							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1.		Engineering Entrepreneurship Development	T	2-0-2	4	3	HUM
2.		Climate Change and Sustainability	T	2-0-0	2	2	HUM
3.		High Voltage Engineering	T	3-0-0	3	3	ES (PC)
4.		Programme Elective – IV	T	3-0-0	3	3	ES (PE)
5.		Programme Elective – V	T	3-0-0	3	3	ES (PE)
6.		Project Management	T	2-0-0	2	2	HUM
7.		Power System Laboratory	L	0-0-4	4	2	ES (PC)
8.		Summer Internship	---	---	---	1	SD
Total Credits					**21**	**19**	
For Honours Degree							
1.		Capstone Design Project – Level III	CDP	0-0-12	12	6	SD
OR							
1.		Honours Elective – V	T	3-0-0	3	3	
2.		Honours Elective – VI	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – V	T	3-0-0	3	3	
2.		Minor Elective – VI	T	3-0-0	3	3	

Semester – VIII							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1		Project Work / Internship cum Project Work	PW / IPW	0-0-16	16	8	SD
Total Credits					**16**	**8**	
Total Credits							168

PROGRAMME ELECTIVE COURSES – STREAMS					
Power Engineering	**Power Electronic Converters and Drives**	**Embedded Systems**	**Electric Vehicle Technology**	**Advanced Control**	**Diversified Courses**
Utilization and Conservation of Electrical Energy	Special Electrical Machines	Digital Signal Processing	e-Mobility	Process modelling and Simulation	Hybrid Energy Technology
Substation Engineering and Automation	Modern Power Converters	Smart System Automation	Electric Vehicle Architecture	Computer Control of Processes	Design and Modelling of Renewable Energy Systems
Restructured Power Market	Analysis of Electrical Machines	MEMS and NEMS	Design of Motor and Power Converters for Electric Vehicles	Model based Control	Energy Management and Auditing
Smart Grid	SMPS and UPS	Embedded Communication Protocols	Battery Management Systems	Non Linear Control	VLSI Design
HVDC and FACTS	Power Electronics for Renewable Energy Systems	Embedded System Design	EV Charging infrastructure	Optimal Control	Substation Erection
Power system Transients	Control of Power Electronic systems	Embedded Processors	Safety and Testing of Electric Vehicles	Adaptive Control	Power Plant Engineering
Renewable Energy Systems		Internet of things	Connected Vehicles	Process Control	EMI and EMC
Power System Operation and Control	Electrical Drives	Signals and Systems	Drone Technologies	System Identification Techniques	Machine Learning
Grid Integration Techniques	Power Quality	-	-	Factory Automation	Energy Storage System
Condition Monitoring and Testing of Electrical Equipment	-	-	-	-	-

Semester I

MA25C01	Applied Calculus	L	T	P	C
		3	1	0	4

Course Objectives:

- To provide technical competence of modelling engineering problems using calculus.
- To apply the calculus concepts in solving engineering problems using analytical methods and computational tools.

Differential Calculus: Functions, graph of functions, New functions from old functions, Limit of a function, Continuity, Limits at infinity, Derivative as a function, Maxima and Minima of functions of single variable, Mean value theorem, Effect of derivatives on the shape of a graph.

Activities: Visualization of the functions, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).

Functions of Several Variables: Partial derivatives, Chain rule, Total derivative, Maxima and minima of functions of two variables, Method of Lagrange's Multipliers, Application problems in engineering.

Activities: Partial Derivatives with two or three variables, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).

Integral Calculus: Fundamental theorem of Calculus, Indefinite integrals and the Net Change Theorem, Improper integrals, Arc Length, Area of Region, Area of surface of revolution.

Activities: Definite and Indefinite Integrals, Determination of Area, Solving of Competitive Examination questions (Ex. GATE).

Multiple Integrals: Iterated integrals and Fubini's theorem, Evaluation of double integrals, change of order of integration, change of variables between Cartesian and polar co-ordinates, evaluation of triple integrals-change of variables between Cartesian and cylindrical and spherical co-ordinates.

Activities: Double integrals and triple integrals using open-source software, Solving of Competitive Examination questions (Ex. GATE).

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), Solving of GATE questions (20%), Internal Examinations (40%).

References:

1. Anton, H., Bivens, I. C., & Davis, S. (2021). Calculus: Early transcendentals. John Wiley & Sons.
2. Ron Larson and David C. Falvo,(2013), Calculus: an Applied Approach. Cengage Learning.

3. Stewart, J., Clegg, D., & Watson, S. (2019). *Calculus: Early transcendentals*.
4. Thomas, G. B., Jr., Weir, M. D., Hass, J., & Heil, C. (2018). *Thomas' calculus: Early transcendentals*. Pearson.
5. Singh, K. (2019). *Engineering mathematics through applications*. Bloomsbury Publishing.
6. Grewal, B. S. (2012). *Higher engineering mathematics.* Khanna Publishers.

E-resources:

1. https://math.libretexts.org/Bookshelves/Calculus/Map%3A_Calculus__Early_Transcendentals_(Stewart)/
2. https://openstax.org/books/calculus-volume-1/
3. https://tutorial.math.lamar.edu/Classes/CalcII/CalcII.aspx
4. SCILAB, https://www.scilab.org/

	Description of CO	PO	PSO
CO1	Explain the meaning of derivative, integral, and their geometric and physical interpretations.	---	---
CO2	Apply differentiation and integration techniques to compute maxima, minima, and area.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyze the behavior of single and multivariable functions using derivatives and partial derivatives.	PO2(3)	PSO1(2) PSO3(1)
CO4	Utilize modern computational software and online platforms to deepen understanding, perform complex calculations, and visualize mathematical concepts.	PO5(2) PO11(1)	PSO2(3) PSO3(1)

EE25C03	Fundamentals of Electrical and Electronics Engineering	L	T	P	C
		2	1	0	3

Course Objective:

- To impart the foundational concepts of electrical circuits and digital electronics in various applications

DC Circuits: DC Circuits: Circuit Components: Resistor, Inductor, Capacitor, Independent and Dependent Sources, Ohm's Law, Kirchhoff's Laws, Series and Parallel Circuits, Simple problems

AC Circuits: Introduction to AC Circuits (R, RL, RLC) and Parameters: Waveforms, Average value, RMS Value, Peak Value, Form Factor, Power factor.

Magnetic Circuits: Introduction to Magnetic Circuits, Types -Basic definitions, Flux Linkage, Inductance, fringing, Properties of Magnetic materials, AC excitation, Hysteresis and Eddy Current losses. Analysis of simple composite magnetic circuits-Simple Problems, Applications of Magnetic circuits

Basics of Power Systems: Introduction, Types of Distribution Systems, Generation: Hydro, Thermal, Atomic, Wind and Solar power plants (Qualitative Analysis) One-line diagram, Operating voltages in Power Systems.

Domestic Wiring: Types of Domestic wiring, Cleat, Wooden/PVC, Toughened Rubber Sheath and Conduit wiring. Specifications of Wires, Types of Cables, Earthing system, Fuses and HRC fuses, Conductor and Insulating Materials, Classification, Properties.

Analog And Digital Electronics: Operation and Characteristics of electronic devices: PN Junction Diodes, Zener Diode and BJT. Applications: Diode Bridge Rectifier and Shunt Regulator. Digital Electronics: Basics Logic Gates-Flip Flops.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Quiz (10%), Assignments (40%) and Internal Examinations (50%)

References:

1. Del Toro. (2022). *Electrical engineering fundamentals*. Pearson Education.
2. Ghosh, S. (2010). *Fundamentals of electrical and electronics engineering*.
3. Prasad, R. (2014). *Fundamentals of electrical engineering*. Prentice Hall of India.
4. Sharma, S. (2019). *Basics of electrical engineering*. Wiley.
5. Wadhwa, C. L. (2007). *Fundamentals of electrical engineering*. New Age International.
6. Mittal, V., & Mittal, A. (2017). *Basic electrical engineering*. McGraw Hill.

E-resources:https://archive.nptel.ac.in/courses/108/106/108106172/

	Description of CO	PO	PSO
CO1	Explain core electrical engineering concepts.	---	PSO1 (1) PSO3 (1)
CO2	Apply basic engineering calculations in electrical systems.	PO1(3)	PSO1 (2) PSO3 (1)
CO3	Identify common various components and its applications in various electrical circuits	PO2 (3)	PSO1 (1) PSO3 (1)

UC25H01	தமிழர் மரபு	L	T	P	C
		1	0	0	1

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

மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை: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.

நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

தமிழர்களின் திணைக் கோட்பாடுகள்: 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.

இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு, இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் , சுயமரியாதை இயக்கம் இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு, கல்வெட்டுகள், கையெழுத்துப்படிகள், தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

References:

1. தமிழக வரலாறு, மக்களும் பண்பாடும், கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ், முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி, வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை, ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

UC25H01	Heritage of Tamils	L	T	P	C
		1	0	0	1

Language and Literature: Language Families in India, Dravidian Languages, Tamil as aClassical 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.

Heritage - Rock Art Paintings to Modern Art – Sculpture: 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.

Folk and Martial Arts: Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance, Sports and Games of Tamils.

Thinai Concept of Tamils: 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.

Contribution of Tamils to Indian National Movement and Indian Culture:
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

References:

1. தமிழக வரலாறு, மக்களும் பண்பாடும், கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும், கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ், முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி, வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை, ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils, The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi, 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL), Reference Book.

EN25C01	English Essentials – I	L	T	P	C
		2	0	0	2

Course Objectives:

- Enhance learners' listening and speaking skills to understand and deliver speeches effectively
- Equip students with the skills to write clear, coherent, and grammatically correct texts for various purposes.
- Strengthen the ability to comprehend, interpret, and analyse written English across diverse contexts.

Speaking Skills: Self-Introduction (Tenses, Adjectives) Expressing opinions (Subject-Verb Agreement), Participating in Conversations (Speech Acts - agreeing & disagreeing – synonyms and antonyms**)**

Suggested Activities: Self-Introduction, Just a Minute (JAM) Video recording, Situational role plays, Spell Bee, Word Substitution, Usage of Apps.

Listening Skills: Listening to Simple Conversations (Understanding tone and intent), Short Speeches / Stories, Extracting information, Pronunciation, Listening to Various Accents.

Suggested Activities: Listening and Repeating, Gap fill exercises, Note-taking

Reading Skills: Reading Strategies – (Skimming, scanning, predicting) intensive reading - short passages and long passages on suggested themes (Sentence Patterns, Prefixes and suffixes, idioms and phrases).

Activities: Reading - newspaper and digital articles, Cloze, Reading comprehension, note making and summarising,

Writing Skills: Word Substitution, Sentence Formation, Hints Development (Guided Writing), Writing Different Types of Paragraphs - (Sentence Structure) – Letter Writing / Emails (Informal)

Activities: Error Detection, Picture and poster description, Descriptive, Narrative and Comparative paragraphs, Brainstorming and Mind Mapping - Informal letters/ Emails

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Quiz (10%), Assignments (20%), Speaking Task (10%), Reading Task (10%), Writing Task (10%), Internal Examinations (40%).

References:

1. Miller, K. Q., & Wahl, S. T. (2023). *Business and Professional Communication: KEYS for Workplace Excellence* (5th ed.). SAGE Publications.
2. Kumar, Sanjay & Pushpalatha. (2018). *English Language and Communication Skills for Engineers*. India: Oxford University Press.
3. Sharma, S., & Mishra, B. (2024). *Communication Skills for Engineers and Scientists* (2nd ed.). PHI Learning.

E-resources:

1. Cambridge English – https://www.cambridgeenglish.org/learning-english/grammar-and-vocabulary/

2. Perfect English Grammar – https://www.perfect-english-grammar.com/
3. British Council – Learn English - https://learnenglish.britishcouncil.org/grammar
4. Speechling – https://speechling.com/
5. mePro by Pearson – https://mepro.pearson.com/
6. TED Talks – https://www.ted.com/

	Description of CO	**PO**	**PSO1**
CO1	Listen and comprehend spoken English, take and draft notes.	---	---
CO2	Apply vocabulary and grammar appropriately to communicate in written and spoken forms.	PO1(3)	PSO1(2) PSO3(3)
CO3	Analyze texts in different contexts using appropriate reading strategies.	PO2(2)	PSO2(1)
CO4	Communicate thoughts and ideas in real life situations.	PO9(2)	PSO3(2)
CO5	Develop communication skills relevant to engineering and technology.	PO11(1)	PSO3(3)

PH25C01	Applied Physics – I	L	T	P	C
		2	0	2	3

Course Objective(s):

- To impart knowledge and expose the essentials of physics in various engineering applications.

Properties of Matter: Elasticity, Cantilever, Young's modulus (non-uniform bending), Girders: Bridges and buildings, Viscosity: Stokes method, Surface tension: drop weight method, Thermal expansion, Thermal stress, Bimetallic strips, Expansion joints

Practical: Non-Uniform bending, Young's modulus of the material, Torsional pendulum, Rigidity modulus of the wire and moment of inertia of the disc.

Activities: Virtual demonstration of thermal stress.

Oscillations: Simple Harmonic motion, Torsional pendulum, Couple per unit twist, Damped and Forced Oscillation

Waves: Waves on a stretched string, Energy and Power, standing waves, Ultrasonics, piezo, electric method, Acoustic grating, Electromagnetic waves: Maxwell equation, Production of EM waves by dipole antenna, Propagation of EM waves in free space , wave equation, Cell phone reception

Practical: Melde's string experiment – Frequency of an electrically vibrating metal tip.

Activities: Virtual demonstration of propagation of EM waves

Quantum Mechanics: Black body radiation, Photoelectric effect, de Broglie hypothesis, Schrodinger Wave equation, Particle in a box (infinite potential well - three-dimensional box), Barrier penetration and quantum tunnelling.

Practical: Photo-electric effect, Determination of Planck's constant.

Activities: Virtual demonstration of Scanning Transmission Electron Microscope

Applied Optics: Interference: Air wedge, Michelson's Interferometer, Fiber optics: Structure of a fiber, Fiber Optic Communication System, Fiber Sensors (Virtual demo), Displacement, pressure sensor and Temperature sensor, Einstein Co-efficient, Nd:YAG laser, CO_2 laser (construction, functioning and applications), dye laser

Practical: Ruling width of Compact disc using Laser, Thickness of a thin sheet/wire using Air wedge Method.

Activities: Demonstration of sensors and applications of Lasers

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Quiz (5%), Assignments (20%), Flipped Class (5%), Practical (30%), Internal Examinations (40%)

References:

1. Young, H. D., & Freedman, R. A. (2020). University physics with modern physics. Pearson.
2. Gaur, R. K., & Gupta, S. L. (2022). Engineering physics. Dhanpat Rai Publications.
3. Mathur, D. S. (2010). Elements of properties of matter. S. Chand Publishing.
4. Griffiths, D. J. (2018). Introduction to quantum mechanics. Cambridge University Press.
5. Silfvast, W. T. (2008). Laser fundamentals (2nd ed.). Cambridge University Press.

E-Resources:

1. Barrier penetration problem and Quantum tunnelling: https://archive.nptel.ac.in/courses/115/104/115104096/
2. EM waves and wireless channelling: https://onlinecourses.nptel.ac.in/noc24_ee31/preview
3. CO2 Laser: https://onlinecourses.nptel.ac.in/noc25_ph03/preview
4. Bimetallic Strips _ https://www.youtube.com/watch?v=WZQ8lvxdzDk
5. Cell phone Reception_ https://www.youtube.com/watch?v=1JZG9x_VOwA
6. Dipole Antenna_ https://www.youtube.com/watch?v=4xF1Fq2wB1I
7. Optical Sensors_ https://auece.digimat.in/nptel/courses/video/108106173/L02.html
8. Scanning Tunnelling Electron Microscope_ https://www.youtube.com/watch?v=XNYZYbXNWQA

	Description of CO	PO	PSO
CO1	Explain the physics concepts in various applications.	---	---
CO2	Apply the principles of wave optics and laser physics in practical systems.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyse the behaviour of materials under different conditions.	PO2(2)	PSO1(2) PSO3(1)
CO4	Conduct experiments in groups and interpret the data.	PO4(3) PO8(1)	PSO1(2) PSO2(2)

CY25C01	Applied Chemistry – I	L	T	P	C
		2	0	2	3

Course Objectives:

- To provide students with a solid understanding of the chemical principles for engineering applications.
- To introduce the chemical properties of materials and how these properties influence the selection and use of materials in engineering systems.
- To impart practical applications of chemistry in commonly used engineering devices

Water Technology: Water quality parameters and standards. Industrial feed water, Remediation. Municipal water treatment. Desalination.

Practical: Analysis of alkalinity, hardness and dissolved oxygen.

Activity: Coagulation of water sample using Alum

Nano-chemistry: Classification, Size, dependent properties. Preparation of nanomaterials, Top-down and Bottom-Up approaches, Applications (Flipped classroom).

Practical: Preparation of nanoparticles by Sol-Gel method.

Electrochemistry: Electrochemical cell, Electrode potential., Redox reaction. Conductivity of electrolytes, Factors.

Practical: Conductometric titrations

Activity: Electrochemical cell demonstration

Corrosion & Control: Chemical and electrochemical corrosions, galvanic series, factors influencing corrosion, Electrochemical protection. Organic and Inorganic coating.

Practical:

- Corrosion study by weight loss and salt spray method.
- Potentiometry/UV-visible spectrophotometer.

Activities: Case Study on Corrosion in Pipelines and Electronics, Control measures for a corroded metal

Batteries: Conventional, Contemporary and Emerging battery storage technologies, Primary & Secondary Batteries, Battery Pack, Battery Materials, Performance Parameters, Testing, Safety aspects.

Practical: Measurement of EMF, Internal Resistance, Charge and Discharge Characteristics.

Activities: Demonstration of battery pack in e-vehicles.

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Quiz (5%), Assignments (20%), Flipped Class (5%), Practical (30%), Internal Examinations (40%)

References:

1. Jain, P. C., & Jain, M. (2015). Engineering Chemistry (17th ed.). Dhanpat Rai Publishing Company (P) Ltd.
2. Dara, S. S. (2004). A Textbook of Engineering Chemistry. Chand Publications.
3. Sachdeva, M. V. (2011). Basics of Nano Chemistry. Anmol Publications Pvt Ltd.
4. Friedrich, E. (2014). Engineering Chemistry. Medtech.

E-Resources:

1. Water and Wastewater Engineering (Prof. Ligy Philip, IIT Madras) – https://nptel.ac.in/courses/105106202.
2. Electrochemical Energy Systems (Prof. S. Mitra, IIT Madras) – https://nptel.ac.in/courses/113106028.
3. Corrosion (Prof. Kallol Mondal, IIT Kanpur) – https://nptel.ac.in/courses/112104088
4. Chemistry of Battery Systems (Prof. V. R. Marathe, IIT Madras) – https://nptel.ac.in/courses/115106130
5. Resource on all battery types, testing, and safety – https://batteryuniversity.com/articles

	Description of CO	**PO**	**PSO**
CO1	Understand the importance of chemistry applications with underlying mechanisms.	---	---
CO2	Apply the chemistry concepts in widely used devices.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyse the effect of various chemical parameters on performance of engineering systems.	PO2(2)	PSO1(2) PSO2(1)
CO4	Perform experimentations as a group and interpret the results.	PO4(3) PO8(1)	PSO2(2) PSO3(2)
CO5	Communicate findings through case studies and reports	PO9(1)	PSO2(2) PSO3(3)

CS25C01	Computer Programming: C	L	T	P	C
		2	0	2	3

Course Objectives:

- To equip engineering students with the foundational knowledge and practical skills in 'C' programming to analyse and solve computational problems effectively.
- To foster problem-solving, critical thinking, and modular programming skills essential for engineering domains.

Introduction to C: Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudocode, program structure, Compilation & Execution process, Interactive and Script mode, Comments, Indentation, Error messages, Primitive data types, Constants, Variables, Reserved words, Arithmetic, Relational, Logical, Bitwise, Assignment, Conditional operators, Input/Output Functions, Built-in Functions.

Practical: Create Problem Analysis Charts, Flowcharts and Pseudocode for simple C programs (Minimum three).

Control Structures: if, if-else, nested if, switch-case, while, do-while, for, nested loops, Jump statements.

Practical: Usage of conditional logics in programs. (Minimum three)

Functions: Function Declaration, Definition and Calling, Function Parameters and Return Types, Call by Value and Call by Reference, Recursive Functions, Scope and Lifetime of Variables, Header files and Modular Programming.

Practical: Usage of functions in programs. (Minimum three)

Strings & Pointers: One-dimensional and Multi-dimensional Arrays, Array operations and traversals, String Handling: String declaration, input/output, string library functions, Pointer arithmetic, Pointers and Arrays, Pointers to function, Dynamic memory allocation.

Practical: Programs using pointers, dynamic memory, pointer arithmetic, string manipulations, array operations. (Minimum three)

Structures & Unions: Defining and using structures, Array of structures, Pointers to structures, Unions and their uses, Enumerations.

Practical: Program to use structures and unions

File Operations: Open, read, write, close file operations, Binary vs Text files, File pointers, Error handling in file operations.

Practical: Programs reading/writing data in text and binary files (Minimum three).

Standard Libraries & Header Files: Using standard libraries like stdio.h, stdlib.h, string.h, math.h, Creating and using user-defined header files and libraries.

Practical: Use of standard and user-defined libraries in solving problems. (Minimum three), Project (Minimum Two)

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Quiz (5%), Project (15%), Assignment Programs (25%), Practical (25%), Internal Examinations (30%)

References:

1. Thareja, R. (2021). Programming in C . Oxford University Press.
2. Balagurusamy, E. (2019). Programming in ANSI C. McGraw Hill Education.
3. Kanetkar, Y. (2020). Let us C. BPB Publications.
4. Kalicharan, N. (2022). Learn to program with C: An introduction to programming using the C language. Apress.
5. Forouzan, B. A., & Afyouni, H. (2023). Computer science: A structured programming approach in C. Cengage.

E-resources:

1. Learn-C.org - https://www.learn-c.org/
2. GeeksforGeeks - C Programming - https://www.geeksforgeeks.org/c-programming-language/
3. GNU C Library Documentation - https://www.gnu.org/software/libc/manual/
4. “Introduction to C Programming”, Swayam MOOC Course, https://onlinecourses.swayam2.ac.in/imb25_mg71/

CO	Description of CO	PO	PSO
CO1	Explain the potential usage of ‘C’ in engineering applications	---	---
CO2	To apply the concepts of ‘C’ in solving engineering problems and formulate new projects.	PO1 (2) PO5 (2)	PSO1(3) PSO3(1)
CO3	To interpret the data and effectively communicate in groups.	PO2 (3) PO8 (1) PO9 (1)	PSO2(3) PSO3(1)
CO4	Adapt new programming concepts and technologies in the profession.	PO11 (1)	PSO2(1), PSO3(3)

ME25C04	Makerspace	L	T	P	C
		0	0	4	2

Course Objectives:

1. To impart practical skills in the assembly, disassembly, and welding of components using appropriate tools and techniques.
2. To provide hands-on training in electrical wiring practices, and the use of electronic components, sensors, and actuators.

List of Activities

(A). Dis-assembly & Assembly Practices

i. Tools and its handling techniques.
ii. Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine.
iii. Dis-assembly and assembly of Air-Conditioners & Refrigerators.
iv. Dis-assembly and assembly of a Bicycle.

(B). Welding Practices

i. Welding Procedure, Selection & Safety Measures.
ii. Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes.
iii. Hands-on session of preparing base material & Joint groove for welding.
iv. Hands-on session of MAW, GMAW, GTAW, on Carbon Steel & Stainless Stell plates / pipes, for fabrication of a simple part.

(C). Electrical Wiring Practices

i. Electrical Installation tools, equipment & safety measures.
ii. Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box.
iii. Hands-on session of electrical connections for Lightings, Fans, Calling Bells.
iv. Hands-on session of electrical connections for Motors & Uninterruptible Power Supply.

(D). Electronics Components / Equipment Practices

i. Electronic components, equipment & safety measures.
ii. Dis-assembly and assembly of Computers.
iii. Hands-on session of Soldering Practices in a Printed Circuit Board.
iv. Hands-on session of Bridge Rectifier, Op-Amp and Transimpedance amplifier.
v. Hands-on session of integration of sensors and actuators with a Microcontroller.

vi. Demonstration of Programmable Logic Control Circuit.

(E). Contemporary Systems

i. Demonstration of Solid Modelling of components.
ii. Demonstration of Assembly Modelling of components.
iii. Fabrication of simple components / parts using 3D Printers.
iv. Demonstration of cutting of wood / metal in different complex shapes using Laser Cutting Machine.

References:

1. Stephen Christena, Learn to Weld: Beginning MIG Welding and Metal Fabrication Basics, Crestline Books, 2014.
2. H. Lipson, Fabricated - The New World of 3D Printing, Wiley, 1st edition, 2013.
3. Code of Practice for Electrical Wiring Installations (IS 732:2019)

	Description of CO	PO	PSO
CO1	Demonstrate proper use and handling of basic hand and power tools.	---	---
CO2	Carry out electrical wiring installations and repairs, applying safety measures in domestic applications.	PO1(3)	PSO2(1)
CO3	Develop solid innovative models through software.	PO5(2)	PSO2(2)
CO4	Adapt and follow safety protocols in the work environment.	PO11(2)	PSO3(2)

UC25A01	Life Skills for Engineers – I	L	T	P	C
		1	0	2	1

Course Objectives

- To equip engineering students with essential life skills encompassing personal and emotional development, effective management of time and stress, financial literacy, digital safety, and civic responsibility.
- To enhance self-awareness, interpersonal skills, and resilience to prepare students for the professional and personal challenges of engineering careers and life beyond academics**.**

Personal and Emotional Development: Self-Awareness & Personality, Emotional Intelligence & Empathy, Positive thinking, Right attitude, Stress & Anger Management, Goal-Setting & Time Management, Growth Mindset & Resilience.

Activities: Personality tests (MBTI, DISC), reflection journals, Empathy circle, role-playing difficult conversations, Guided mindfulness sessions, stress relief toolkit creation, Vision board creation, weekly time audit and planner, Group challenge scenarios, resilience journal.

Management Skills: Financial Literacy: Budgeting & Saving, Nutrition, Health, and Hygiene, Digital Literacy & Online Safety, Civic Responsibility & Ethics

Activities: Create a monthly budget, financial simulation game, Meal planning workshop, physical wellness challenge, Social media audit, privacy and safety scenarios, Community service, values debate.

Weightage: Continuous Assessment: 100%

Assessment Methodology: Assignments (20%), Flipped Class & Worksheets (10%), Practical (30%), Internal Examinations (40%)

References:

1. Khera, S. (2003). *You can win*. Macmillan.
2. Levesque, H. (n.d.). *Life skills 101: A practical guide to leaving home and living on your own*. (Publication year not specified)
3. Mitra, B. K. (2017). *Personality development & soft skills* (3rd impression). Oxford University Press.
4. ICT Academy of Kerala. (2016). *Life skills for engineers*. McGraw Hill Education (India) Private Ltd.

	Description of CO	PO	PSO1
CO1	Understand personality traits and emotional intelligence, in interpersonal interactions.	---	---
CO2	To work and execute as a team through successful implementation of set goals.	PO7 (1) PO8 (2) PO9 (2)	PSO3(2)
CO3	Develop and implement best practices in day-to-day life, in terms of planning and execution.	PO11 (3)	PSO3(2)

UC25A02	Physical Education - l	L	T	P	C
		0	0	4	1

Course Objectives:

- To impart the fundamentals of physical education for development of students' physical, mental, and social well-being.
- To instill a lifelong appreciation for physical activity towards the development of positive attitude and fostering values of team work and sportsmanship.

Introduction to physical education: Exercise for Good Posture – Conditioning and Calisthenics for Before start, Jogging, Bending, Twisting, Standing, Sitting and Relaxation, Training on First Aid Practices.

Participation of athletic events: Rules and regulations of important athletic events, Sprint, Jumps, Throws and Hurdles.

Skill development in any one of the following outdoor games: Basket Ball, Volley Ball, Ball Badminton, Football, Hockey, Kho-Kho, Kabaddi, Cricket, Hand ball and Tennis.

Skill development in any one of the following indoor games: Shuttle Badminton, Chess and Table Tennis.

Weightage: Continuous Assessment: 100%

Assessment Methodology: Attendance (60%), Quiz (10%), Participation in Sports and Games (20%) and Viva Voce (10%)

References:

1. Singh, A. (2008). Essentials of physical education. Kalyani Publishers.
2. Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co.
3. Mangal, S. K. (2009). *Psychology of sports performance*. Sports Publication.

E-resources:

https://www.who.int/health-topics/physical-activity

	CO Description	PO	PSO
CO1	Understand and explain the importance of physical activity for mental and physical health.	---	---
CO2	Apply basic principles of exercise science in the routine life.	PO1(3)	PSO1(1)
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively.	PO8(3)	PSO3(2)
CO4	Demonstrate independent learning in health, nutrition, and fitness-related topics.	PO11(2)	PSO3(2)

Semester II

MA25C03	Transforms and its Applications	L	T	P	C
		3	1	0	4

Course Objective:

- To provide a strong foundation in Fourier Series, Laplace, Fourier and Z-Transforms.
- To develop the ability to analyze and solve engineering problems in continuous and discrete time domains using appropriate transform techniques.

Laplace Transforms: Existence conditions, Properties of Laplace transform, Laplace transform of standard functions, derivatives and integrals, Unit step function and Dirac delta function, Laplace transform of periodic functions; Inverse Laplace transform: Partial fraction technique, Convolution theorem.

Application: Solution of second order ordinary differential equations using Laplace transform.

Activities: Compute the Laplace transform of time-domain functions, Inverse Laplace transform, Solution of ordinary differential equations using Laplace transform.

Z-Transform: Z-transform of standard functions, properties; Inverse Z – transform: Standard functions, Partial fraction technique, Convolution theorem.

Application: Solution of difference equation using Z – transform.

Activities: Compute the Z-transform of a discrete-time signal, Solution of linear constant-coefficient difference equations using Z-transform.

Fourier Series: Dirichlet's conditions, General Fourier series, Convergence of Fourier series, Odd and even functions; Half range sine series, Half range cosine series, Root mean square value, Parseval's identity.

Application: Solution of one-dimensional wave and heat equation.

Activities: Compute Fourier coefficients, Reconstruct signal using Fourier series (Partial sum), Plot convergence of Fourier series.

Fourier Transform: Complex Fourier transform, Properties, Relation between Fourier and Laplace transform, Fourier sine and cosine transforms, Parseval's identity, Convolution theorem.

Application: Simple applications to solve partial differential equations using Fourier transform.

Activities: Compute the Fourier and inverse Fourier transform, Parseval's theorem validation.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignment (20%), Software activity (20%), Quiz (10%), Internal Examinations (50%).

References:

1. Kreyszig, G. E. (2018). *Advanced engineering mathematics*. John Wiley & Sons Ltd.
2. Grewal, B. S. (2021). *Higher engineering mathematics*. Khanna Publications.
3. Zill, D. G. (2022). *Advanced engineering mathematics*. Jones & Bartlett India Ltd.
4. Wylie, C. R., & Barrett, L. C. (2019). *Advanced engineering mathematics*. Tata McGraw-Hill.
5. Duffy, D. G. (2017). *Advanced engineering mathematics with MATLAB*. CRC Press.

E-resources:

1. Stanford Engineering Everywhere | EE261 - The Fourier Transform and its Applications
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-003-signals-and-systems-fall-2011/
3. https://www.coursera.org/learn/mathematics-engineers-fourier-laplace-z-transforms
4. Transforms and Applications Handbook | Alexander D. Poularikas, Artyom

	Description of CO	PO	PSO1	PSO2	PSO3
CO1	Explain the concept of various transform functions in engineering applications	---			
CO2	Apply Laplace and inverse Laplace transforms for solving differential equations.	PO1(3)			
CO3	Apply Z-transform methods to solve problems and analyze the results	PO1(2) PO2 (1) PO5 (1)			
CO4	Apply Fourier series to express functions and analyze the convergence behavior of the series.	PO1 (3) PO2 (1) PO5 (1)			
CO5	Select and apply appropriate software for applying transform functions	PO1 (2) PO2 (2) PO5 (1)			

UC25H02	தமிழர்களும் தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில், பானைத் தொழில்நுட்பம், கருப்பு சிவப்பு பாண்டங்கள், பாண்டங்களில் கீறல் குறியீடுகள்.

வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: 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 வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள், மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள், பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ, சாரோசெனிக் கட்டிடக் கலை.

உற்பத்தித் தொழில் நுட்பம்: கப்பல் கட்டும் கலை, உலோகவியல், இரும்புத் தொழிற்சாலை, இரும்பை உருக்குதல், எஃகு, வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள், நாணயங்கள் அச்சடித்தல், மணி உருவாக்கும் தொழிற்சாலைகள், கல்மணிகள், கண்ணாடி மணிகள், சுடுமண் மணிகள், சங்கு மணிகள், எலும்புத்துண்டுகள், தொல்லியல் சான்றுகள், சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: அணை, ஏரி, குளங்கள், மதகு, சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம், கால்நடை பராமரிப்பு, கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள், வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள், கடல்சார் அறிவு, மீன்வளம், முத்து மற்றும் முத்துக்குளித்தல், பெருங்கடல் குறித்த பண்டைய அறிவு, அறிவுசார் சமூகம்.

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

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Quiz (20%), Assignments (30%), Internal Examinations (50%)

References

1. தமிழக வரலாறு, மக்களும் பண்பாடும், கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை, ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

UC25H02	Tamils and Technology	L	T	P	C
		1	0	0	1

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

Design and Construction Technology: 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 Nayaka rMahal, Chetti Nadu Houses, Indo, Saracenic architecture at Madras during British Period.

Manufacturing Technology: 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 Stonebeads, Glass beads, Terracotta beads, Shell beads / bone beats, Archeological evidences, Gem stone types described in Silappathikaram.

Agriculture and Irrigation Technology: Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompuof 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.

Scientific Tamil & Tamil Computing: 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.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Quiz (20%), Assignments (30%), Internal Examinations (50%)

References

1. தமிழக வரலாறு, மக்களும் பண்பாடும், கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ், முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி, வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை, ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils, The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi , 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

GE25C01	Basic Civil and Mechanical Engineering	L	T	P	C
		3	0	0	3

Course Objective:

- To impart major fundamental concept of civil & mechanical engineering & provide the insight with regard to applications.

Historical Evaluation of Engineering: History, Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering, Role for infrastructure development, Buildings, Types and Terminologies, Impact on environment.

Activities: Visit to construction sites, Energy consumption in building.

Building Materials: Types, selection criteria, Bricks and Blocks, Composition- Fly ash brick, FRP bricks, Types of Cements, Mortar, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials.

Activities: Virtual demonstration of cement manufacturing, virtual demonstration of heat infiltration to the building.

Building Components: Foundations, Types, Bearing capacity and settlement, Brick masonry, Stone Masonry, Beams, Columns, Lintels and Rain Water Harvesting, concept of Green Buildings.

Activities: Virtual demonstration of foundations, Erection of transformers.

Power Plants: Classifications, Working principle of steam, Gas, Diesel, Hydro, electric and Nuclear Power plants. Renewable energy scenario.

Activities: Virtual demonstration of Power plants.

Thermal systems: Classifications, Working of IC Engines and its applications, Turbines and Pumps. Working of HVAC systems.

Activities: Virtual demonstration of IC Engines, Turbines and Pumps, Case study on energy consumption in Refrigeration systems.

Manufacturing: Welding, Machining, Forming and Additive manufacturing.

Activities: Virtual demonstration of any machining processes.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Quiz (10%), Assignments (40%) & Internal Examinations 50%)

References:

1. Shanmugam, G., & Palanichamy, M. S. (2015). Basic Civil and Mechanical Engineering. Tata McGraw Hill.

2. Ramesh Babu, V. (2010). Basic Civil and Mechanical Engineering. Scitech Publications.
3. Venugopal, K., & Prahu Raja, V. (2006). Basic Mechanical Engineering. Anuradha Publications.
4. Rangwala, S. C. (2008). Engineering Materials. Charotar Publishing House.

	CO Description	PO	PSO1	PSO2	PSO3
CO1	Understand the scope and significance of civil and mechanical engineering in societal and industrial development.	---			
CO2	Apply basic technical knowledge in the field of civil and mechanical engineering.	PO1(3)			
CO3	Develop an appreciation for interdisciplinary roles of civil and mechanical engineers in solving real-world problems.	PO11(1)			

PH25C04	Applied Physics (EE) – II	L	T	P	C
		2	1	0	3

Course Objectives:

- To impart knowledge on physics concepts and explore the potential applications in the field of electrical engineering.

Semiconductor Materials: Intrinsic and Extrinsic Semiconductors - Carrier Concentration- Fermi level -Dependence on carrier-concentration and temperature- Carrier generation and recombination-Carrier transport: diffusion and drift- Hall Effect – Applications- Metal-semiconductor junction (Ohmic and Schottky)

Activities: Determination of Hall coefficient

Dielectrics Materials: Dielectric polarization under static fields - electronic, ionic and dipolar polarizations-internal fields in solid-Clausius-Mossotti equation - Behavior of dielectrics in alternating fields- Application of dielectrics in transformers- Capacitor materials – Ferro and piezo materials- Complex dielectric permittivity- dipolar relaxation- dielectric loss- Applications.

Activities: Measurement of Dielectric Constant of different materials

Magnetic Materials: Magnetic material parameters –Ferromagnetic materials – Ferrites - Soft and Hard magnetic materials – GMR sensors - magnetic disk memories – Principle of magnetic recording – Materials for magnetic data storage.

Activities: Determination of Hysteresis loop for a ferromagnetic material (B-H curve)

Advanced Materials: Thermocouple, bimetals, leads soldering and fuses Materials – their applications

Activities: Virtual demonstration of working of various types of thermocouples.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Quiz (10%), Assignments (30%), Flipped Class (10%), Internal Examinations (50%)

References:

1. Kasap, S. O. (2007). Principles of electronic materials and devices. McGraw-Hill Education.
2. Callister, W. D., & Rethwisch, D. G. (2014). Materials science and engineering. John Wiley & Sons.
3. Indulkar, C. S., & Thiruvengadam, S. (n.d.). An introduction to electrical engineering materials. S. Chand.

E-Resources:

1. The emergence of spin electronics in data storage -Claude Chappert, Albert Fert and Frédéric Nguyen Van Dau, Nature Publishing Group 2007

2. Hall Effect - https://ssp-amrt.vlabs.ac.in/exp/hall-effect-charge-carrier/simulation.html
3. Magnetic Susceptibility – https://em-amrt.vlabs.ac.in/exp/quinckes-method
4. NPTEL : NOC:Nanophotonics, Plasmonics, and Metamaterials.

	Description of CO	**PO**	**PSO**
CO1	Explain the concepts of physics in electrical engineering stream.	---	---
CO2	Apply appropriate techniques in physics to solve engineering problems.	PO1(3)	PSO1(3)
CO3	Analyse physical systems and interpret data from the virtual studies in the core branches in electrical engineering.	PO2(2)	PSO1(2)

ME25C01	Engineering Drawing	L	T	P	C
		2	0	4	4

Course Objectives:

- To impart knowledge on dimensions and drawing standards.
- To explore the orthographic projection of lines and solids.
- To provide the understanding of orthographic, isometric and perspective views.

Fundamentals: Drawing instruments, Drawing standards (BIS), Lettering in engineering, Sheet layout, elements of dimensioning, Systems of dimensioning. Free hand sketching of 2D & 3D objects, Conics – Ellipse, Parabola and Hyperbola.

Activities: Virtual Demonstration of Conics and Cycloids.

Orthographic Projection: First angle projection, Projection of points, straight lines and planes.

Projection of Solids: Simple Solids, Section of Solids, Development of Surfaces

Activities: Development of models of various solids and virtual demonstration of sectioning, CAD modelling of 2D objects.

Isometric Projection: Isometric Scale, Projection of Simple solids.

Activities: Conversion of 3D into 2D orthographic views, CAD modelling of 3D objects.

Perspective Projection: Simple solids projection

Activities: Virtual demonstration of perspective views.

Project: Development of 2D objects and 3D objects using CAD tools.

Weightage:
Continuous Assessment: 50%
End Semester Examinations: 50%

Assessment Methodology:
Project – 10%, Models - 5%, Assignments - 35% and Internal Examinations - 50%

References:

1. Natarajan, K. V. (2025). A Text Book of Engineering Graphics. Dhanalakshmi Publisher.
2. Venugopal, K., & Prabhu Raja, V. (2022). Engineering Drawing + AutoCAD. New Age International Publishers.

E-Resources:

1. CAD Software – https://www.freecadweb.org/
2. Engineering Drawing and Computer Graphics, Prof. Rajaram Lakkaraju (IIT Kharagpur) – https://onlinecourses.nptel.ac.in/noc22_me105/preview

3. MIT Design Handbook: Engineering Drawing and Sketching – https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/

	CO Description	PO	PSO1
CO1	Explain the advantages of engineering drawing in engineering applications	---	
CO2	Apply the concepts of projections in formulating various solid parts in engineering systems.	PO1(3)	PSO1(2)
CO3	Analyse the various view and interpret the engineering drawings.	PO2(3)	PSO1(2)
CO4	Use CAD tools for creation of various models.	PO3(1)	PSO2(2)
CO5	Critically think and develop innovative models.	PO11(1)	PSO3(1)

EN25C02	English Essentials – II	L	T	P	C
		1	0	2	2

Course Objectives:

- Enable learners to improve fluency and accuracy in spoken and written communication.
- Develop learners' ability to articulate ideas clearly and effectively in formal and informal spoken interactions.
- Help learners construct well-organised written documents relevant to academic and workplace contexts.

Oral Communication: Types (Verbal and Nonverbal), Interpersonal and group communication, Telephonic conversation.

Suggested Activities: Short presentations, Debates, Formal Speeches (Welcome, Vote of Thanks and introducing guests), Listen and respond to short podcasts.

Business Correspondence: Email Communication, Formal Letters (Types), Business Meeting.

Suggested Activities: Email and letter writing (Complaint, request, permission), Agenda, minutes of the meeting.

Academic Writing: Paraphrasing, Summarizing, Essay Writing, Instructions and Recommendations.

Suggested Activities: Essay writing (Cause and effect, argumentative, persuasive), User guides/ manuals, policy document.

Team Work: Leadership Skills (Team building, Team Leader, Team player), Negotiation and Problem solving skills

Suggested Activities: SWOT Analysis, Brainstorming and Group discussions.

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Worksheets (10%), Group Activity (20%), Report Writing (20%), Internal Examinations (50%)

References:

1. Koneru Aruna. (2020*). English Language Skills for Engineers*. McGraw Hill Education.
2. Taylor, Shirley & Chandra .V. (2010). *Communication for Business A Practical Approach*. India: Pearson Longman.
3. Ian Badger, et al., (2014). *Listening: B2 (Collins English for Life: Skills)*, Collins.
4. Raymond Murphy (2019), *Grammar in Use*, Cambridge University Press.

E-Resources:

1. Communication for Business Success - https://open.umn.edu/opentextbooks/textbooks/8
2. TED Talks – https://www.ted.com/

	Description of CO	PO	PSO
CO4	Understand the importance of communication and drafting skills in engineering and technology.	---	
CO5	Apply listening strategies to comprehend spoken English in various contexts.	PO1(3)	PSO3(2)
CO6	Participate actively in group discussions by analysing critically from different views.	PO2(2) PO8(1)	PSO3(3)
CO7	Create written reports coherently for various purposes.	PO9(2)	PSO3(2)
CO8	Adapt communication styles to global, multicultural environments.	PO11(1)	PSO2(2)

CS25C04	Data Structures and Algorithms	L	T	P	C
		3	0	2	4

Course Objective:

- To provide the fundamentals of data organization and algorithms.

Data Types: Abstract Data Types (ADTs), ADTs and classes, introduction to OOP, Classes in Python, Inheritance, Namespaces, Shallow and Deep Copying.

Practical: Implement simple ADTs as Python classes

Linear Structures: List ADT, array-based implementations, linked list implementations, singly linked lists, circularly linked lists, doubly linked lists, Stack ADT, Queue ADT, double ended queues, applications

Practical: List ADT using Python arrays, Linked list, Stack and Queue ADTs and Applications.

Tree Structures: Tree ADT, Binary Tree ADT, tree traversals, binary search trees, AVL trees, heaps, multi-way search trees

Practical: Tree representation and traversal algorithms, Binary Search Trees, Heaps.

Graph Structures: Graph ADT, representations of graph, graph traversals, DAG, topological ordering, greedy algorithms, dynamic programming, shortest paths, minimum spanning trees, introduction to complexity classes and intractability

Practical: Graph representation and Traversal algorithms, Single source shortest path algorithm, Minimum spanning tree algorithms.

Algorithm: Analysis of algorithms, Asymptotic notations, Divide & Conquer, Recursion, Recursive Algorithms

Practical: Implement recursive algorithms in Python.

Sorting and Searching

Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Analysis of sorting algorithms, Linear & Binary search, Hashing, Hash functions, Collision handling, Load factors, Rehashing, and Efficiency

Practical: Sorting and searching algorithms, Hash tables.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Quiz (10%), Assignments (30%) Review of GATE questions (20%) and Internal Examinations (50%)

References:

1. Goodrich, M. T., Tamassia, R., & Goldwasser, M. H. (2021). *Data structures & algorithms in Python* (Indian adaptation). John Wiley & Sons Inc.
2. Lee, K. D., & Hubbard, S. (2015). *Data structures and algorithms with Python. Springer*.
3. Necaise, R. D. (2011). *Data structures and algorithms using Python*. John Wiley & Sons.
4. Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2002). *Introduction to algorithms*. McGraw-Hill.
5. Weiss, M. A. (2014). *Data structures and algorithm analysis in C++.* Pearson Education.

E-Resource: https://nptel.ac.in/courses/106106133

	Description of CO	**PO**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain fundamental concepts of data structures and Algorithms.	---			
CO2	Implement the data structures in different Applications.	PO1(3)			
CO3	Evaluate and compare different searching and sorting algorithms	PO1 (3) PO2 (1)			
CO4	Demonstrate in continuous learning in interdisciplinary projects involving AI, ML, Data Science, or other technology domains.	PO11 (1)			

ME25C05	Re-Engineering for Innovation	L	T	P	C
		0	0	4	2

Course Objectives:

- To cultivate foundational skills in prototyping, and automation for development of prototypes with real-world applications.
- To provide a comprehensive, hands-on exposure to product development through reverse engineering concepts.

Bootcamp 1: Introduction to Product Development, Reverse Engineering, Overview of the product lifecycle, Hands-on disassembly of simple products, Practice of basic measurements and sketching, Introduction to CAD modeling of disassembled parts, Virtual assembly of parts.

Bootcamp 2: Embedded System Programming (Open-source platforms), Practice of interfacing sensors, reading data, automation in home, healthcare and agriculture.

Reverse Engineering: Sketch and prototype alternative designs, Group brainstorming sessions, Manufacture prototype parts using 3D printing and / or workshop tools, Assemble prototype product.

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

References:

1. Wang, W. (2010). Reverse engineering: Mechanisms, structures, systems & materials. CRC Press.
2. Margolis, M. (2020). Arduino cookbook: Recipes to begin, expand, and enhance your projects (3rd ed.). O'Reilly Media.

E-resources:

1. GrabCAD – https://grabcad.com/
2. GitHub – https://github.com/

	Description of CO	PO	PSO
CO1	Understand the product development lifecycle, including stages such as concept generation, design, prototyping, and testing.	---	
CO2	Apply reverse engineering techniques to analyze and document existing products.	PO1 (3) PO2 (2)	PSO1(2)
CO3	Collaborate in teams to fabricate prototypes using appropriate tools.	PO5 (2) PO8 (1) PO9 (1)	PSO3(3)
CO4	Engage in independent learning and continuously adapt to emerging technologies in product design	PO11(2)	PSO2(2) PSO3(2)

UC25A03	Life Skills for Engineers – II	L	T	P	C
		1	0	2	1

Course Objectives:

- To impart and cultivate analytical reasoning, innovative thinking, effective collaboration, and ethical leadership to prepare students for complex challenges in professional and personal environments.

Critical Thinking: Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity, Critical thinking Vs Creative thinking, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence.

Activities: Two-Brainstorm Method, “30 Circles” Challenge, “Desert Survival” Simulation, Lateral thinking riddles and puzzles, "What If?" Scenario Writing, Fast vs. Slow Thinking Game, Creativity Myth Busters

Problem Solving: Techniques, Six Thinking Hats, Mind Mapping, Forced Connections. Analytical Thinking, Numeric, symbolic, and graphic reasoning. Scientific temperament and Logical thinking.

Activities: Case study analysis, Escape Room challenge.

Leadership: Leadership Styles & Self-Assessment, Communication & Active Listening, Decision-Making & Responsibility, Teamwork & Delegation, Empathy, Integrity & Conflict Management, Vision, Motivation & Goal-Setting.

Activities: Crisis Leadership Simulation, Tower Challenge, Leadership Dilemmas Role-Play, Team Vision Board

Weightage: Continuous Assessment: 100%

Assessment Methodology: Assignments (20%), Flipped Class & Worksheets (10%), Practical (30%), Internal Examinations (40%)

References:

1. De Bono, E. (2017). *Six thinking hats*, Little, Brown Book Group.
2. Facione, P. A. (2015). *Critical thinking: What it is and why it counts*. Insight Assessment.
3. Kahneman, D. (2011). *Thinking, fast and slow*. Farrar, Straus and Giroux.
4. Whetten, D. A., & Cameron, K. S. (2016). *Developing management skills*. Pearson.

	Description of CO	PO	PSO
CO1	Explain the importance of leadership and management skills in life.	---	
CO2	Apply and demonstrate creative thinking techniques to generate innovative solutions.	PO7 (3)	PSO1(1) PSO2(1)
CO3	Exhibit effective collaboration and communication skills through teamwork, active listening, and conflict resolution strategies.	PO8 (2)	PSO3(3)
CO4	Integrate scientific temperament and logical reasoning into c problem solving in engineering and real-world contexts.	PO11 (2)	PSO2(1) PSO3(2)

UC25A04	Physical Education - ll	L	T	P	C
		0	0	4	1

Course Objectives:

- To impart knowledge on gymnastic exercises and pressing needs for upskilling in a particular game.

Basic gymnastics exercises: Warming up, Suitable exercise, Lead up games, Safety education, Movement education, Balanced Walk, execution, floor exercise, tumbling/acrobatics, grip, release, swinging, parallel bar exercise, horizontal bar exercise, flic-flac-walk and pyramids.

Upskilling in any one of the athletics: Broad Jump, High Jump, Triple Jump, Relay Sprints, Javelin Throw, Discuss Throw, Shot Put, Short and Long-distance Running.

Advance skills in any one of the indoor/outdoor games, which has been opted by the student in the I semester.

Weightage: Continuous Assessment: 100%

Assessment Methodology: Attendance (60%), Quiz (10%), Participation in Sports and Games (20%) and Viva Voce (10%)

References:

1. Singh, A. (2008). Essentials of physical education. Kalyani Publishers.
2. Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co.
3. Mangal, S. K. (2009). *Psychology of sports performance*. Sports Publication.
4. Kandappan, K. (2004). *Foundations of physical education*. Friends Publications.

E-resources:

https://www.who.int/health-topics/physical-activity

	CO Description	PO	PSO
CO1	Understand and explain the importance of physical activity for mental and physical health.	---	
CO2	Apply safety principles and methods during sports activities.	PO1(3)	PSO3(1)
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively.	PO8 (3)	PSO3(2)
CO4	Demonstrate the advanced technical skills and strategic understanding in the game of their interest.	PO11(1)	PSO3(2)

Foreign Language^

UC25F01	Deutsch – I	L	T	P	C
		1	0	2	1

Course Objectives:

- To impart fundamentals of the Deutsch language, including reading, writing systems, pronunciation, and speaking.

Basics & Introduction: German alphabet and pronunciation, Basic greetings and farewells, Introducing yourself and others (Ich heiße…, Wer bist du?), Numbers 1–100 and days of the week, Personal pronouns (ich, du, er, sie…), Sentence structure (SVO word order).

Activities: Alphabet spelling game, short skits, Use color-coded cards for SVO sentences.

Grammar Essentials & Everyday Vocabulary: Present tense of regular verbs (spielen, arbeiten, machen…), Common irregular verbs: sein (to be), haben (to have), gehen, kommen, Articles and gender (der, die, das; ein, eine), Simple questions and negation (nicht, kein), Describing people and things: adjectives and colors, Family, school, food, and common objects vocabulary.

Activities: Conjugate regular and irregular verbs, “Question Chain” game, Create a simple family tree.

Everyday Communication in German: Asking for and giving directions, Telling the time and talking about schedules, Ordering food and drinks at a café or restaurant, Talking about hobbies, weather, and daily routines, Listening to short conversations and responding appropriately, Introduction to German culture and formal/informal language use (du vs Sie).

Activities: Ordering food and drinks, Give directions, Formal / Informal greetings, Do’s and Don’ts.

Weightage: Continuous Assessment: 100%

Assessment Methodology: Assignments (30%), Quiz (10%) and Internal Examinations 60%

References:

1. Funk, H., Kuhn, C., & Demme, S. (2015). Menschen A1: Deutsch als Fremdsprache Kursbuch. Hueber Verlag.

	CO Description	PO	PSO
CO1	Understand simple spoken Deutsch in everyday contexts.	---	
CO2	Communicate with widely used Deutsch words effectively.	PO9 (2)	PSO3(2)
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Deutsch language.	PO11 (1)	PSO3(2)

UC25F02	Japanese – I	L	T	P	C
		1	0	2	1

Course Objectives:

- To impart fundamentals of the Japanese language, including reading, writing systems, pronunciation, and speaking.

Writing Systems & Basic Communication: Introduction to Hiragana: vowels, basic characters, reading & writing, Introduction to Katakana: basic characters and usage, Basic greetings and farewells (こんにちは, おはようございます, さようなら), Introducing yourself (名前、出身、年齢), Basic sentence structure: Subject–Object–Verb, Numbers 1–100, days of the week, classroom expressions.

Activities: Flashcard games and writing drills, Self-introduction, Numbers & date-matching, Greeting expressions, Listening to audio.

Grammar & Everyday Vocabulary: Particles: は (wa), を (wo), の (no), へ (e), に (ni), Present tense verbs: です, ます-form conjugation (たべます、のみます), Negative forms: ではありません, ません, Describing people and objects using adjectives (い and な), Question formation: なに、どこ、だれ、いつ, Vocabulary for family, food, colors, and basic actions.

Activities: Verb conjugation drills, Guessing game, Picture description, “Shopping” with food vocab and counters

Conversation & Cultural Etiquette: Talking about routines and schedules (daily verbs, time expressions), Asking and giving simple directions (〜はどこですか？), Ordering food and making polite requests (〜をください、〜をおねがいします), Expressing likes and dislikes (すき・きらい), Listening to short conversations and identifying key phrases, Introduction to formal/informal speech and Japanese etiquette.

Activities: Skits and role-plays, daily schedule, beginner-level dialogue, Group discussion on etiquette.

Activities: Practice worksheets and flashcards for hiragana, Writing drills and reading simple katakana words, Dialogue practice for greetings and self-introduction, Sentence construction exercises with basic SOV structure, Particle usage exercises and short dialogues, Role-play scheduling, shopping, and telling time, Verb conjugation drills for common verbs, Descriptive sentence exercises using adjectives, Practice Q&A dialogues forming questions and negations, Kanji writing practice and quizzes for basic characters, Vocabulary tests and conversational practice on daily topics, Oral presentations and listening comprehension quizzes.

Weightage: Continuous Assessment: 100%

Assessment Methodology: Assignments (30%), Quiz (10%) and Internal Examinations 60%

References:

1. Banno, E., Ikeda, Y., Ohno, Y., Shinagawa, C., & Tokashiki, K. (2011). Genki I: An integrated course in elementary Japanese. The Japan Times.
2. The Japan Foundation. (2017). Marugoto Japanese language and culture starter (A1) course book for communicative language activities. Goyal Publishers.

	CO Description	PO	PSO
CO1	Understand simple spoken Japanese in everyday contexts.	---	
CO2	Communicate with widely used Japanese words effectively.	PO9 (2)	PSO3(2)
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Japanese language.	PO11 (1)	PSO3(2)

UC25F03	Korean – I	L	T	P	C
		1	0	2	1

Course Objectives:

- To impart fundamentals of the Korean language, including reading, writing systems, pronunciation, and speaking.

Fundamentals of Korean: Introduction to Hangul: consonants and vowels, Basic pronunciation and syllable formation, Common greetings and self-introductions, Numbers (Sino-Korean and Native Korean basics), Basic sentence structure (Subject-Object-Verb), Simple expressions (e.g., 감사합니다, 안녕하세요).

Activities: Writing and reading Hangul practice sheets, Pronunciation drills and audio repetition, Dialogue practice for greetings and self-introduction, Counting and number exercises.

Essential Grammar and Vocabulary: Particles (은/는, 이/가, 을/를) and usage, Basic verbs and present tense conjugation, Sentence patterns: affirmative, negative, interrogative, Common adjectives and descriptive sentences, Expressing possession and location, Asking simple questions (어디, 뭐, 누구).

Activities: Verb conjugation and sentence formation drills, Role-play conversations for shopping and daily routines, Descriptive writing and speaking exercises, Question and answer practice.

Everyday Korean Communication: Polite speech levels and honorifics introduction, Talking about time, dates, and schedules, Ordering food, shopping phrases, counting objects, Simple directions and transportation vocabulary, Listening practice with short dialogues, Cultural notes on etiquette and communication.

Activities: Role-play ordering at a restaurant or buying items, Listening comprehension exercises, Giving and asking for directions practice, Group conversations and presentations.

Weightage: Continuous Assessment: 100%

Assessment Methodology: Assignments (30%), Quiz (10%) and Internal Examinations 60%

References:

1. King, R., Yeon, J., & Brown, A. (2015). Elementary Korean (2nd ed.). Tuttle Publishing.
2. Cho, Y., Lee, H., Schulz, C., Sohn, H.-M., & Sohn, S.-O. (2001). Integrated Korean: Beginning 1. University of Hawai‘i Press.

	CO Description	PO	PSO
CO1	Understand simple spoken Korean in everyday contexts.	---	
CO2	Communicate with widely used Korean words effectively.	PO9 (2)	PSO3(2)
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Korean language.	PO11 (1)	PSO3(2)

Semester III

MA25C10	Matrices for Engineers	L	T	P	C
		2	0	0	2

Course Objectives: The Objectives of the course are to enable the students to understand and apply matrix concepts such as eigenvalues, orthogonal transformations, matrix decompositions (QR and SVD), quadratic forms and least-squares solutions for solving engineering problems.

Matrices: Introduction – Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of Eigen values and Eigen vectors (without proof) – Cayley – Hamilton theorem (Statement and applications only) - Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Nature of Quadratic forms - Reduction of quadratic form to canonical form by orthogonal transformation. Matrix norms, Jordan Normal form, QR decomposition – Singular Value Decomposition (SVD) - Least squares solutions- simple problems.

Activities: Computation of eigenvalues and eigenvectors, matrix norm, QR decomposition and SVD using open-source software, Solving Competitive Examination questions.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), Solving Competitive Examination questions (20%), Internal Examinations (40%).

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, (11th ed.), John Wiley & Sons, USA,2025.
2. Alan Jeffrey, *Matrix Operations for Engineers and Scientists,* Springer Science, 2010.
3. Gilbert Strang. Linear Algebra for Everyone. 2020. Wellesley-Cambridge Press

E-resources:

1. https://ocw.mit.edu/courses/18-06sc-linear-algebra-fall-2011/
2. https://nptel.ac.in/courses/111108066

	Description of CO	PO	PSO
CO1	Understand concepts of eigenvalues, eigenvectors and matrix norms.	-	-
CO2	Apply QR decomposition and SVD to solve matrix problems arising in engineering applications.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyze quadratic forms using orthogonal transformations and use least-squares methods to obtain approximate solutions of linear systems.	PO2(3) PO5(3)	PSO2(3) PSO3(2)

	Description of CO	PO	PSO
CO1	Understand concepts of eigenvalues, eigenvectors and matrix norms.	-	-

EE25C10	Electromagnetic Theory	L	T	P	C
		3	1	0	4

Course Objectives:

1. To introduce the fundamental concepts of electric, magnetic, and electromagnetic fields
2. To develop the ability to analyze field behavior, field distributions, and electromagnetic wave propagation using basic mathematical and engineering principles.
3. To enhance problem-solving and visualization skills through graphical representation, analytical methods, and practical applications of electromagnetics.

Electrostatics I

Sources, effects and exposure limits of electromagnetic fields, Coordinate systems, Vector calculus-Gradient, Divergence and Curl, theorems and applications, Coulomb's Law – Electric field intensity – Electric Field due to discrete and continuous charges – Gauss's law and applications.

Activity:

Graphical Representation and interpretation of fields (using Mathematical Development Tool)

Computation, graphical representation and interpretation of Vector addition, subtraction, multiplication - dot product and cross product in 2-D and 3-D Gradient fields, Divergence fields & Curl fields.

Electrostatics II

Electric potential – Electric fields and equipotential plots, Uniform and Non-Uniform fields, Utilization factor – Electric field in free space, conductors, dielectric -Dielectric polarization – Dielectric strength , Electric fields in multiple dielectrics – Boundary conditions, capacitance, Energy density, Poisson's and Laplace's equations, Applications.

Activity:

Sketch equipotential lines, E-field lines, and verify boundary conditions at dielectric interfaces for parallel plate, coaxial, and point charge geometries on graph paper.

Magnetostatics

Lorentz force, magnetic field intensity (H) – Biot– Savart's Law - Ampere's Circuit Law- H due to straight conductors, circular loop, infinite sheet of current– Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, Scalar and vector potential,

	Description of CO	PO	PSO
CO1	Understand concepts of eigenvalues, eigenvectors and matrix norms.	-	-

Poisson's Equation, Magnetic force, Torque, Inductance and mutual inductance, Energy density, Applications.

Activity:
Quiz, assignment, visual demonstration, seminar, review of GATE questions

Electrodynamic Fields

Magnetic Circuits - Faraday's law – Transformer and motional EMF – Displacement current - Maxwell's equations (differential and integral form) – Time varying potential – Relation between field theory and circuit theory, Applications.

Activity:
Quiz, assignment, visual demonstration, seminar, review of GATE questions

Electromagnetic Waves

Electromagnetic Wave Generation and Wave equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossless and lossy dielectrics, conductors-skin depth, Poynting vector, Plane wave reflection and refraction – Standing Wave, Applications.

Activity:
Quiz, assignment, visual demonstration, seminar, review of GATE questions

Tasks:

T1: Perform the comparison between Electric Field and Magnetic Field .

T2: Prepare a report on biological effects and safety exposure limits of EMF..

T3: Plot equipotential surfaces for different charge configurations..

T4: Investigate applications of dielectric materials in cables and capacitors..

T5: Relate electromagnetic field theory to electrical circuit concepts.

T6: Analyze power flow using the Poynting vector.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), review of GATE questions (20%),Internal Examinations (40%).

References:

1. Mathew N. O. Sadiku, S.V. Kulkarni, 'Principles of Electromagnetics', 6th Edition, Oxford University Press, 2015, Asian Edition.
2. Bhag Singh Guru and Hüseyin R. Hiziroglu "Electromagnetic field theory fundamentals", Cambridge University Press; Second Revised Edition, 2009.

	Description of CO	PO	PSO
CO1	Understand concepts of eigenvalues, eigenvectors and matrix norms.	-	-

Ashutosh Pramanik, 'Electromagnetism – Theory and Applications', PHI Learning Private Limited, New Delhi, Second Edition-2008.

3. Joseph. A. Edminister, 'Schaum's Outline of Electromagnetics, Third Edition (Schaum's Outline Series), Tata McGraw Hill, 2010
4. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', Tata McGraw Hill, 9th Edition, 2018.
5. Kraus and Fleisch, 'Electromagnetics with Applications', McGraw Hill International Edition, Fifth Edition, 2017.
6. Karl E.Lonngren, Sava V. Savov, Randy J. Jost, 'Fundamentals of Electromagnetics with MATLAB", 2nd Edition, PHI Learning Pvt. Ltd., 2009.

E-resources:
https://nptel.ac.in/courses/111108066

CO	Description of CO	PO	PSO
CO1	Apply vector calculus tools and coordinate systems to represent and analyze basic electromagnetic field quantities.	-	-
CO2	Apply electrostatic laws to determine electric field intensity, electric potential, capacitance, and dielectric behavior in simple configurations.	PO2, PO4	PSO1(3)
CO3	Analyze magnetic fields and magnetic circuits using Biot–Savart law and Ampere's circuital law.	PO2, PO4	PSO1(3)
CO4	Interpret Maxwell's equations and explain the behavior of time-varying electromagnetic fields and induction phenomena. .	PO2, PO3, PO5	PSO2(3)
CO5	Describe electromagnetic wave propagation characteristics in free space and different media for basic engineering applications	PO2, PO4	PSO2(3)

EE25301	Digital Electronics	L	T	P	C
		3	0	0	3

Course objective:

This course aims to provide a strong foundation in the principles of digital systems and logic design. It introduces number systems, Boolean algebra, and techniques for designing combinational and sequential circuits. The course also explores memory devices and programmable logic components essential for modern digital systems.

Digital Fundamentals: Number Systems – Decimal, Binary, Octal, Hexadecimal, 1‘s and 2‘s complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Min terms and Max terms, Karnaugh map Minimization and QuineMcCluskey method of minimization.

Combinational Logic Design: Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Binary Multiplier, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder

Synchronous Sequential Circuits: Flip flops – SR, JK, T, D, Master/Slave. FF operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters: Binary, BCD, Modulo n, Up/Down counters-Counter for Random Sequence - Shift registers: - UniversalShiftRegister–SynchronouscountersRingcounter–Johnsoncounter.

Asynchronous Sequential Circuits: Analysis and Design of Asynchronous Sequential Circuits-Reduction of Flow Tables- Stable and Unstable states, state reduction, output specifications, cycles and races, race free assignments, Hazards: Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits

Memory and Programmable Logic Devices: ROM -PROM – EPROM – EEPROM –EAPROM, RAM –- Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using PLA, PAL,CPLD’s. TTL and CMOS Logic families

Hardware Description Language: Introduction to Verilog: Structure of Verilog module, Operators, data types, Styles of description- Data flow description, Implement logic gates, half adder and full adder using Verilog data flow description. Behavioral description: Structure, variable assignment statement, sequential statements, loop statements, Verilog behavioral description of Multiplexers (2:1,4:1,8:1) and De-multiplexers -Encoders (8 to 3), Decoders (2 to 4). latches-flipflops .

Tasks:

T1: Design logic circuits using SOP and POS forms.

T2: Compare canonical and standard forms of Boolean expressions.

T3: Design and test a BCD Adder...

T4: Demonstrate triggering methods of flip-flops..

T5: Design asynchronous sequential circuits from specifications.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), review of GATE questions (20%),Internal Examinations (40%).

References:

1 Mano, M. M. (2016). Digital logic and computer design (1st ed.). Pearson India.
2 Floyd, T. L. (2025). Digital fundamentals (11th ed.). Pearson Education.
3 Roth, C. H., Jr., & Kinney, L. L. (2014). Fundamentals of logic design (7th ed.). Cengage Learning.
4 Wakerly, J. F. (2021). Digital design: Principles and practices (5th ed.). Pearson Education.
5 Leach, D. P., Malvino, A. P., & Saha, G. (2017). Digital principles and applications (7th ed.). McGraw-Hill Education.

E-resources:

1. NPTEL Course: *Digital Circuits*

CO	Description of CO	PO	PSO
CO1	Explain number systems, binary codes, Boolean algebra, and logic gate operations.	-	-
CO2	Design and simplify combinational logic circuits using K-Maps and MSI devices.	PO2, PO3	PSO1(3)
CO3	Analyze and design synchronous and asynchronous sequential circuits.	PO2, PO4	PSO1(3)
CO4	Apply memory devices and programmable logic concepts for real-time digital system applications.	PO3, PO5, PO11	PSO1(3)
CO5	Design digital circuits using HDL	PO3, PO5, P011	PSO2(2)

EE25302	Electric Circuit Analysis	L	T	P	C
		3	0	0	3

Course Objective:

To Apply the basic circuit solving techniques for both AC and DC circuits. To know the applications of various network theorems, transient analysis. Resonance, two port networks and Three phase circuits

Introduction to DC And AC Circuits:

Types of sources, Review of Mesh and Nodal Analysis. Mesh and Nodal analysis with dependent sources applied to DC and AC Circuits- Super mesh and Super node analysis applied to DC and AC Circuits. Locus Diagrams.

Phasors and AC Steady State Analysis:

Concept of phasors, phasor relationships for R, L and C, Concept of impedance and admittance, sinusoidal steady state analysis using phasors, phasor diagrams.

Network Reduction Techniques:

Review of Series parallel circuits; star and delta transformation.

Network Theorems:

Superposition, Reciprocity, Compensation, Thevenin's, Norton's and Maximum Power Transfer Theorems; Analysis with dependent and independent sources-Application to DC and AC networks.

Solution of First and Second Order Networks:

Solution of first and second order differential equations for Series and Parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response. Application of Laplace transforms and inverse Laplace transforms for electrical circuits.

Resonance and Two Port Networks:

Resonant circuits-series, parallel, series-parallel circuits-effect of variation of Q on resonance. Relations between circuit parameters- Q, resonant frequency and bandwidth.

Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks

Three Phase Circuits

Three phase balanced / unbalanced circuits, phase sequence – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced loads – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

T1: Simulation of circuits with Krichoff's law validation

T2: Simulation of network theorems

T3: Simulation of circuit transients

T4: Simulation of Resonance & Three phase circuits

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Quiz (5%), Project (15%), Assignment Programs (25%), Practical (25%), Internal Examinations (30%)

References :

1. Nahvi, M., & Edminister, J. A. (2009). Electric circuits (4th ed., Schaum's Outline Series). Tata McGraw-Hill.
2. Alexander, C. K., & Sadiku, M. N. O. (2013). Fundamentals of electric circuits (5th ed.). McGraw-Hill.
3. Rahmani-Andebili, M. (2020). DC electrical circuit analysis: Practice problems, methods, and solutions (1st ed.). Springer.
4. Sudhakar, A., & Shyammohan, S. P. (2015). Circuits and Networks: Analysis and synthesis (5th ed.). Tata McGraw-Hill.
5. "Engineering Circuit Analysis" by Hayt, Kemmerle, 9th edition,2020

E-resources:

1. https://archive.nptel.ac.in/courses/108/104/108104139/

CO	Description of CO	PO	PSO
CO1	Apply basic circuit analysis techniques to solve DC and AC circuits using mesh and nodal methods.	PO1 PO2	PSO1(2)
CO2	Analyze electrical networks using network theorems and reduction techniques.	PO2 PO3	PSO1(3)
CO3	Evaluate transient and steady-state responses of first and second order circuits using differential equations and Laplace transforms.	PO2 PO4	PSO1(3)
CO4	Analyze resonance phenomena and two-port network parameters in electrical circuits.	PO2 PO3	PSO1(3)
CO5	Analyze balanced and unbalanced three-phase circuits and apply concepts to practical power systems.	PO2 PO3 PO5	PSO1(3)

EE25C05	Electronic Devices and Circuits	L	T	P	C
		3	0	0	3

Course Objective:

The course introduces students to the physical principles and operational characteristics of electronic devices such as diodes, BJTs, and FETs. Through laboratory-integrated lectures, students will apply these concepts in designing and analyzing rectifiers, amplifiers, and switching circuits. The course emphasizes problem-solving and hands-on skills needed for analog circuit implementation.

Semiconductor Physics and Diodes: Energy bands, carrier generation and recombination, drift and diffusion currents. PN junction operation, ideal and real diode characteristics. Diode Applications: Rectifiers, clippers, clampers, and voltage regulators.

Bipolar Junction Transistors (BJTS): Structure and modes of operation: Active, Cutoff, Saturation. BJT biasing techniques and stability analysis. Small signal analysis and single-stage amplifier design.

Field Effect Transistors (FETs): JFET and MOSFET structures, characteristics and parameters. FET biasing methods and analog switching applications. Common source amplifier design and multistage configurations.

Frequency Response and Power Amplifiers: Frequency response of amplifiers: low, mid, and high frequency. Decibel gain, Bode plots, gain-bandwidth trade-off.Power amplifiers: Class A, B, AB, C – operation and efficiency.

Feedback Amplifiers and Oscillators: Positive and negative feedback, feedback topologies, gain enhancement. Oscillators – Colpitts, Hartley, Crystal – design and analysis.

Task 1: Semiconductor Energy Band Analysis

- Explain:
  - Conduction band
  - Valence band
  - Forbidden energy gap
- Compare:
  - Conductors
  - Semiconductors
  - Insulators

T2 : Design and analyze:

- Half-wave rectifier
- Full-wave rectifier
- Bridge rectifier

T3: Design:

- Positive clipper
- Negative clipper

o Biased clipper o Clamper circuits and Observe waveform shaping **T4: Design Zener diode voltage regulator** **T5: Calculate stability factor for different biasing methods.** **T6 Design two-stage RC coupled amplifier** **T7: Compare Class B and Class AB Amplifiers** o Efficiency o Distortion o Power handling
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.
Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), Review of GATE questions (20%), Internal Examinations (40%).
References: 1. Salivahanan, S., & Suresh Kumar, N. (2023). Electronic devices and circuits (5th ed.). McGraw Hill Education. 2. Bell, D. A. (2008). Electronic devices and circuits (5th ed.). Oxford University Press. 3. Mehta, V. K., & Mehta, R. (2020). Principles of electronics (12th ed.). S. Chand Publishing. 4. Boylestad, R. L., & Nashelsky, L. (2012). Electronic devices and circuit theory (11th ed.). Pearson Education. 5. Donal Neamen (2006). Electronic circuits: Analysis and design (3rd ed.). Tata McGraw-Hill Education.
E-resources: https://be-iitkgp.vlabs.ac.in/ http://nptel.ac.in/courses/117103063/

CO	Description of CO	PO	PSO
CO1	Explain semiconductor physics and analyze the characteristics of diodes and their applications.	-	-
CO2	Analyze and design BJT-based circuits including biasing and single-stage amplifiers.	PO2 PO3	PSO1(3)
CO3	Analyze FET characteristics and design amplifier and switching circuits using JFET and MOSFET.	PO2 PO3	PSO1(3)
CO4	Evaluate frequency response and design power amplifiers for various applications.	PO2 PO4,	PSO1(3)
CO5	Apply feedback concepts and design oscillators and electronic circuits for practical implementations.	PO3 PO5 PO11	PSO2(3)

EE25303	Electric Circuit Laboratory	L	T	P	C
		0	0	3	1.5

Course Objective:

- To Apply the basic circuit solving techniques for both AC and DC circuits.
- To know the applications of various network theorems, transient analysis. Resonance, two port networks and Three phase circuits

List of Experiments:

1. Determination of sinusoidal current response for a series RL, RLC network in steady state for sinusoidal input voltage excitation using phasor concepts (impedances).
2. Application and experimental verification of network theorems (Thevenin's, Norton's, Superposition, Maximum Power Transfer and Reciprocity theorem).
3. Circuit Transient and steady state analysis: Determination of time constant of series RL, RC circuits. b. Determination of frequency response of RLC circuits. c. Steady state analysis of series RL, RC and RLC circuits.
4. Determination of resonant frequency and bandwidth for Series and Parallel resonant circuits.
5. Determination of impedance, admittance, transmission and hybrid parameters for two port networks.
6. Determination of power in a three phase balanced and unbalanced circuits.

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

CO	Description of CO	PO	PSO
CO1	Apply phasor concepts and analyze steady-state response of RL, RC and RLC circuits for sinusoidal excitation.	PO1 PO2 PO5	PSO1(3)
CO2	Verify network theorems and analyze transient, steady-state and frequency response characteristics of electrical circuits experimentally.	PO2 PO3 PO4 PO5	PSO1(3)
CO3	Determine resonance characteristics, two-port network parameters and power in three-phase balanced and unbalanced circuits.	PO1 PO2 PO5	PSO1(3)

EE25C06	Electronics Laboratory	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To be familiar with the structure of basic electronic devices
- To be exposed to the operation and application of electronic devices and their circuits
- To analyze circuit characteristics with signal analysis using Op-amp

List of Experiments:

1.Introduction to circuit simulation package by:

i) PN junction characteristics

ii) Transistor (CE conf) characteristics

iii) JFET characteristics.

2. Frequency response of transistor amplifier circuit.

3.Line and load regulation of Zener Diode

4. UJT – relaxation oscillator circuit

5.Wien bridge oscillator

6.Transistorized Differential amplifier

T1: Design a clipper circuit
T2: Design a clamper circuit
T3: Design of half wave rectifier circuit
T4: Design of full wave rectifier circuit
T5: Design of voltage regulator circuit

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

CO	Description of CO	PO	PSO
CO1	Conduct experiments to study the characteristics and behavior of basic electronic devices like diodes, BJTs, and JFETs.	-	-
CO2	Analyze and design transistor amplifier circuits, Zener regulator circuits, and oscillator circuits including UJT, Wien bridge, and 555 timer-based circuits.	PO2, PO3 PO5	PSO1(3)
CO3	Design and implement operational amplifier circuits such as inverting, non-inverting, differential, instrumentation amplifiers, and precision rectifier/clipper circuits.	PO2, PO3 PO5	PSO2(3)

EN25C03	English Communication Skills Laboratory– I	L	T	P	C
		0	0	2	1

Course Objectives:

The objectives of the course are to foster students' confidence and fluency in professional and social communication and to bridge the gap between academic English and industry expectations.

List of Activities

A. Elements of Effective Speaking and Listening

(i) Sharing life experience/ turning point in their life – SATORI
(ii) Situational Conversation – eg. Talking to a Senior about Internship Tips
(iii) Welcoming a Guest Speaker at a Seminar
(iv) Pictography to represent data using images or symbols
(v) B2-C1 Listening exercises include lectures, interviews, and discussions.

B. Mastering Presentations

(i) Presentation Skills – Non-verbal communication
(ii) Mini-Presentations: Topics like "My Dream Project," "Engineering in 2050,"3-minute technical pitches with logical flow
(iii) Technical Presentations with PPT

C. Group Discussion Strategies:

(i) Introduction to Group Discussions - Key skills for effective participation
(ii) Phases in a GD and Conversational Phrases in GD.
(iii) Group Discussions – Abstract and Factual topics

D. Resume & LinkedIn Optimization

(i) Building LinkedIn Profile – Drafting headlines and summaries
(ii) Social Media Optimisation
(iii) Preparing Video Resume

E. Podcast-Based Language Learning:

(i) Listening to podcast (motivational, career oriented, success stories)
(ii) Podcast Preparation – Purpose – Topic – Structure – Recording Tips - Publication of the Podcast

F. Mock Interviews and Communication Strategies:

(i) Listening – Job interview
(ii) Speaking – Mock interviews

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%.

Internal Assessment: 1. Listening (20 marks)
2. Video Resume (20 marks)
3. Creating a Podcast (30 marks)
4. Mock interview (30 marks)

End Semester Assessment: 1. Presentation with PPT (50 marks)
2. Group Discussion (50 marks)

References:

1. Floyd Kory, "Interpersonal Communication", McGraw Hill Publication, 2023.
2. Bharadwaj Apoorva, "Leadership Communication Skills for Intercultural Management: Strategies for Effective Intercultural Management

(Contemporary Themes in Business and Management)", Routledge India; 1st edition, 2024.

3. Helen Spencer-Oatey and DomnaLazidou**, "**Making Working Relationships Work: The TRIPS Toolkit for Handling Relationship Challenges and Promoting Rapport",Castledown Publishers,2023.
4. Presentations - Cambridge
5. Speaking Extra -
6. Listening Extra – Miles Craven by Cambridge University Press
7. CVs, Resumes, and LinkedIn: A Guide to Professional English – Springer International Publishing

E-resources:

1. Train your mind to perform under pressure- Simon Sinek https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-under-pressure-capture-your-flag/
2. Brilliant way one CEO rallied his team in the middle of layoffs https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-before-numbers.html
3. Will Smith's Top Ten rules for success https://www.youtube.com/watch?v=bBsT9omTeh0

	Description of CO	**PO**	**PSO1**
CO1	Communicate effectively in everyday professional situations with confidence	-	-
CO2	Deliver well-organised and effective presentations.	PO9(3)	PSO1(1) PSO3(2)
CO3	Participate in group discussions and express ideas clearly and confidently.	PO8(2) PO9(3)	PSO3(2)
CO4	Create professional video resumes and participate in interviews effectively.	PO9(2)	PSO3(3)
CO5	Create, record and publish motivational podcasts.	PO9(2) PO11(1)	PSO2(2) PSO3(3)

Semester IV

MA25C13	Probability and Statistics	L	T	P	C
		3	1	0	4

Course Objectives: The Objectives of the course are to introduce data collection methods, classification techniques, and graphical representation of data using charts and plots, to explain the fundamental concepts of descriptive statistics, probability theory, random variables, and hypothesis testing for analyzing data and to demonstrate the application of statistical techniques such as experimental design and process control using R/Python for data-driven decision-making.

Descriptive Statistics: Collection of Data-Classification-Tabulation-Graphical Representation – Simple Bar Chart – Pie Chart -Measures of Central Tendency: Arithmetic Mean, Median and Mode – Measures of Variation: Range, Quartile Deviation - Standard Deviation and Coefficient of Variation – Five Number Summary – Box Plot Technique.

Activities: Application of descriptive statistics and data presentation methods using R/ Python programming and Analysing data using Box Plots using R/ Python programming.

Probability and Random Variables: Axioms of probability - Conditional probability – Total probability – Bayes' theorem Random variable – Distribution function – properties – Probability mass function – Probability density function – Moments - Standard Distributions - Binomial, Poisson and Normal Distributions-Problems, Uniform Distribution and Exponential Distribution (Simple Problems)

Activities*:* Application of various distributions using R/ Python programming.

Two-Dimensional Random Variables: Joint distributions – Marginal and conditional distributions – Expected values of functions of two variables– Correlation and regression (for discrete data only) - Central limit theorem – Statement and Simple Problems

Activities: Applications of Correlation and Regression using R/ Python programming.

Testing of Hypothesis: Large sample tests for single mean and difference of means – Small samples tests based on t and F distributions (single mean, difference of means, paired t- test and variance ratio test) – Chi-square test for independence of attributes and goodness of fit.

Activities: Application of Student – t test, F test ,Chi –s square test using R/ Python programming.

Design of Experiments: Analysis of Variance (ANOVA) – Completely Randomized Design (CRD) – Randomized Block Design (RBD) – Latin Square Design (LSD)

Activities: Application and visualization of One-way ANOVA and Two -way ANOVA using R/ Python programming.

Weightage: Continuous Theory Assessment: 20%, Continuous Lab Assessment: 20%, End Semester Examinations: 60%

Assessment Methodology: Quiz - 10%, Assignments - 20%, Lab Manual - 15% Lab Examination - 15%, Internal Examinations - 40%

References:

1. Walpole R. E., Myers S.L. & Keying Ye, “Probability and Statistics for Engineers and Scientists”, Pearson Education Inc, 9th edition, 2024.
2. Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, “An Introduction to Statistical Learning with Applications in R”, Springer, 2021.
3. Johnson R. A., Miller & Freund’s, “Probability and Statistics for Engineers”, 9th Edition, Pearson Education, Delhi, 2020.
4. Charles Henry Brase and Corrinne Pellillo Brase, “Understandable Statistics: Concepts and Methods”, Cengage Learning, 12th Edition, 2018.
5. Richard A. Johnson and Dean W. Wichern, “Applied Multivariate Statistical Analysis”, 6th Edition, Pearson Education, Asia, 2012.
6. Anderson, T. W, “An Introduction to Multivariate Statistical Analysis”, 3rd edition, John Wiley and Sons, 2009.

E-resources:

1. NPTEL – Descriptive Statistics with R Software - https://onlinecourses.nptel.ac.in/noc22_mg87/preview
2. MIT OCW – Introduction to Probability and Statistics (18.05, Spring 2022) - https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/
3. MIT OCW – Statistics for Applications (18.650, Fall 2016) - https://ocw.mit.edu/courses/18-650-statistics-for-applications-fall-2016/
4. Control Charts – Coursera: https://www.coursera.org/learn/stability-and-capability-in-quality-improvement#modules

CO	CO Description	PO	PSO
CO1	Understand concepts of descriptive statistics, probability theory and testing of hypothesis.	-	-
CO2	Apply probability distributions and statistical methods to solve engineering problems	PO1(3)	PSO1(1)
CO3	Analyze data using correlation, regression, and probability models.	PO2(3)	PSO1(2) PSO3(1)
CO4	Utilize hypothesis testing, ANOVA for data-driven decision-making.	PO5 (3) PO11 (2)	PSO2(2)

EE25401	Transmission and Distribution	L	T	P	C
		3	0	0	3

Course objective:

This course introduces fundamental concepts and analysis of electrical power transmission and distribution systems. It covers modeling of transmission lines for AC and DC, including calculation of inductance and capacitance for various conductor configurations. Sag and tension calculations under different environmental conditions are discussed in detail. The course also examines types overhead line insulators used for different voltage levels, potential distribution, corona effects with mitigation techniques and underground cables. Overall, this course equips students with essential analytical skills for reliable power delivery.

Modeling of Transmission Lines: AC and DC transmission systems, Resistance, Inductance and Capacitance Calculations, Single phase transmission lines, two wire system and composite conductors, Three phase transmission lines with unsymmetrical spacing, transposition of conductors, double circuit line, Bundled conductors Skin effect, Proximity effect.

Performance of Transmission Lines: Short, Medium and Long transmission lines with Nominal-T, π and rigorous methods, ABCD constants, Power Circle diagram, Ferranti effect, Compensators - Series and Shunt.

Sag and Tension Calculations: Overview of mechanical design aspects, Line Supports, Types of poles and towers, Classification and selection criteria, Sag and Tension Calculations: Supports at equal heights, Supports at unequal heights, Effects of wind and ice loading on conductor weight, Use of sag templates and safety clearances.

Insulators and Concepts of Corona: Overhead line insulators, Types of Insulators, Methods of Improving String Efficiency. Corona – mitigation methods, Grounding

Underground Cables: Underground cables - Construction and types - Single core and multi core cables -Capacitance, Insulation resistance, Electric stresses and Dielectric loss – Grading of Cables, Capacitance Grading and Inter-sheath Grading.

AC Distribution Systems: Voltage Drop Calculations in AC Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

Tasks:

T1: Compare AC and DC transmission systems with advantages and disadvantages.

T2: Derive inductance equations for:

- Single-phase two-wire systems

- Composite conductors
- Three-phase lines

T3: Derive and calculate ABCD constants for different line models.
T4: Study different types of transmission line supports and towers.
T5: Study thermal behavior and current carrying capacity of cables.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), Solving of GATE questions (20%), Internal Examinations (40%).

References

1. Kothari, D. P., & Nagrath, I. J. (2019). Power system engineering (3rd ed.). McGraw-Hill Publishing Company Limited.
2. Singh, S. N. (2008). Electric power generation, transmission and distribution (2nd ed.). Prentice Hall of India. https://doi.org/978-81-203-36508
3. Wadhwa, C. L. (2010). Electrical power system (6th ed.). New Age International.
4. Hardy, J. B., & Bayliss, C. R. (2011). Transmission and distribution in electrical engineering (4th ed.). Newnes Publication.
5. Wadhwa, C. L. (2006). Generation, distribution and utilization of electrical energy (2nd ed.). New Age International Publishers.

E-resources:

NPTEL courses in Transmission & Distribution, Power Systems Engineering

CO	Description of CO	PO	PSO
CO1	Explain transmission line modeling and compute resistance, inductance and capacitance for various conductor configurations.	-	-
CO2	Analyze performance of transmission lines using different models and evaluate parameters such as voltage regulation, efficiency and ABCD constants.	PO2, PO4	PSO1(3)
CO3	Apply mechanical design concepts including sag and tension calculations, and analyze insulators and corona effects.	PO2, PO3	PSO1(3)
CO4	Evaluate underground cables and AC distribution systems for efficient and reliable power delivery.	PO2, PO3 PO5	PSO2(3)

EE25C07	Control Systems	L	T	P	C
		3	0	0	3

Course objective:

- The objective of this course is to equip students with a fundamental understanding of control systems by modelling physical systems using transfer functions and state-space methods.
- The course aims to develop analytical skills to evaluate system behavior in both time and frequency domains, assess system stability, and design appropriate controllers and compensators to meet desired performance specifications.
- Through theoretical concepts and design techniques, students will gain the ability to model, analyse, and control dynamic systems effectively.

Transfer Function Modelling of the Physical Systems: Systems - open and closed loop systems configurations - Modelling: electrical, mechanical and electro-mechanical systems - Block Diagram Reduction techniques-Signal Flow Graph.

Time Domain Analysis of the System: Standard test signals - Time response analysis of first and second order systems – Time domain specifications - Steady State Error - Generalized error series.

Stability Analysis and Root Locus: Routh Hurwitz Criteria - Root Locus: concepts and construction rules - Effect of addition of poles and Zeros – Analysis of system using Root Locus.

Frequency Domain Analysis of the System: Frequency domain analysis - specifications -Correlation between time domain and frequency domain –Open loop frequency response: Bode Plot - Polar Plot.

State Space Analysis of the System: State Space model Representation – State space from transfer function: Phase variable, Canonical variable – Block diagram representation of state space model – Solution of state equations – controllability, observability and stability analysis of the system.

Design Of Compensator and Controller: Design specifications - Compensator network and types - Design of Lag compensator, Lead Compensator and Lag-Lead Compensator using Bode plot – PID control algorithms - Ziegler-Nichols based PID controller design - Design of State Feedback controller using pole placement.

Tasks:

T1: Derive the transfer function of: RLC series circuit

T2: Model a DC motor and derive transfer function relating: Armature voltage → Angular speed

T3: Study effect of damping ratio on:

- Overshoot
- Peak time
- Settling time

T4: Determine gain range for stability using root locus.

T5: Design lead compensator using Bode plot for improved transient response**.**

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), Review of GATE questions (20%), Internal Examinations (40%).

References

1. Nise, N. S. (2020). Control systems engineering (8th ed.). John Wiley.
2. Nagrath, I. J., & Gopal, M. (2016). Control systems engineering (5th ed., Reprint). New Age International Publishers.
3. Dorf, R. C., & Bishop, R. H. (2022). Modern control systems (14th ed.). Pearson.
4. Ogata, K. (2010). Modern control engineering (5th ed.). Prentice Hall Private Limited.
5. Kuo, B. C., & Golnaraghi, F. (2017). Automatic control systems (10th ed.). McGraw Hill Education.

E-resources

1. NPTEL course: Control Engineering - Dr. Ramkrishna Pasumarthy, Professor, IITM. https://archive.nptel.ac.in/courses/108/106/108106098/
2. Virtual Lab: Control Engineering. Link: https://ce-dei.vlabs.ac.in/

CO	Description of CO	PO	PSO
CO1	Model physical systems using transfer function and block diagram representations.	-	-
CO2	Analyze system performance in time and frequency domains and evaluate stability using appropriate techniques.	PO2, PO4	PSO1 (3)
CO3	Apply root locus and frequency response methods for stability analysis and system design.	PO2, PO3	PSO1 (3)
CO4	Design controllers and compensators using classical and state-space techniques to meet desired specifications.	PO2, PO3 PO5	PSO2 (3)

EE25C08	Applied Data Science	L	T	P	C
		3	0	0	3

Course Objective: The Students will be equipped with data science competencies to analyze complex electrical systems through machine learning and statistical modelling, and foster application-based problem solving for optimizing smart grid operations, load forecasting, and renewable energy integration. This course enables to design of IoT-driven frameworks for real-time monitoring and anomaly detection in modern power networks, facilitates to develop industry-oriented skills in predictive maintenance and fault diagnosis for enhancing data-driven decision-making within digital energy ecosystems.

Foundations of Data Science

Data science lifecycle, Electrical engineering data : sensor, SCADA, IoT, Data preprocessing and visualization, Data Science Context- Prerequisites for a Data Scientist – Tools and Skills required.

***Activity –** Microsoft Visio / MATLAB Simulink

1. Smart Meter Data Cleaning
2. Transformer Temperature Monitoring

Statistical Methods in Electrical Engineering

Probability and distributions- Statistical analysis of load uncertainty and renewable energy variability in power systems. Correlation and linear regression models for prediction of electrical parameters and energy consumption, Hypothesis testing

***Activity –** Preparation of Cheat Sheet/Microsoft Visio / MATLAB Simulink

1. Fault Detection using Statistical Analysis
2. Load vs Temperature Correlation Analysis

Machine Learning Applications in Electrical Systems

Supervised and unsupervised learning techniques for power systems and smart grids, Regression methods for load and energy prediction, Classification algorithms for fault detection and system state identification, Clustering techniques for load pattern analysis and anomaly detection, and model evaluation using accuracy, precision, recall, and F1-score.

***Activity –** Quiz, Reproduction of research paper.

Signal Processing and Data Analytics

Time series analysis of electrical signals for trend and forecasting, Fourier transform and FFT for frequency and harmonic analysis, feature extraction from signals for condition monitoring, and application of signal analytics for power quality assessment and predictive maintenance.

***Activity –** Project Based Learning/Research writing

1. Power Quality Analysis to detect harmonics.
2. Predictive Maintenance to analyze motor vibration data.

Data-Driven Smart Grid and Sustainable Energy Systems

Smart grid architecture and communication, renewable energy forecasting and integration, IoT-based monitoring and real-time analytics, data-driven optimization for load management, and applications in smart grids and energy systems.

***Activity –** Project Based Learning/Research writing

1. Solar Power Prediction
2. Smart Grid Optimization

Suggested Practices: (Analogy)

1. Simulation of Smart Meter Data Cleaning- Clean and preprocess power data to analyze energy

Assessment Weightage:

IAT 1: CO1 and CO2
IAT 2: CO3 and CO4
IAT 3: CO4 and CO5

References:

1. Le Xie, Yang Weng, Ram Rajagopal (2023). Data Science and Applications for Modern Power Systems. Springer, Power Electronics and Power Systems Series. ISBN: 978-3-031-29100-5.
2. S. Vijayalakshmi, Lekha J., Lija Jacob, Savita Dahiya, R. Gunavathi (Eds.) (2025). Smart Power Systems: Grid Modernization Using AI and IoT-Based Applications. Springer, Cham. ISBN: 978-3-031-89459-6.
3. B. Vinoth Kumar, P. Sivakumar, M.M. Rajan Singaravel, K. Vijayakumar (Eds.) (2021). Intelligent Paradigms for Smart Grid and Renewable Energy Systems. Springer. ISBN: 978-981-15-9968-2.
4. Bhargav Appasani, Nicu Bizon (Eds.) (2023). Smart Grid 3.0: Computational and Communication Technologies. Springer. ISBN: 978-3-031-38506-3.

E- resources:

1. Introduction to Smart Grid - Course NPTEL SWAYAM
2. Smart Grid: Basics to Advanced Technologies - Course NPTEL SWAYAM
3. Intelligent Data Analytics for Power and Energy Systems | Springer Nature Link
4. https://www.microsoft.com/visio
5. IoT Analytics - ThingSpeak Internet of Things
6. Tinkercad

CO	Description of CO	PO	PSO
CO1	Understand data science concepts in electrical systems	-	-
CO2	Apply preprocessing and statistical analysis to electrical data	PO1-3 PO2-3 PO3-2 PO4-3 PO7-2 PO8-1 PO10-3	PSO1(3)
CO3	Analyze data using regression and hypothesis testing	PO1-3 PO2-3 PO3-2 PO4-3 PO7-2 PO8-1 PO10-2	PSO1(3)
CO4	Develop ML models for forecasting and fault detection	PO1-3 PO2-3 PO3-3 PO4-3 PO7-2 PO8-2 PO10-3	PSO2(3)
CO5	Apply signal analytics for power quality and maintenance	PO1-3 PO2-2 PO3-2 PO4-3 PO5-3 PO7-2 PO8-3 PO10-3	PSO2(3)
CO6	Design data-driven solutions for smart grids and energy systems	PO1-3 PO2-3 PO3-3 PO4-3 PO5-3 PO7-3 PO8-2 PO10-3	PSO2(3)

EE25402	DC Machines and Transformers	L	T	P	C
		3	0	0	3

Course objective:

To educate the students about the concept of electromechanical energy conversion system , construction and different types of DC generator and its characteristics. To impart knowledge on the principle of operation, starting and speed control methods of DC motor. To facilitate the students regarding the working principle of single phase Transformers and various tests involved . To make the students to understand the working of auto transformer and three phase transformers.

Electro Mechanical Energy Conversion: Principle of Energy conversion – Review of magnetic circuit–Faraday's law of induced EMF - Hysteresis and Eddy Current losses – AC operation of magnetic circuits - Singly and Doubly Excited magnetic field systems – Torque production in rotating machines

DC Generators: Principle of operation, constructional details, armature windings and its types, EMF equation, armature reaction, demagnetizing and cross magnetizing Ampere turns, compensating winding, commutation, methods of improving commutation, interpoles, OCC and load characteristics of different types of DC Generators. Parallel operation of DC Generators, equalizing connections - applications of DC Generators.

DC Motors: Principle of operation, significance of back emf, torque equations and power developed by armature, speed control of DC motors, starting methods of DC motors, load characteristics of DC motors, losses and efficiency in DC machine, condition for maximum efficiency. -applications of DC motors.

Testing of DC Machines: Brake test, Swinburne’s test, Hopkinson's test, Field test, Retardation test, Separation of core losses -

Single Phase Transformers: Construction and principle of operation, equivalent circuit, phasor diagrams, testing - polarity test, open circuit and short circuit tests, voltage regulation, losses and efficiency, all day efficiency, back-to- back test, separation of core losses, parallel operation of single-phase transformers, applications of single-phase transformer.

Auto Transformer and Three Phase Transformer: Construction and working of auto transformer, comparison with two winding transformers, applications of autotransformer. Three Phase Transformer - Construction, types of connections and their comparative features, Scott connection, applications of Scott connection.

Tasks:

T1. Analyze series and parallel magnetic circuits.

T2:Observe effect of: Flux variation, Number of turns, Frequency in Faraday’s Law of Induced EMF

T3:Explain energy conversion mechanism with examples.
T4 Compare: Lap winding & Wave winding
T5:Study the effect on terminal voltage due to armature reaction.
T6:Draw the Phasor diagram for Transformer for any one type of load.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), Review of GATE questions (20%), Internal Examinations (40%).

References:

1. Kothari, D. P., & Nagrath, I. L. (2021). Electric machines (5th ed., fully revised). Tata McGraw Hill Publishing Company Ltd.
2. Bimbhra, P. S. (2021). Electrical machinery (2nd ed.). Khanna Publishers.
3. Fitzgerald, A. E., & Kingsley, C. (2017). Electric machinery (6th ed.). McGraw Hill Education.
4. Clayton, A. E., & Hancock, N. N. (2018). Performance and design of DC machines. CBS Publishers.
5. Say, M. G. (2008). Performance and design of AC machines (1st ed.). CBS Publishers.

E-resources:

https://nptel.ac.in/courses/Electrical Machines-I

CO	Description of CO	PO	PSO
CO1	Explain principles of electromechanical energy conversion and magnetic circuits.	-	-
CO2	Analyze the performance and characteristics of DC generators under various operating conditions.	PO2, PO4	PSO1(3)
CO3	Evaluate the operation, control, and testing methods of DC motors.	PO2, PO3 PO4	PSO1(3)
CO4	Analyze single-phase, auto, and three-phase transformers including testing, performance, and applications.	PO2, PO3 PO5	PSO2 (3)

EE25C09	Linear Integrated Circuits	L	T	P	C
		3	0	0	3

Course objective:

A linear integrated circuit is a solid-state analog device capable of operating across a continuous range of input levels, offering theoretically infinite operating states. These circuits are commonly used in applications such as audio amplifiers, analog-to-digital converters, averaging amplifiers, differentiators, DC amplifiers, integrators, multivibrators, oscillators, audio filters, and sweep generators.

Introduction: Integrated circuits – Classification, Thin and thick film techniques, SMT(Surface Mount Technology) Monolithic technique - wafer preparation, Epitaxial growth, Oxidation, Photolithography, Diffusion, Ion Implantation, Isolation, Metallization and Packaging, Fabrication of Integrated resistors, capacitors and inductors -Bipolar and MOSFET devices fabrication techniques

Operational Amplifier: Basic concepts - differential amplifiers - block diagram-ideal op-amp parameters - Basic op-amp applications Scale changer, Inverting and non-inverting amplifiers, summer and subtractor, Log and antilog amplifiers - multiplier, Divider, differentiator**,** Integrator. Instrumentation amplifier

OP-Amp Circuits: V to I and I to V converters- Precision rectifier-Clipper and clamper- Sample and hold circuits - Active filters: first order and second order LPF and HPF- Band Pass and Band Reject Filters - Comparators - Regenerative comparator (Schmitt Trigger)- Square wave and Triangular wave generators- Sine wave generators: RC Phase shift and Wein bridge oscillators.

Other Linear ICS: IC voltage regulators – Fixed and Variable voltage regulators- 78XX and 79XX series regulators, LM317 voltage regulator -Switching Regulator- 555 timer IC: Astable and Monostable modes – Phase locked loop - Operation, Characteristics & Application.

D/A and A/D Converters: weighted resistor and R-2R ladder- A/D converters: Successive approximation, Counter type, Flash type and Delta-sigma-

T1: Classification of Integrated Circuits

- Compare:
  - Analog ICs
  - Digital ICs
  - Mixed signal ICs
- Explain applications of each category

T2: Thin Film and Thick Film Techniques

- Differentiate between:
  - Thin film IC fabrication
  - Thick film IC fabrication

- Compare:
    - Cost
    - Accuracy
    - Reliability

T3: Differential Amplifier Analysis

- Analyze:
    - Differential gain
    - Common mode gain
    - CMRR

T4: Inverting and Non-Inverting Amplifiers

- Design amplifier circuits using IC 741.
- Verify gain experimentally.

T5: Summer and Subtractor Circuits

- Design:
    - Summing amplifier
    - Difference amplifier
- Verify output mathematically.

T6: Integrator and Differentiator

- Build:
    - Op-amp integrator
    - Op-amp differentiator
- Observe waveform transformation.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), Solving of GATE questions (20%), Internal Examinations (40%).

References

1. Roy Choudhury, D., & Jain, S. B. (2018). Linear integrated circuits (5th ed.). Wiley Eastern Ltd.
2. Gayakwad, R. A. (2015). Op-amps and linear integrated circuits (4th ed.). Pearson Education.
3. Botkar, K. R. (2008). Integrated circuits (10th ed.). Hanna Publishers.
4. Millman, J., & Halkias, C. C. (2017). Integrated electronics (2nd ed.). McGraw Hill Education.
5. Driscoll, F. F., & Coughlin, R. F. (1997). Operational amplifiers and linear integrated circuits (4th ed.). Pearson.

E-resources

1. Nptel- Integrated Circuits and Applications - Course
2. MOOCs course link: Introduction to Electronics | Coursera

CO	Description of CO	PO	PSO
CO1	Explain the fabrication, classification, and basic concepts of integrated circuits including op-amps and linear ICs.	-	-
CO2	Analyze and design basic operational amplifier circuits such as inverting, non-inverting, summing, differential, integrator, and differentiator circuits.	PO2, PO3	PSO1(3)
CO3	Design and implement advanced op-amp applications including precision rectifiers, instrumentation amplifiers, and active filters.	PO2, PO3	PSO2 (3)
CO4	Understand and apply the working principles of D/A and A/D converters, PLL, and other linear IC applications.	PO2, PO3 PO5	PSO2 (3)

EN25C04	English Communication Skills Laboratory– II	L	T	P	C
		0	0	2	1

Course Objectives:

The objectives of the course are to build students' advanced communication skills for workplace readiness and develop intercultural competence for effective collaboration in global and virtual teams. Prepare students for competitive exams with focused skill-building and test-oriented practice.

List of Activities

Stage Ready – Impactful Public Speaking .

(i) Simulate a formal event such as an academic conference, convocation, or awards ceremony, where students roles including Master of Ceremonies (MC), Role as a dignitary, and a Commentator

(ii) Visual Prompt Storytelling: Use random images to create spontaneous stories, focusing on plot, setting, and character,

(iii) **Digital Presentation - Record** a short video explaining a project or technical concept, using slides, voiceover, and visual aids (to be uploaded using google classroom or drive link)

Professional and Application-Oriented Writing

(i) Résumé Preparation: Design ATS-friendly résumés tailored to various job descriptions, using action verbs and quantifiable impact.

(ii) Design engaging content for poster presentation relevant to their domain.

Receptive Skills in Workplace Communication·

(i) Reading articles related to their domain and discuss in groups

(ii) Visit company websites, make inferences and present in the class

(iii) Listen to recorded mock interviews and take detailed notes. Summarise key points and action items in a professional format and make a presentation.

Intercultural Communication

(i) Assertive vs Aggressive communication

(ii) Role play activities – workplace communication in intercultural/crosscultural contexts

From Campus to Career: Industry Skills and Global Exam Preparation

(i) Participate in HR interviews using AI tools or peer interviewers, responding to behavioural questions using methods like STAR (Situation, Task, Action, Result)

(ii) Practice Verbal Ability in competitive exams like UPSC, SSC, CDS, TNPSC, etc.

Weightage: Continuous Assessment: 60%, End Semester Lab Examinations: 40%.

Internal Assessment Methodology: 1. Oral story telling using visual prompts (30 marks)
2. Poster presentation (40 marks)
3. ATS resume writing (30 marks)

End Semester Assessment:

1. Interview (50 marks)
2. Verbal Ability test (50 marks)

(students must bring the resume but evaluation must be done based on the performance in the interview)

References:

1. Lucas, Stephen, and Paul Stob. The Art of Public Speaking. Thirteenth edition, McGraw- Hill Education, 2020.
2. Abrahams, Matt. Think Faster, Talk Smarter: How to Speak Successfully When You're Put on the Spot. Simon & Schuster, 2023.
3.. Beshara, Tony. Powerful Phrases for Successful Interviews, Rev. ed., McGraw-Hill, 2023.
4. Papalia, Anna. Interviewology: The New Science of Interviewing. Harper Business, 2024.
5. Verbal Ability and Reading Comprehension by Ajay Singh McGraw Hill Education 2020

E-resources:

1. Purdue OWL – Online Writing Lab (Academic and professional writing help) https://owl.purdue.edu/
2. Canva Resume Builder (Creative, ATS-friendly resume design) https://www.canva.com/resumes/
3. BBC Learning English – Pronunciation https://www.bbc.co.uk/learningenglish/english/features/pronunciation
4. India Bix website

CO	Description of CO	PO	PSO
CO1	Understand basic industry-related reading materials.	-	-
CO2	Design and present a domain specific poster	PO9(3)	PSO1(2) PSO3(3)
CO3	Deliver effective digital presentations	PO9(3)	PSO2(1)
CO4	Communicate appropriately in intercultural/cross cultural contexts	PO9(3)& PO11(1)	PSO3(3)
CO5	Perform in interviews and competitive exams successfully	PO9(3)	PSO3(1)

EE25403	DC Machines and Transformers Laboratory	L	T	P	C
		0	0	4	2

Course Objectives:

To educate the students about the concept of electromechanical energy conversion system and different types of DC generator and its characteristics. To impart knowledge on the principle of operation, starting and speed control methods of DC motor. To facilitate the students regarding the working principle of single phase Transformers and various tests involved. To make the students to understand the working of auto transformer and three phase transformers.

List Of Experiments

- Open circuit and load characteristics of a separately excited DC Generator
- Study of starters of DC motors
- Speed control of DC shunt motor
- Load test on DC shunt motor.
- Load test on DC series motor
- Load test of DC compound motor
- Swinburne's test.
- Hopkinson's Test.
- Open circuit and short circuit test on single-phase transformer.
- Separation of no-load losses in a single phase transformer.
- Sumpner's test to determine the temperature rise of transformers
- Connections of multi-phase transformers.
- Scott Connection for Phase Conversion of Transformers

T1: Modeling of electrical machines using differential equations

T2: Simulation of DC machines and transformers using differential equations.

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

CO	Description of CO	PO	PSO
CO1	Conduct and analyze tests on DC generators and DC motors, including open-circuit, load, and speed control experiments.	-	-
CO2	Evaluate the performance and efficiency of DC machines using Swinburne's and Hopkinson's tests.	PO2, PO3	PSO 1(3)

EE25404	Linear Integrated Circuits Laboratory	L	T	P	C
		0	0	4	2

Course Objectives:

- To be familiar with the structure of basic electronic devices
- To be exposed to the operation and application of electronic devices and their circuits
- To analyze circuit characteristics with signal analysis using Op-amp Ics.
- To design and construct application circuits with Ics as Op-amp, 555, etc.
- To study internal functional blocks and the applications of special ICs like Timers, DAC/ADCs

List of Experiments:

1. OPAMP based amplifier circuits:
   i) Inverting amplifier.
   ii) Non-inverting amplifier and voltage follower
   iii) Differential amplifier and Instrumentation amplifier.
2. Design of Adder-subtractor circuits.
3. Square wave oscillator/ tri-angular wave oscillator.
4. OPAMP based RC –phase shift oscillator
5. 555 – timer IC based astable multi-vibrator
6. OPAMP based precision rectifier circuit/ clipper circuits.

T1: Design and Analysis of OPAMP Amplifier Circuits

T2: Waveform Generation and Signal Conditioning using OPAMP/555 Timer

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

CO	Description of CO	PO	PSO
CO1	Conduct experiments to study the characteristics and behavior of basic electronic devices like diodes, BJTs, and JFETs.	-	-
CO2	Analyze and design transistor amplifier circuits, Zener regulator circuits, and oscillator circuits including UJT, Wien bridge, and 555 timer-based circuits.	PO2, PO3 PO5	PSO1 (3)
CO3	Design and implement operational amplifier circuits such as inverting, non-inverting, differential, instrumentation amplifiers, and precision rectifier/clipper circuits.	PO2, PO3 PO5	PSO2 (3)