ANNA UNIVERSITY, CHENNAI

UNDERGRADUATECURRICULUM(NON-AUTONOMOUS AFFILIATED INSTITUTIONS)

Programme: B.E - Electronics and Communication 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)

Semester – I							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.		Applied Calculus	T	3-1-0	4	4	BS
2.		English Essentials – I	T	2-0-0	2	2	HUM
3.		தமிழர் மரபு / Heritage of Tamils	T	1-0-0	1	1	HUM
4.		Introduction to Electronics Engineering	T	2-1-0	3	3	ES (PC)
5.		Applied Physics - I	LIT	2-0-2	4	3	BS
6.		Applied Chemistry - I	LIT	2-0-2	4	3	BS
7.		Computer Programming: C	LIT	2-0-2	4	3	ES (G)
8.		Makerspace	L	0-0-4	4	2	SD
9.		Life Skills for Engineers – I*	---	1-0-2	3	---	HUM
10.		NCC / NSS / NSO	---	---	---	---	---
			Total Credits		**29**	**21**	

*Audit Course

Semester – II							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.		Transforms and its Applications	T	3-1-0	4	4	BS
2.		தமிழர்களும் தொழில்நுட்பமும் / Tamils and Technology	T	1-0-0	1	1	HUM
3.		Applied Physics (ECE) – II	T	2-1-0	3	3	BS
4.		English Essentials – II	LIT	1-0-2	3	2	HUM
5.		Electron Devices	LIT	3-0-2	5	4	ES (PC)
6.		Data Structures and OOPS with Python	LIT	3-0-2	5	4	ES (PC)
7.		Circuits and Network Analysis	LIT	3-0-2	5	4	ES (PC)
8.		Life Skills for Engineers – II*	---	1-0-2	3	---	HUM
9.		Reverse Engineering	L	0-0-4	4	2	SD
10.		Foreign Language^	L	1-0-2	3	---	HUM
				Total Credits	**36**	**24**	

^ Deutsch / Japanese / Korean *Audit Course

Semester – III							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/ Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.		Linear Algebra	T	3-1-0	4	4	BS
2.		Signals and Systems	T	3-1-0	4	4	ES (PC)
3.		Computer Architecture and Organization	T	3-0-0	3	3	ES (PC)
4.		Electronic Circuits and Analysis	LIT	3-0-2	5	4	ES (PC)
5.		Digital System Design	LIT	3-0-2	5	4	ES (PC)
6.		Skill Development Course-I	LIT	1-0-2	3	2	SD
7.		English Communication Skills Laboratory – II	L	0-0-2	2	1	HUM
				Total Credits	**26**	**22**	

Semester–IV							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/ Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.		Probability and Random Processes	T	3-1-0	4	4	BS
2.		Electro Magnetic Fields and Transmission Lines	T	3-0-0	3	3	ES (PC)
3.		Introduction to Standards in Electronics and Communication	T	1-0-0	1	1	ES (PC)
4.		Linear Integrated Circuits	LIT	3-0-2	5	4	ES (PC)
5.		Communication Systems	LIT	3-0-2	5	4	ES (PC)
6.		Digital Signal Processing	LIT	3-0-2	5	4	ES (PC)
7.		Skill Development Course – II	LIT	1-0-2	3	2	SD
8.		English Communication Skills – III	L	0-0-2	2	1	HSM
				Total Credits	**28**	**24**	

Semester – V							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.		Control Systems	T	3-0-0	3	3	ES (PC)
2.		Programme Elective – I	T	3-0-0	3	3	ES (PE)
3.		Data Communication Networks	LIT	3-0-2	5	4	ES (PC)
4.		VLSI Design	LIT	3-0-2	5	4	ES (PC)
5.		Microprocessor and Microcontroller	LIT	3-0-2	5	4	ES (PC)
6.		Artificial Intelligence & Machine Learning	LIT	2-0-2	4	3	ES (PC)
7.		Skill Development Course – III	LIT	1-0-2	3	2	SD
8.		Industry Oriented Course - I	LIT	1-0-2	3	1	SD
				Total Credits	**31**	**24**	
For Honours Degree							
1.		Capstone Design Project – Level I	CDP	0-0-12	12	6	SD
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.		Programme Elective – II	T	3-0-0	3	3	ES (PE)
2.		Programme Elective – III	T	3-0-0	3	3	ES (PE)
3.		Open Elective	T	3-0-0	3	3	ES (OE)
4.		Antenna Design	LIT	3-0-2	5	4	ES (PC)
5.		Digital Communication	LIT	3-0-2	5	4	ES (PC)
6.		Wireless Communication	LIT	3-0-2	5	4	ES (PC)
7.		Industry Oriented Course - II	LIT	1-0-2	3	2	SD
8.		Self-Learning Course	---	---	0	1	SL
			Total Credits		**27**	**24**	
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	
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

Semester – VII							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
2.		Climatic Change and Sustainability	T	2-0-0	2	2	HUM
3.		RF and Microwave 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.		Fiber Optic Communication	LIT	3-0-2	5	4	ES (PC)
8.		Industrial IOT	LIT	3-0-2	5	4	ES (PC)
9.		Summer Internship*	---	---	---	1	SD
Total Credits					**27**	**25**	
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**	

PROGRAMME ELECTIVE COURSES – STREAMS					
Vertical I Semiconductor Chip Design and Testing	**Vertical II Computer Vision and Signal Processing**	**Vertical III RF Technologies**	**Vertical IV Bio Medical and Sensor Technologies**	**Vertical V Communication and Space Technologies**	**Vertical VI Emerging and Smart Technologies**
ASIC IC Design	Advanced Digital Signal Processing	RF Transceivers Design	Smart Sensors	Radar and Navigation Systems	Natural Language Processing
CAD for VLSI Design	Digital Image and Video Processing	Smart Antennas	Body Area Networks	Remote sensing	Block Chain Technology
Low Power IC Design	VLSI Signal Processing	Signal Integrity for High Speed Design	Medical Imaging Systems	Advanced wireless communication	Deep Learning
Mixed Signal IC Design	DSP Architecture and Programming	MICs and RF System Design	MEMS and NEMS Design	Satellite ommunication	Edge and Cloud Computing
VLSI Testing and Design for Testability	Computer Vision	RFID System Design & Testing	Automotive Electronics	MIMO and Millimeter wave communication	Cryptography Network Security
Network on Chip design	Pattern Recognition	Electromagnetic Interference and Compatibility	Brain Computer Interface and Applications	Quantum Communication	Robotics and Automation

Semester I

	Applied Calculus	L	T	P	C
		3	1	0	4

Course Objectives:

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

Differential Calculus: 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 software, Solving of GATE questions.

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.

Activities: Partial Derivatives with two or three variables, Maxima and Minima of a function using software, Solving of GATE questions.

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 GATE questions.

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 software, Solving of GATE questions.

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%).

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	PSO1	PSO2	PSO3
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)			
CO3	Analyze the behavior of single and multivariable functions using derivatives and partial derivatives.	PO2(3)			
CO4	Utilize modern computational software and online platforms to deepen understanding, perform complex calculations, and visualize mathematical concepts.	PO5(2) PO11(1)			

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

Course Objectives:

- To equip students with the skills to write clear, coherent, and grammatically correct texts for various purposes.
- To strengthen the ability to comprehend, interpret, and analyse written English across diverse contexts.

Speaking Skills: Parts of Speech, Articles, Tenses, Sentence Structure, Types of Sentences, Subject-Verb Agreement**,** Synonyms and Antonyms, Prefixes and Suffixes, Idioms and Phrases, Self-Introduction, Expressing Oneself, Everyday Conversations, Team Interactions, Emotions, agreeing & disagreeing

Activities: Self-Introduction, Just a Minute (JAM) Video recording, Brainstorming sessions, Situational role plays, Usage of Applications.

Listening Skills: Listening to Simple Conversations, Short Speeches / Stories, Extracting key information, Phonemes, Listening to Native Speakers, Listening to Various Accents.

Activities: Gap fill exercises, Understanding tone and intent, Listening and imitating, Spell Bee

Reading Skills: Reading Strategies, Skimming and Scanning, active reading with short passages.

Activities: Summarising, loud reading, Cloze reading, Reading comprehension, Reading newspaper articles, Reading Long passage and note making.

Drafting Skills: Sentence Formation, Word Substitution, Keywords Development, Writing Paragraphs, Emails and Letters.

Activities: Picture and poster interpretation, formal and informal letters, Official e-mails.

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	PSO2	PSO3
CO1	Comprehend spoken English, take and draft notes.	---			
CO2	Apply vocabulary, with appropriate ways to enhance drafting and communication.	PO1(3)			
CO3	Analyze texts in different contexts using appropriate reading strategies.	PO2(2)			
CO4	Communicate thoughts and ideas in both planned and unplanned situations.	PO9(2)			
CO5	Continuously improving English communication skills relevant to engineering and scientific work.	PO11(1)			

	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.

	Heritage of Tamils	L	T	P	C
		1	0	0	1

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

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, Leather puppetry, 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 Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & 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 Bookand Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

	Introduction to Electronics Engineering	L	T	P	C
		2	1	0	3

Course Objectives:

- To impart the fundamental concepts and evolution of electrical, electronics and communication technologies.

Evolution Electronics: Early days, Modern era and Future directions, Voltage/Current/Multi meter, Function Generator, Analog/Digital Power supplies, Wattmeter, Energy Meter, Multimeter, CT and PT, DSO - Block Diagram Approach.

Activities: Demonstration of all the electronics and electrical equipment's

Audio/ Video Systems: Microphones and Loudspeakers, Digital audio fundamentals, Basics of Television, colour television, LED, LCD, HD and Plasma TV. TV Receiver-NTSC, PAL, SECAM-DTH television – CCTV

Activities: Virtual demonstration of TV and CCTV.

Consumer Electronics: Operation of Micro-wave oven, Smart Refrigerators, Digital Electronic Lock –ATM, Digital Cameras, Home automation, Smart phone.

Activities : Practical demonstration of the various parameters in the Smartphone and Tablet, PC

Electronics/Electrical in Industries: Industry 4.0 Design, Technology & Innovation, Industrial Automation, Robotics, machine tools, Earthing, methods of earthing, protective devices-switch fuse unit, Miniature circuit breaker moulded case circuit breaker, earth leakage circuit breaker, safety precautions and First Aid.

Activities: demonstration of robotics, earthing and safety precautions.

Communication: Analog/Digital Signal Processing, Analog/ Digital Communication, Wireless/Mobile Communication-Microwave/Satellite Communication, Radar/LiDAR-UAV/Drones systems.

Activities: Demonstration of AM and Fm transmission, Demonstration of Drone systems.

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

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

References:

1. Malvino, A. (1993). Electronic principles. McGraw-Hill Book Company.
2. Boylestad, R. L., & Nashelsky, L. (2015). Electronic devices and circuit theory. Pearson Education.
3. Deo, V. R. (2012). Electronic components and applications. Ane Books Pvt. Ltd.
4. Lathi, B. P. (2007). Modern digital and analog communication systems. Oxford University Press.

5. D. P. Kothari and I. J. Nagrath - "Basic Electrical Engineering" - Tata McGraw Hill - 2010.

E- Resources:

1. Falstad Circuit Simulator - https://www.falstad.com/circuit/
2. www.semiconductors.org/main/resources
3. www. technav.ieee.org/tag/5783/electronic-noses
4. Make Electronics – Learning by Discovery by Charles Platt, 3 rd edition,2021.

	Description of CO	PO	PSO1	PSO2	PSO3
CO1	Explain core electronics engineering concepts.	---			
CO2	Apply basic engineering calculations in electronic systems.	PO1			
CO3	Identify common devices for engineering applications.	PO1			

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

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

	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.

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/

	Description of CO	PO	PSO1	PSO2	PSO3
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)			
CO3	To interpret the data and effectively communicate in groups.	PO2 (3) PO8 (1) PO9 (1)			
CO4	Adapt new programming concepts and technologies in the profession.	PO11 (1)			

	Makerspace	L	T	P	C
		0	0	4	2

Course Objectives:

- To impart practical skills in the assembly, disassembly, and welding of components using appropriate tools and techniques.
- 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 Breaker.
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)

Course Outcomes:

	Description of CO	**PO**	**PSO1**	**PSO2**	**PSO3**
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)			
CO3	Develop solid innovative models through software.	PO5 (2)			
CO4	Adapt and follow safety protocols in the work environment.	PO11 (2)			

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

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	PSO2	PSO3
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)			
CO3	Develop and implement best practices in day-to-day life, in terms of planning and execution.	PO11 (3)			