KUMARAGURU COLLEGE OF TECHNOLOGY

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641049

B.E. - ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATIONS 2024

CURRICULUM AND SYLLABUS

I to III Semesters

Department of Electronics and Communication Engineering

VISION

To be a centre of excellence in education and research by offering an internationally accredited curriculum, state-of-the-art infrastructure, and advanced laboratories that empower students to excel in globally competitive academic and industrial environments.

MISSION

The Department is committed to:

- Inspiring students to cultivate professional ethics, self-confidence, and leadership qualities.
- Enabling students to acquire knowledge and skills through innovative practices to address evolving global challenges and societal needs.
- Pursuing excellence in academics, core engineering domains, and research activities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Programme Educational Objectives of Electronics and Communication Engineering Undergraduate Programme are:

PEO1: Graduates will be successful as Professionals, Researchers or Entrepreneurs in Electronics, Information and Communication Engineering disciplines.
PEO2: Graduates will continuously be updated with state-of the art technology through formal and informal education to provide sustainable solutions.
PEO3: Graduates will demonstrate ethical and social responsibilities as an individual and in a team of diverse cultures.

PROGRAMME OUTCOMES (POs)

PO1: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO4: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO5: Create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

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PO6: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO7: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
PO10: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11: Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Graduates of the Electronics and Communication Engineering Programme will have the ability to:

PSO1: Apply principles of signal processing and communication systems to design, develop, and optimize modern communication networks by addressing complex challenges using contemporary tools and technologies.

PSO2: Design, implement, and validate VLSI circuits and embedded systems by leveraging domain knowledge to develop efficient and innovative solutions for diverse engineering applications.

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KUMARAGURU COLLEGE OF TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATION 2024

B.E. Electronics and Communication Engineering – Curriculum

(For students admitted from 2024-25 onwards)

Semester I

S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HST101	Heritage of Tamils	Theory	HS	1	0	0	0	1
2	24MAI113	Linear Algebra and Multivariant Calculus	Embedded	BS	3	0	2	0	4
3	24CYI101	Electronic Materials Chemistry	Embedded	BS	3	0	2	0	4
4	24CSI101	Logical Thinking and Problem Solving	Embedded	ES	3	0	2	0	4
5	24ECT101	Network Theory	Theory	ES	3	1	0	0	4
6	24INP102	Innovation Practicum - 1	Practical	ES	0	0	2	0	1
7	24HSP111	Holistic Wellness - 1	Practical	HS	0	0	2	0	1
8	24INP101	Design Thinking	Practical	HS	0	0	2	0	1
9	24ADP001	Basics of AI	Practical	ES	0	0	2	0	1
10	24INO101	FCLF General Stack - 1	Practical	OE	0	0	2	0	1
								Total Credits	**22**
								Total Contact Hours/week	**30**

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Semester II									
S.No	**Course code**	**Course Title**	**Course Mode**	**Course Type**	**L**	**T**	**P**	**J**	**C**
1	24HST102	Tamils and Technology	Theory	HS	1	0	0	0	1
2	24HST103	Effective Communication	Theory	HS	2	0	0	0	2
3	24MAI123	Computational Differential Equations	Embedded	BS	3	0	2	0	4
4	24PHI102	Applied Physics for Circuit Engineering	Embedded	BS	3	0	2	0	4
5	24MEI103	Computer Aided Engineering Graphics	Embedded	ES	2	0	2	0	3
6	24EET106	Electrical Machines and Drives	Theory	ES	3	0	0	0	3
7	24ECI102	Electron Devices and Circuits	Embedded	PC	3	0	2	0	4
8	24INP103	Innovation Practicum - 2	Practical	ES	0	0	2	0	1
9	24HSP112	Holistic Wellness - 2	Practical	HS	0	0	2	0	1
10	24INO102	FCLF General Stack - 2	Practical	OE	0	0	2	0	1
Total Credits									**24**
Total Contact Hours/week									**31**

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Semester III									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24HSP005	Mastering Conversations	Practical	HS	0	0	2	0	1
2	24INM201	Universal Human Values II: Understanding Harmony	Theory	HS	1	0	0	0	1
3	24INP201	Innovation Practicum - 3	Practical	ES	0	0	2	0	1
4	24INM102	Indian Knowledge Systems in Science and Engineering	Theory	HS	1	0	0	0	1
5	24INO__	FCLF General Stack - 3	Practical	OE	0	0	2	0	1
6	24ECT201	Electromagnetic Waves and Waveguides	Theory	PC	3	0	0	0	3
7	24ECT202	Signals and Systems	Theory	ES	3	1	0	0	4
8	24ECI203	Linear Integrated Circuits	Embedded	PC	3	0	2	0	4
9	24EEI203	Digital System Design	Embedded	PC	3	0	2	0	4
10	24ECJ204	Internship - I	Internship	PRJ	0	0	0	0	1
Total Credits									**21**
Total Contact Hours/week									**25**

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SEMESTER I

24HST101	தமிழர் மரபு / HERITAGE OF TAMILS (Common to all Departments)	L	T	P	J	C
		1	0	0	0	1
HS		SDG	4, 11, 16			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	தமிழ் மொழி மற்றும் இலக்கியத்தின் அடிப்படை அம்சங்களை அறிமுகப்படுத்துதல், அதன் தொன்மைக்காலம் முதல் நவீனகாலம் வரையிலான வளர்ச்சியை விளக்கம் செய்யுதல். Introduce students to the foundational aspects of Tamil language and literature, tracing its evolution from ancient to modern times.
2	தமிழகத்தின் செழுமையான கலாச்சார பாரம்பரியத்தை அறிமுகப்படுத்துதல், பாறை ஓவியக் கலையிலிருந்து நவீன சிற்ப கலையின்படி அதன் கலை வெளிப்பாடுகளை ஆராய்தல். Familiarize students with the rich cultural heritage of Tamil Nadu, exploring its artistic expressions from rock art paintings to contemporary sculptures.
3	தமிழகத்தின் நாட்டுப்புறக் கலைகள் மற்றும் வீரவிளையாட்டுகளை அறிதல்- தினணக்கோட்பாடுகளை ஆராய்தல்- இந்திய தேசிய இயக்கத்தில் தமிழர்களின் பங்கினை அறிதல். To know the folk arts and heroic ames of Tamilnadu-explore the concept of thinai -to know the role of Tamils in Indian National movement.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	தமிழ் மொழி மற்றும் இலக்கியத்தின் அடிப்படை அறிவை மேம்படுத்துதல். மொழி பண்பாட்டில் எவ்வாறு இணைந்துள்ளது என்பதை உணர்தல். Enhance the fundamental knowledge of Tamil language and literature	U
CO2	பழங்கால பாறை ஓவியங்கள், சிற்பம் என கலைகள் நவீன காலம்வரை எவ்வாறு பயணிக்கிறது என்பதை புரிந்துகொள்ளுதல். Understand the heritage, rock art paintings to modern art sculpture	U
CO3	நாட்டுப்புறக் கலைகள் தற்காப்புக் கலைகளாகவும், உடல் ஆரோக்கியத்தை மேம்படுத்தும் விதமாகவும் அமைவதை அறிந்து கலைகள் மீதான ஆர்வத்தை அதிகரிக்கச் செய்தல்- தமிழர்களின் அகத்திணை, புறத்திணை கோட்பாட்டினை புரிந்து கொள்ளுதல். இந்திய பண்பாட்டில் தமிழர்களின் பங்களிப்பை அறிதல். Acquire essential knowledge in the folk and martial arts-understanding the Agam and puram concept- to know the contribution of Tamils in Indian culture.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1							3	2	2		2			

2							3	3	2		2			
3							3	2	2		2			

Course Content	
மொழி மற்றும் இலக்கியம் இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தொடக்கம் -பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு. **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.	**3 Hours**
மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புற தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு. **HERITAGE – ROCK ART PAINTINGS TO MODERN ART SCULPTURES** 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.	**3 Hours**
நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள். **FOLK AND MARTIAL ARTS** Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Ciabatta, Valari, Tiger dance - Sports and Games of Tami	**3 Hours**
தமிழர்களின் திணைக்கோட்பாடுகள் தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பொடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறைமுகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் தமிழர்களின் வெற்றி. **THINAI CONCEPTS OF TAMIL** 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.	**3 Hours**
இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு. **CONTRIBUTIONS OF TAMIL TO INDIAN NATIONAL MOMENT 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.	**3 Hours**

Theory Hours:	**15**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**15**

Learning Resources

Reference books:

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - 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 of Archaeology & Tamil Nadu Textbook 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)

Online Educational Resources:

1. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e
2. https://www.youtube.com/watch?v=j6_ddjn_gLc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e&index=2
3. https://docs.google.com/presentation/d/1pf0jbyuDTNdvlcKMnOfoPjbqha7JqdOc/edit#slide=id.p1
4. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e&index=1

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE), Assignments, Quiz, Library Record

Course Curated by

Expert from Industry	Expert(s) from Higher Education Institutions	Internal Expert

Mr.Vijayan Ramanathan , Project manager, Toppan Merrill. Technologies, Coimbatore	Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben, CIT, Coimbatore	Suriya Prakash Department of Language	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24MAI113	LINEAR ALGEBRA AND MULTIVARIATE CALCULUS (Common to EC, EE, EI)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	provide a solid foundation in linear algebra, focusing on eigenvalues, eigenvectors, matrix transformations, and quadratic forms for practical applications.
2	develop skills in multivariate calculus for solving optimization problems and computing derivatives, integrals, and volumes using double and triple integrals.
3	teach key concepts in vector calculus, including operations like gradient, divergence, curl, and the application of Green's, Gauss's, and Stokes' theorems.
4	introduce fundamental principles of complex analysis, covering analytic functions, Cauchy's theorems, and residue calculus for evaluating integrals through contour integration.
5	equip students with MATLAB proficiency to perform matrix operations, solve optimization problems, compute integrals and verify complex mathematical theorems.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	apply the concepts of eigenvalues, eigenvectors, and the Cayley-Hamilton theorem to diagonalize matrices and perform orthogonal transformations of symmetric matrices using matrix operations and eigenvalue computations.	Ap
CO2	apply orthogonal transformations to reduce quadratic forms to their canonical forms and solve related matrix problems, leveraging to compute transformations and quadratic forms.	Ap
CO3	analyze and solve unconstrained and constrained optimization problems using the Lagrange multiplier method and determine the maxima and minima of functions with two or more variables relevant to engineering applications.	An
CO4	apply double and triple integrals in Cartesian coordinates by computing and using them to determine areas and volumes in engineering applications, including changing the order of integration.	Ap
CO5	apply vector calculus operations like gradient, divergence, curl, and directional derivatives to verify Green's theorem, Gauss's divergence theorem, and Stokes' theorem used for computational verification.	Ap
CO6	apply Cauchy-Riemann equations, Cauchy's integral theorem, and Cauchy's integral formula to solve complex analysis problems and evaluate integrals using the residue theorem for performing contour integration.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2			2									
2		3	2		2									

3	2				2		1							
4	3			2	2									
5		2			2			2						
6					2									

Course Content:

MATRICES Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley Hamilton theorem (excluding proof) - Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation. **Practical Component** Introduction to MATLAB - Matrix Operations - Addition, Multiplication, Transpose, Inverse and eigenvalues and eigenvectors of higher order matrices. Characteristic equation of a Matrix and Cayley-Hamilton Theorem.	**9 Hours** **6 Hours**
FUNCTIONS OF SEVERAL VARIABLES Total derivative – Taylor's series expansion – Maxima and minima of functions of two variables – Constrained maxima and minima: Lagrange's multiplier method with single constraints – Jacobians. **Practical Component** Determining Maxima and Minima of a function of one variable. Determining Maxima and Minima of a function of two variables	**9 Hours** **6 Hours**
MULTIPLE INTEGRALS Double integration in Cartesian coordinates – Change of order of integration - Triple integration in Cartesian coordinates – Applications: Area as double integral and Volume as triple integral. **Practical Component** Double Integral and Area as double integral Triple Integral and Volume as triple integral	**9 Hours** **6 Hours**
VECTOR CALCULUS Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields - Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) – Verification of theorem and simple applications. **Practical Component** Evaluating gradient, divergence and curl. Verifying Green's theorem in the plane	**9 Hours** **6 Hours**
ANALYTIC FUNCTIONS Functions of a complex variable – Analytic functions – Necessary and sufficient conditions in Cartesian coordinates, Cauchy- Riemann equations (excluding proofs). **Practical Component** Check analyticity using Cauchy-Riemann equations	**4 Hours** **3 Hours**
COMPLEX INTEGRATION Cauchy's integral theorem – Cauchy's integral formula –Singularities –Residues – Residue theorem –Application of residue theorem for evaluation of real integrals – Contour Integration (excluding poles on the real axis). **Practical Component** Perform contour integration around a circular contour	**5 Hours** **3 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 30	Total Hours: 75

Learning Resources

Textbooks

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45thEdition, 2020.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2018.
3. Kreyszig E., "Advanced Engineering Mathematics" International students' version, 10th Edition, John Wiley and sons, 2023.

Reference books

1. Veerarajan T., "Engineering Mathematics (for First Year)", Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2008.
2. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics", S. Chand & Co., New Delhi, (Reprint) 2014.
3. Venkataraman M.K., "Engineering Mathematics", The National Publising Co., Chennai, 2003.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.

Online Resources (Web Links)

1. Linear Algebra by MIT Open Courseware (Free) https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/
2. Multivariable Calculus by MIT Open Courseware (Free) https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/
3. Khan Academy: Multivariable Calculus (Free) https://www.khanacademy.org/math/multivariable-calculus
4. Coursera: Introduction to MATLAB Programming by Vanderbilt University https://www.coursera.org/learn/matlab

Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore. Mr.Jayakumar Venkatesan, Valles Marineris International Private Limited- Chennai. Mr. Imran Khan, GE Transportation Company, Bangalore.	Dr.T.Govindan, Government College of Engineering, Srirangam, Trichy. Dr.C.Porkodi, PSG College of Technology, Coimbatore. Dr.P.Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore.	Dr. K.Maheswari Dr. J.Rajasingh Dr. K.Meena, Department of Mathematics

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24CYI101	ELECTRONIC MATERIALS CHEMISTRY (Common to EC, EE, EI and MR)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	acquire knowledge of advanced electrochemical energy systems, organic materials, insulating, and high-resistivity materials in electronics to understand their role in modern electronic applications.
2	develop skills to synthesize, analyze, and characterize various electronic materials such as conducting polymers, nanomaterials, and green electronic materials through theoretical and practical approaches.
3	gain competency in evaluating the environmental impact of electronic materials and promote sustainable practices, including green chemistry principles, recycling, and e-waste management.
4	apply advanced concepts of electronic materials to solve real-world engineering problems in the field of energy storage, flexible electronics, and nanoelectronics.
5	enhance analytical and problem-solving abilities through hands-on laboratory experiments, bridging theoretical concepts with practical applications in the electronic materials domain.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	apply electrochemical principles to solve challenges in advanced battery and hybrid energy systems.	Ap
CO2	analyse the properties and synthesis of conducting polymers to compare their applications in flexible electronics and OLEDs.	An
CO3	analyse the applications in electronic components by integrating the properties of insulating and high-resistivity materials.	An
CO4	apply the concepts of nanomaterials to demonstrate their significance in nanoelectronics and electronic sensing technologies.	Ap
CO5	analyse the environmental impact of electronic materials to prioritize the adoption of green chemistry and sustainable electronic practices.	An
CO6	evaluate and recommend innovative eco-friendly electronic materials and recycling strategies to address future environmental challenges.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2												
2	2		2								2			
3	2	2		2										

4			2		2									
5						3	2							
6		1	1				1				1			

Course Content

ADVANCED ELECTROCHEMICAL ENERGY SYSTEMS Introduction to electrochemistry for energy systems - Advanced battery technologies (Li-ion batteries, Sodium-ion batteries, Al – air Battery, Zn - air batteries) - Comparison of battery technologies and its challenges. Hybrid energy storage systems: Super-capacitors: Electric double-layer capacitors (EDLCs) - Pseudo capacitors - Hybrid supercapacitors Fuel cells: Principles and recent advancements of Proton exchange membrane fuel cells (PEMFCs) - Solid oxide fuel cells (SOFCs) - Microbial fuel cells - Regenerative fuel cells. **Practical Component:** • Compare the Conductivity of different electrolytes in battery systems. • Determination of electrical conductivity in electroplated metal coating on substrate. • Determination of electrode potentials of the cell and construct feasible cell. • Estimation of mixture of acids using strong base by Conductometric titrations.	**9 Hours** **12 Hours**
ORGANIC MATERIALS FOR ELECTRONIC APPLICATIONS Introduction to polymers - Classification - Functionality - Degree of Polymerization. Polymerization: Addition polymerization and its Mechanism (Free Radical, Cationic, and Anionic) - Condensation polymerization – Copolymerization Conducting materials: Small molecule conductors (Pentacenes and their derivatives) - Engineered Pentacenes and Reversible functionalization - Synthesis and doping of conducting polymers (Polyacetylene and Polythiophene) - Applications of conducting materials in devices (Organic light-emitting diodes (OLEDs), Organic photovoltaics, Flexible and printed electronics) **Practical Component:** • Determination of molecular weight of polymer using Viscometric method.	**9 Hours** **3 Hours**
INSULATING AND HIGH-RESISTIVITY MATERIALS IN ELECTRONICS Insulating materials in electronics: Introduction (Importance and Key properties) - Classification (Solid, liquid, and gas insulators) - Properties (Dielectric properties and breakdown) - Preparation, properties, and uses of Solid inorganic (Mica and Porcelain) and organic insulators (Bakelite and Rubber) - Liquid insulators (Epoxy resin and Transformer oil) – Gas Insulator (Sulfur hexafluoride) High Electrical resistivity materials: Factors influencing electrical resistivity - High resistivity materials (Composition, properties, and applications of Manganin and Molybdenum disilicide) - Nanocomposite insulators **Practical Component:** • Determination of pH and Conductivity in different Transformer Oils	**9 Hours** **3 Hours**
NANOMATERIALS AND NANOELECTRONICS Introduction to nano chemistry - Distinction between molecules, nanoparticles, and bulk materials - Size-dependent properties of nanomaterials - Quantum confinement effects - Carbon nanotubes and graphene (Preparation by Chemical Vapor Deposition and Laser Ablation, Properties and Applications in electronics) - Nanowires (Preparation by Electrochemical Deposition and Electrospinning, Properties and Applications in electronics) – Nanoparticles, nanoclusters, and nanorods (Preparation by Sol-gel, Solvothermal, Properties and Applications in electronics) - Nanotubes and nanowires in sensing applications.	**9 Hours**

Practical Component: • Synthesis of Nanoparticle using Solvo-Thermal Method	**3 Hours**
GREEN CHEMISTRY AND SUSTAINABLE ELECTRONICS Introduction to sustainable electronics (Importance and Environmental challenges in the electronics industry) - Environmental impact (Conductors, semiconductors, and polymers), Toxicity and persistence of electronic materials - Green chemistry principles in electronics manufacturing (12 principles of green chemistry applied to electronics and Eco-friendly materials and processes) - Life cycle assessment of electronic products - Recycling and e-waste management strategies (Recovery, Challenges and innovations in electronics recycling) - Future trends in eco-friendly electronic materials. **Practical Component:** • Determination of Copper from electronic waste by Complexometric method. • Estimation of copper ion by spectrophotometry. • Estimation of strength of sulphuric acid in spent Battery Electrolytes by pH metry	**9 Hours** **9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**75**

Learning Resources

References:

1. Singh, G. (2019). Advanced battery technology for energy storage applications (1st ed.). New Age International Publishers.
2. Beguin, F., & Frackowiak, E. (2013). Supercapacitors: Materials, systems, and applications (1st ed.). Wiley-VCH.
3. Kumar, V., & Kumar, A. (2015). Conducting polymers: Synthesis, properties, and applications (1st ed.). Narosa Publishing House.
4. Chandrasekhar, S. (2014). Organic electronics: Concepts and applications (1st ed.). Springer.
5. Sharma, R. K. (2022). Electrochemistry for energy systems (1st ed.). Narosa Publishing House.
6. Hironis, N. P., & Pal, M. (2004). Electrical insulating materials (1st ed.). S. Chand & Company Ltd.
7. Kulkarni, S. K. (2014). Nanotechnology: Principles and practices (3rd ed.). Capital Publishing Company.
8. Ahluwalia, V. K. (2009). Green chemistry: Environmentally benign reactions (1st ed.). Ane Books Pvt. Ltd.
9. Shina, S. G. (2008). Green electronics design and manufacturing (1st ed.). McGraw-Hill.

Online Resources (Weblinks)

1. https://www.coursera.org/learn/lithium-based-batteries
2. https://www.youtube.com/watch?v=Gbltx4IXLzQ&list=PLbMVogVj5nJT0slH3tuas5BIp1DG8ZpMj&index=2
3. https://www.coursera.org/learn/applied-sustainability-engineering
4. https://www.youtube.com/watch?v=nSAvyQajVzE

Assessment (Embedded course)

CAT, Activity and Learning Task(s) (Concept Map, Think-Pair-Share, Jigsaw), MCQ, End Semester Examination (ESE), Lab Workbook, Model Exam, Viva-Voce.

Course Curated by

Expert from Industry	Expert from Higher Education Institution	Internal Expert(s)
Dr. Muthuraja Perumal	Dr. Venkatakrishnan Professor,	Dr K Rathidevi, Dr. K Sampath,

General Manager - Research & Development Rohith Industries, APIIC Industrial Park, Andhra Pradesh	School of Chemical Sciences Indian Institute of Technology (Mandi) Himachal Pradesh India		Dr S Jyothi, Dr R Ashokkumar, Department of Chemistry
Recommended by BoS on	16.08.2024		
Academic Council Approval	No.27	**Date**	24.08.2024

24CSI101	LOGICAL THINKING AND PROBLEM SOLVING (Common to all Programmes)	L	T	P	J	C
		3	0	2	0	4
ES		SDG	8, 9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	gain a comprehensive understanding of computing systems, including their classification, processing units, memory structures, storage hierarchies, and the essential functions and types of operating systems
2	develop strong logical and analytical thinking skills, enabling the systematic analysis and solution of computational problems using reasoning techniques, algorithms, and flowcharts.
3	acquire a solid foundation in C programming, mastering the use of data types, operators, control structures, and input/output operations to create efficient and effective programs.
4	apply advanced programming techniques, including the use of arrays, structures, pointers, and functions, to solve complex real-world problems with a focus on modular and efficient coding practices.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	understand the basic concepts of hardware, software, Operating systems, and the logic behind the functioning of the Computing systems.	U
CO2	apply logical thinking and reasoning to solve computing problems using tools like algorithms and flowcharts.	Ap
CO3	understand the structured programming paradigms, memory organization and how the language can be used as a tool to solve problems.	U
CO4	develop simple programs using data types, operators, control structures, pointers, and functions as appropriate in real world applications.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2												
2	3	2	1									3	
3		1										2	
4	3	2	1									3	

Course Content

FUNDAMENTALS OF COMPUTERS AND COMPUTING Generations of computers, and classification of computers (supercomputers, mainframes, minicomputers, microcomputers). Processing Units (CPU, GPU, TPU), memory (RAM, ROM), storage devices and hierarchy, input / output and peripheral devices. System software, application software. Operating Systems - Functions (process	**6 Hours**

management, memory management, file system management, device management, security), types of operating systems (desktop, mobile, networking, distributed, real-time, embedded). **Number Systems**: Introduction to different number systems (binary, octal, decimal, hexadecimal), conversions between number systems, and binary arithmetic (addition, subtraction, multiplication, division). **Practical Component** Exploring hardware and software components	 **4 Hours**
LOGICAL THINKING, REASONING AND TOOLS Problem Analysis – Logical Thinking vs Critical Thinking vs Design Thinking - Inference – Inductive Reasoning – Deductive Reasoning **– Logical Thinking Tools: Algorithms**: Definition and importance, characteristics of algorithms (finite, clear and unambiguous, well-defined inputs and outputs, feasible). Algorithm representation Techniques: Pseudocode, stepwise refinement, and top-down design. **Flowcharts**: Symbols used in flowcharts, creating flowcharts, and examples of flowchart-based problem-solving. **Practical Component** Algorithm writing and Flowcharts,	**8 Hours** **4 Hours**
PROGRAMMING PARADIGMS AND INTRODUCTION TO C PROGRAMMING **Programming Paradigms**: Structured programming - functional programming - object-oriented programming. **Introduction to C Programming**: History of C - features of C - structure of a C program – input / output statements. **Data Types**: Primitive data types (int, char, float, double) - derived data types, typecast. **Operators**: Arithmetic operators - relational operators - logical operators - bitwise operators - assignment operators - operator precedence. **Conditional Statements**: If - if-else - nested if - switch-case. **Looping Statements**: For loop - while loop - do-while loop. Pre-processor Directives and Command line arguments, Storage Classes. **Practical Component** Programs on Operator precedence, Decision Making, Iterations	**11 Hours** **10 Hours**
ARRAYS AND STRUCTURES **Collections**: Arrays – 2D Arrays – String Manipulation. **Structures and Unions**: Definition - declaration - accessing members - differences between structures and unions - applications. **Practical Component** Programs on Arrays, Structures, Union,	**10 Hours** **6 Hours**
POINTERS AND FUNCTIONS **Pointers**: Definition - declaration - pointer arithmetic - pointers and arrays. **Functions**: Definition - declaration - types of functions (user-defined, library functions) - parameter passing (by value, by reference) pointers and functions, recursion. **Practical Component** Pointers and Functions. Additional programs on Files to be discussed.	**10 Hours** **6 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

Textbooks:

1. Kanetkar, Yashavant. Let Us C. BPB Publications, New Delhi (2023).
2. Rajaraman, V. Fundamentals of Computers. PHI Learning, New Delhi (2020).
3. Dromey, R.G. How to Solve it by Computer. Prentice Hall International, New York (2008).

Reference

1. Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms. MIT Press, Cambridge (2022).
2. Balagurusamy, E. Programming in ANSI C. McGraw Hill Education, New York (2021).
3. Kernighan, Brian W., and Dennis M. Ritchie. The C Programming Language. Prentice Hall, New York (2017).
4. Patterson, David A., and John L. Hennessy. Computer Organization and Design: The Hardware/Software Interface. Morgan Kaufmann, San Francisco (2017).

Online Resources (Weblinks)

1. https://nptel.ac.in/courses/106105214
2. https://www.coursera.org/learn/computer-fundamentals
3. https://www.khanacademy.org/computing/computer-science/algorithms
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/
5. https://www.geeksforgeeks.org/c-programming-language/

Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert
-	-	Dr. S. Kavitha, Department of Information Technology

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24ECT101	Network Theory	L	T	P	J	C
		3	1	0	0	4
ES		SDG	9			

Pre-requisite courses	NA	Data Book / Codes / Standards (If any)	NA

Course Objectives:	The purpose of taking this course is to:
1	Establish a comprehensive understanding of circuit laws and network theorems for solving complex DC circuits.
2	Develop the ability to analyse AC circuits using phasor representation and two-port network parameters to determine impedance, admittance, and other related parameters.
3	Provide knowledge of AC power analysis techniques for optimizing power transfer in complex circuits.
4	Examine the transient and steady-state behaviour of first-order and second-order circuits to predict their response to different inputs.
5	Equip students with the skills to design resonance and coupled circuits, focusing on mutual inductance calculations and energy transfer analysis in passive filters.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Apply circuit laws and network theorems to solve complex DC circuits, including Delta-Star and Star-Delta transformations.	Ap
CO 2	Analyze AC circuits using phasor representation and two-port network parameters to determine impedance, admittance, and related parameters.	An
CO 3	Evaluate AC power analysis techniques to optimize power transfer and perform power factor correction in complex circuits.	E
CO 4	Examine the transient and steady-state behaviour of first-order and second-order circuits to predict their response to various inputs.	An
CO 5	Design resonance and coupled circuits by calculating mutual inductance and analyzing energy transfer characteristics in passive filters.	C

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2											1	
2	2	3			2							1	
3	1		2									1	
4	1			2							2	1	
5	1		2									2	

Course Content	
DC CIRCUITS ANALYSIS AND NETWORK THEOREMS Circuit Laws – Ohms Law, KVL and KCL, Delta-Star and Star-Delta transformation, Mesh and Nodal analysis – Superposition theorem – Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.	**14 Hours**
AC CIRCUITS AND TWO PORT NETWORKS Sinusoids, Phasors, Phasor representation of R, L and C – Impedance and admittance – Mesh and Nodal analysis – Two Port Networks – Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission Parameters, Relation between parameters.	**12 Hours**
AC POWER ANALYSIS Instantaneous and Average Power – Maximum Average power transfer – Effective or RMS Value – Apparent Power and Power Factor, Complex Power, Power Factor Correction.	**10 Hours**
FIRST ORDER AND SECOND ORDER CIRCUITS Source-free RC Circuit and Source-free RL Circuit – Unit step function – Step response of an RC Circuit and RL Circuit – Source-free series and parallel RLC circuits.	**12 Hours**
RESONANCE AND COUPLED CIRCUITS Series Resonance, Parallel Resonance, Passive filters – Magnetically Coupled Circuits – Mutual Inductance, Co-efficient of Coupling, Energy in a coupled circuit.	**12 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**15**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**60**

Learning Resources

Textbooks

1. Charles K. Alexander and Mathew N.O. Sadiku, Fundamentals of Electric Circuits, McGraw Hill Education, 7th Edition (2022).
2. David E. Johnson, Johny R. Johnson and John L. Hilburn, Electric Circuit Analysis, Prentice-Hall Int., 2nd Edition (1992).

Reference books

1. William H. Hayt, Jr., Jack E. Kemmerly and Steven M. Durbin, Engineering Circuit Analysis, McGraw Hill Education, 8th Edition (2013).
2. Joseph Edministor and Nahvi (Mohmood), Theory & Problems of Electric Circuits, McGraw Hill Education, 5th Edition (2011).
3. Murthy K.V.V. and Kamath M.S., Basic Circuit Analysis, Jaico Publishing House, Mumbai (1999).
4. Norman Balabanian, Electric Circuits, McGraw Hill Education, ISE Edition (1994).
5. DeCarlo R.A. and Lin P.M., Linear Circuit Analysis – Time, Domain, Phasor and Laplace Transform Approaches, Oxford University Press, 2nd Edition (2003).

Online Educational Resources

1. https://onlinecourses.nptel.ac.in/noc22_ee07/preview

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
1. Mr. R. Sanjaykumar, Sasken Technologies Limited	1. Dr. D. Jude Hemanth, Karunya Institute of Technology and Sciences	Mr. R. Karthikeyan, ECE
Recommended by BoS on	**13.08.2024**	
Academic Council Approval	No: 27	24.08.2024

24INP102	INNOVATION PRACTICUM – 1 (Common to all Departments)	L	T	P	J	C
		0	0	2	0	1
ES		SDG	9, 11, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	analyse the effectiveness of systems thinking and problem-solving methodologies in applying data-driven insights for innovative solution design.
2	evaluate the impact of transdisciplinary collaboration on creating functional hardware prototypes through fabrication techniques.
3	understand the future trends and implications of technology in developing innovative products.

Course Outcomes:

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	recall the fundamental principles of custom hardware design.	R
CO2	understand the appropriate tools and their applications for solving hardware-related problems.	U
CO3	apply systems engineering concepts to real-world hardware design challenges.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2		1											
2	2				1									
3		2	2	1										

Course Content

Engineering Fundamentals and Innovation Why engineering? The concept of street fight engineering - Real-world design process and problem-solving methodology - Data-driven insights and concept generation - Case studies of successful engineering innovations.	**3 Hours**
Transdisciplinary Systems and Manu'Futuring Transdisciplinary systems to accelerate innovation - Manu'Futuring: Technology in hardware manufacturing and manufacturing of hardware technologies - Future scopes with product case studies.	**6 Hours**

Building Custom Hardware How to build a basic custom hardware - Electronics fundamentals and components - Software for hardware control - Fabrication techniques.	**6 Hours**
System Thinking and Engineering Introduction to system thinking - Real world as a system - Concept of system engineering and its application – iLenSys.	**7 Hours**
Creativity Time and Tech Teardown Creativity exercise: Apply system thinking to a real-world problem - Tech teardown: Analyse a product or system to understand its engineering principles - Presentation: Present your creative project and tech teardown with an engaging title	**8 Hours**

Theory Hours: 0	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 30

Learning Resources

Textbooks:

1. Sanjoy Mahajan - Street Fighting Mathematics
2. Donald Knuth - The Art of Computer Programming
3. Think like a programmer: An introduction to creative problem solving
4. Thinking in Systems: A Primer

References:

1. Learning to code: How to think like a programmer
2. How to find innovative ideas: Ramesh Raskar's note
3. Case study: How Tesla changed the auto industry
4. Ultimate Guide: How to develop a new electronic hardware product

Online Resources (Weblinks)

1. https://www.ifixit.com/Teardown?srsltid=AfmBOorwzDG9RhJoL3L5tlZ_Dr4sVcey-vPC-pkKTj2E0mWJWtFYlikY
2. https://www.symmetryelectronics.com/technology-teardowns/

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert from Industry	Expert from Higher Education Institutions	Internal Expert
Dr. Mahesh Veezhinathan Director - Innovation Practicum Associate VP - Forge. Innovation	-	Dr. Samuel Ratna Kumar P S Assistant Professor – III Department Mechanical Engineering

Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24HSP111	HOLISTIC WELLNESS-1 (Common to all Department)	L	T	P	J	C
		0	0	2	0	1
HS		SDG	2, 3			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	introduce first-year students to the foundational concepts of holistic wellness, emphasizing the integration of physical, mental, emotional, and Internal well-being.
2	create a balanced lifestyle that promotes overall health and happiness through practical activities.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	understand the basic principles of holistic wellness.	U
CO 2	apply strategies for maintaining physical health, including nutrition and exercise	Ap
CO 3	practice mindfulness techniques to enhance mental and emotional well-being.	Ap
CO 4	develop a personal wellness plan incorporating various aspects of holistic health.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1						2		1						
2						2								
3						1					3			
4						2					3			

Course Content

INTRODUCTION TO HOLISTIC WELLNESS: • Overview of holistic wellness: physical, mental, emotional, and internal health. • The importance of balance in overall well-being. • Hands-on activity: Self-assessment of current wellness status.	**4 Hour**
PHYSICAL WELLNESS: • Importance of physical activity and exercise. • Understanding nutrition and its role in health. • Sleep hygiene and its impact on well-being. • Hands-on activity: Designing a personalized fitness and nutrition plan.	**14 Hours**
MENTAL AND EMOTIONAL WELLNESS: • Stress management techniques. • The role of Yoga, mindfulness and meditation in mental health. • Emotional intelligence and its impact on relationships.	**6 Hours**

• Hands-on activity: Practicing Yoga, mindfulness and emotional regulation exercises.	
INTERNAL WELLNESS: • Exploring the concept of Internal wellness. • The role of purpose and meaning in life. • Introduction to meditation and reflective practices. • Hands-on activity: Developing a personal reflection, Yoga and meditation routine.	**4 Hours**
INTEGRATING WELLNESS PRACTICES: • Combining physical, mental, emotional, and Internal wellness practices into daily life. • Developing a balanced wellness plan. • Hands-on activity: Creating a comprehensive personal wellness plan.	**2 Hours**

Theory Hours:	**0**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**30**

Learning Resources

Textbooks:

1. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
2. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015).

References:

1. B.K.S Iyengar., Yoga: The Path to Holistic Health., Dorling Kindersley Limited, City of Publication (2001)
2. Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
3. James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
4. Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
5. Kalderdon Adizes Ichak., What Matters in Life: Lessons I Learned from Opening My Heart ., WS Press, Newtown, PA (2023)

Online Resources (Weblinks)

1. Learning Suryanamskar
2. Yoga for well-being
3. Nutritional Educational contents
4. Introduction to Psychology
5. Guided Meditation
6. Simplified physical exercises instructions
7. Simplified Physical Exercises
8. Life skills and value education
9. James Allen Library

Assessment (Practical course)

Participation, Practical activities and assignments, personal wellness plan and reflection.

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
		Dr. Ezhilarasi Principal- KCT
Recommended by BoS on	16.08.2024	

Academic Council Approval	No: 27	**Date**	24.08.2024

24INP101	DESIGN THINKING (Common to all Department)	L	T	P	J	C
		0	0	2	0	1
ES		SDG	9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	introduces first-year engineering students to Design Thinking, focusing on practical, user-centered problem-solving techniques
2	empathize with users, generate ideas, and create models to test and refine their solutions
3	understand iteration, empathy, and critical reflection to cultivate a creative mindset

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply problem-solving techniques and the Design Thinking process to engineering problems using simple models	Ap
CO 2	understand user needs through various empathy techniques and develop/refine models iteratively based on user insights.	U
CO 3	reflect critically on their learning journeys and the emotional demands of problem-solving. Collaborate effectively in teams to develop innovative solutions	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	1		2			2		2			1			
2	1							2			1			
3	1		2			2		1			1			

Course Content

Introduction to Problem Solving and Ground Rules Introduction to problem-solving strategies without mentioning Design Thinking-Emphasize problem-solving attitudes, mindsets, and behaviours necessary for iterative problem solving (e.g., openness to failure, patience, empathy)-Set ground rules for the course, including incentives for creative risk-taking and penalties for non-participation or lack of reflection-Overview of the Design Thinking process and its importance.	**6 Hours**
Empathy and Problem Definition	

Techniques for understanding user needs, including observation, interviews, **surveys** and **focus groups-**Importance of secondary research as a complement for the above-mentioned methods-Introduction to empathy cycles: involve students in two empathy cycles before and after problem definition-Finetuning problem definition based on user insights.	**6 Hours**
Ideation and Concept Modelling Brainstorming ideas and selecting feasible solution-Creating concept modelling to visualize ideas-Include an empathy cycle after students propose solutions, allowing them to revisit and reshape their solutions based on further insights from users.	**6 Hours**
Prototyping and Testing with Models Building basic prototypes using simple materials (e.g., cardboard, clay)- Introduction to different prototyping methods (e.g., **low-fidelity** vs **high-fidelity models**) for different contexts: product design, space design, policy, and digital/e-commerce solutions-Conduct an empathy cycle after the prototype is developed to gather user feedback and refine the prototype.	**6 Hours**
Iteration and Final Modelling Project Students refine their prototypes based on feedback from the empathy cycle-Finalize prototypes for presentation based on consistent feedback loops.	**6 Hours**
Presentation, Reflection, and Learning Summaries Students present their final projects and reflect on their learning journeys, including how their understanding of problem-solving and empathy evolved during the course-**Learning Summary Activity:** Each student presents their individual journey and learning outcomes from the empathy cycles and iterations-Peer review and group discussions.	**6 Hours**

Theory Hours:	0	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total Hours:	30

Learning Resources

Textbooks:

1. Handbook of Design Thinking, Christian Muller – Roterberg, Kindly Direct Publishing
2. The Art of Innovation, Tom Kalley
3. E Balaguruswamy (2022), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company

Online Resources (Weblinks)

1. Survey and focus group design guides
2. Guidance on Designing, Administering and Analyzing Focus Groups and Interviews
3. Empathy mapping tools
4. How to Make a Concept Model
5. Brainstorming Techniques: 15 Creative Activities
6. 10 Brainstorming Techniques for Developing New Ideas
7. Brainstorming templates
8. 5 Common Low-Fidelity Prototypes and Their Best Practices
9. UX Prototypes: Low Fidelity vs. High Fidelity
10. Low-fidelity vs. High-fidelity Design Prototypes (and when to use which)

Case study 1: Iterative Design and Prototype Testing of the NN/g Homepage

Case study 2: Using iterative design to optimise the user flow of a product

11. Reflective practice toolkit

Assessment

Formative: Assignments, Mini project

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**	
		Dr. Padhmanand Sudhagar R Department of Bio-Tech Dr. Arul H Department of Physics	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24ADP001	BASICS OF ARTIFICIAL INTELLIGENCE (Common to all Departments except CS, IT, AD)	L	T	P	J	C
		0	0	2	0	1
ES		SDG	8, 9, 16			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	introduce students to the fundamentals of Artificial Intelligence (AI) and Generative AI, and its key concepts
2	enable students to explore and experiment with common generative AI models and tools for generating text, images, audio, video, and code
3	equip students with the techniques and best practices for crafting effective prompts for AI models

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	understand the fundamentals of AI and generative AI, including its potential impact, issues, limitations, and ethical concerns and its practical use cases in real-world scenarios.	U
CO 2	explore common generative AI models and tools for text, code, image, audio, and video generation.	E
CO 3	apply common prompt engineering techniques and approaches for writing effective prompts.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2						2							
2	2		2											
3					2					2				

Course Content

Introduction to Artificial Intelligence (AI) **Practical Component** Introduction to Artificial Intelligence (AI) - Generative AI Overview and Use Cases - Impact and Examples of AI - Application Domains for AI - Generative AI Applications. AI Concepts, Terminology - Cognitive Computing (Perception, Learning, Reasoning) - Terminology and Related Concepts of AI- Machine Learning Techniques and Training - Deep Learning - Neural Networks - Natural Language Processing, Speech, Computer Vision - Self Driving Cars. AI: Issues, Concerns and Ethical Considerations - AI Ethics, Regulations, Governance, and ESG. The evolution and future of AI - The AI Ladder - The Journey for Adopting AI Successfully - Hotbeds of AI Innovation.	**8 Hours**
Generative AI: Introduction and Applications	

Practical Component Introduction and Capabilities of Generative AI - Applications of Generative AI - Tools for Text Generation - Tools for Image Generation - Tools for Audio and Video Generation - Tools for Code Generation	**6 Hours**
Generative AI: Prompt Engineering Basics **Practical Component** Introduction to Prompt and Prompt Engineering - Best Practices for Prompt Creation - Common Prompt Engineering Tools - Hands on Lab: Getting to Know Our AI Prompting - Experimenting with Prompts - Naive Prompting and Persona Pattern. Prompt Engineering Techniques and Approaches - Text-to-Text Prompt Techniques - Interview Pattern Approach - Chain-of-Thought Approach - Tree-of-Thought Approach - Future of Human-Crafted Prompts - Text-to-Image Prompt Techniques - Hands-on Lab: Effective Text Prompts for Image Generation.	**7 Hours**
Project and Wrap Up **Practical Component** Graded Quiz Final Project: Generating Text, Images, and Code.	**9 Hours**

Theory Hours:	**0**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**30**

Learning Resources

Textbooks:

1. George F. Luger "Artificial Intelligence: Structures and Strategies for Complex Problem Solving" (6th Edition), Pearson, 2021.
2. Anna Jordan, Robert S. Menzies, Kristine P. Schwab, "AI-Powered Creativity: Generative AI and the Future of Content Creation" Routledge, 2023.

References:

1. https://platform.openai.com/docs/overview
2. https://towardsdatascience.com/
3. https://gemini.google.com/

Online Resource (Weblinks)

1. Introduction to Artificial Intelligence (AI) | Coursera
2. Generative AI: Introduction and Applications | Coursera
3. Generative AI: Prompt Engineering Basics | Coursera

Assessment (Practical course)

MCQ, Mini project and viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
-	-	Dr. S. Sangeetha, Associate Professor Department of AI&DS

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

SEMESTER II

24HST102	தமிழரும் தொழில்நுட்பமும்/ TAMILS AND TECHNOLOGY	L	T	P	J	C
		1	0	0	0	1
HS		SDG	4, 8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	தமிழர்களின் நெசவு மற்றும் பானைத் தொழில்நுட்பத்தை அறிமுகப்படுத்துதல், சங்க கால கட்டிட தொழில்நுட்பத்தை விளக்குதல், கோயில்கள் மற்றும் சிற்பக்கலைகளை ஆராய்தல். introducing weaving and pottery technology of Tamils -Explaining the building technology of the Sangam Period-Explore temples and sculptures.
2	கப்பல், இரும்பு, நாணயங்கள், மணி உருவாக்கும் தொழிற்சாலைகள், ஆகியவற்றை விளக்கம் செய்தல், தமிழகத்தின் தொல்லியல் சான்றுகளின் பழமையை உணர்த்துதல். explain Ship, Iron, Coins, Beads Making Factories. Realizing the Antiquity of Archaeological Evidence of Tamil Nadu
3	வேளாண்மை மற்றும் அறிவியல் தமிழைப் பற்றி அறிதல், இணையத்தில் தமிழின் தேவையை உணர்த்துதல்,தமிழ் மென்பொருள்களை அறிமுகம் செய்தல். knowledge of Agricultural and Scientific Tamil, Realizing the need for Tamil on the Internet, Introducing Tamil software.

Course Outcomes:

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	தமிழர்களின் நெசவு மற்றும் பானைத் தொழில்நுட்பத்தின் முக்கியத்துவத்தினை அறிந்து கொள்ளுதல். சங்ககால தமிழர் வளர்த்த அழகுக் கலைகளைத் தெரிந்து கொள்ளுதல். know the importance of weaving and pottery technology of Tamils-To know the Aesthetics arts developed by Sangam Tamils	U
CO 2	கப்பல் கட்டும் கலை, இரும்புத் தொழிற்சாலை, நாணயங்கள் அச்சடித்தல்,மணி உருவாக்கும் தொழிற்சாலைகள், சிலப்பதிகாரத்தில் உள்ள மணிகளின் வகையை அறிதல். knowledge of ship building, ironworks, coinage, minting, and beads making factories,Knowing the types of beads in Silapathikaram.	U
CO 3	வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பத்தை அறிந்து கொள்ளல். அறிவியல் தமிழ் மற்றும் கணினித் தமிழைப் புரிந்து கொள்ளுதல். know agriculture and irrigation technology. Understanding Scientific Tamil and Computer Tamil.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)
	1	2	3	4	5	6	7	8	9	10	11	

Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2		2				3	2	2		2			
2	2		2				3	2	2		2			
3	2		2				3	2	2		2			

Course Content

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள். Weaving Industry during Sangam Age - Ceramic technology - Black and Red Ware Potteries (BRW)-Graffiti on Potteries.	**3 Hours**
வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ரூ 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. Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.	**3 Hours**
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. Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel- Copper and gold- Coins as source of history - Minting of Coins - Beads making- industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidence - Gem stone types described in Silappathikaram.	**3 Hours**
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. Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries - Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.	**3 Hours**
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. 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.	**3 Hours**

Theory Hours:	15	Tutorial Hours:	0	Practical Hours:	0	Project Hours:	0	Total Hours:	15

Reference books

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 Tarnils 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 Textbook 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.

Online Resources

1. https://www.youtube.com/watch?v=Gp1ratX2sOE&list=PLtyn2o7hocf40PtPibRqJTf_dQL3eOtLl
2. https://www.youtube.com/watch?v=jteRvnNiD6w

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
-	-	-

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24HST103	EFFECTIVE COMMUNICATION	L	T	P	J	C
		2	0	0	0	2
HS		SDG	4, 8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to

1	enhance students' abilities to communicate ideas effectively, both orally and in writing, by developing skills in organizing thoughts clearly and logically and expressing them through well-structured paragraphs and concise summaries.
2	enable students to critically evaluate and synthesize information from multiple sources and utilize suitable writing techniques and formats to produce professional-quality content tailored to various contexts.
3	foster active listening, critical reading, and reflective thinking, empowering students to create engaging, relevant, and informative content by applying effective communication strategies across diverse platforms.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	demonstrate proficiency in delivering ideas effectively, both in speaking and writing, with a deeper understanding of the content and the ability to convey complex ideas through well-structured paragraphs and summaries.	Ap
CO2	create and present original content by evaluating information from multiple sources and employing appropriate formats and writing strategies across various professional contexts.	C
CO3	produce engaging and informative content through active listening, reading, reflection, and effective communication skills.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1							2	2	3		3			
2							2	2	3		3			
3							2	2	3		3			

Course Content

Text Analysis Composition of Coherent Paragraphs (Expository, Descriptive, Narrative, Evaluative) - Loud Reading (Reading Extracts will be given were students identify the main idea of paragraphs or sections and debrief)	**6 Hours**
Visual & Written Analysis Process writing (Drafting effective introduction, process and conclusion using	

appropriate transition words and phrases) - Describing Visuals (Line graph, Bar Chart, Flow Chart, Pie Chart, Table, Tree diagram) - Note Making & Summarizing	**6 Hours**
Professional Correspondence Crafting Professional Emails - Writing Instruction for Manuals - Reading technical documents (Reading extracts will be given to construct sentences from the new words found in the document)	**6 Hours**
Research and Documentation Library Reading (Identify at least three sources and extract information, Summarize the main ideas and key findings from each source, compile them findings into a brief report that includes the main points, sources, and relevance to the topic)- Report Writing (Title Page, Abstract, Introduction, Methodology, Results, Discussion, Conclusion and recommendation)	**6 Hours**
Talk Analysis and Podcast Skills Listening to and analyzing TED talks – Preparing Podcast-PRISM (Professional Rhetoric Improvement and Speech Mastery) to share facts, opinions and experiences - Writing Reviews on products.	**6 Hours**

Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 30

Learning Resources

References:

1. Swamy, V. R. Narayana. Strengthen Your Writing. Orient Longman, 2003.
2. Sasikumar, V., and P. V. Dhamija. Spoken English: A Self-Learning Guide to Conversation Practice. Tata McGraw Hill, New Delhi (1993).
3. Maison, Margaret M. Examine Your English. Orient Longman, 1999.
4. Rizwi, Ashraf. Effective Technical Communication. Tata McGraw Hill, 2005.
5. Pickett, Nell Ann, and Ann A. Laster. Technical English: Writing, Reading, and Speaking.
6. Harpercollins College Div, 1993.

Online Resources (Weblinks)

1. https://owl.purdue.edu/owl/general_writing/academic_writing/paragraphs_and_paragraphing/index.html
2. https://learnenglish.britishcouncil.org/skills/writing/upper-intermediate b2/describing-trends
3. https://hbr.org/2016/07/how-to-write-email-with-military-precision
4. https://owl.purdue.edu/owl/subject_specific_writing/professional_technical_writing/reports and_memos/index.html

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr.Vijayan Ramanathan , Project manager, Toppan Merrill. Technologies, Coimbatore	Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben, CIT, Coimbatore	Dr. Arokia Lawrence Vijay Dr. Sreejana Dr. Tissaa Department of English

Recommended by BoS on	16.08.2024		
Academic Council Approval	No:27	**Date**	24.08.2024

24MAI123	COMPUTATIONAL DIFFERENTIAL EQUATIONS (Common to EC, EE, EI)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	understand the fundamental concepts and methods for solving linear ordinary differential equations (ODEs) of second and higher order, and apply them to real-world engineering problems such as electric circuits.
2	develop proficiency in using Laplace Transform techniques to solve ODEs, particularly in scenarios involving constant coefficients, and apply these methods to practical engineering systems.
3	gain expertise in the application of various numerical methods, including Taylor's series, Euler, Improved Euler, and Runge-Kutta methods, to solve initial value problems for ODEs with a focus on accuracy and efficiency.
4	master the methods of solving partial differential equations (PDEs), including separation of variables and standard techniques for first-order and higher-order PDEs, and understand their application in modeling physical phenomena.
5	apply and evaluate finite difference and other numerical techniques for solving complex engineering problems involving PDEs, such as two-dimensional Laplace's and Poisson's equations, as well as one-dimensional heat and wave equations.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	solve linear ordinary differential equations (ODEs) of second and higher order, including applications in electric circuits.	Ap
CO 2	apply Laplace Transform techniques to solve linear ODEs.	Ap
CO 3	apply numerical methods, including Taylor's series, Euler, Improved Euler, and Runge-Kutta methods, to solve initial value problems for ODEs.	Ap
CO 4	analyse and solve partial differential equations (PDEs) using separation of variables and standard methods for first-order PDEs and higher-order linear homogeneous PDEs.	An
CO 5	apply finite difference techniques to solve two-dimensional Laplace's and Poisson's equations and use numerical schemes to solve one-dimensional heat and wave equations.	Ap
CO 6	analyze and solve complex real-world engineering problems using a variety of analytical and numerical methods for ordinary and partial differential equations.	An

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3

1	3	2		2										
2	3				2									
3		2			2						2			
4		3		2										
5		2			3									
6	2	2			2						2			

Course Content

ORDINARY DIFFERENTIAL EQUATIONS Linear equations of second and higher order with constant coefficients – Euler's and Legendre's linear equations – Method of variation of parameters – First order Simultaneous linear equations with constant coefficients – Applications: Electric Circuits.	**9 Hours**
Practical Component: • Solving Second-Order Linear ODEs with Constant Coefficients • Solving First-Order Simultaneous Linear Equations	**7 Hours**
SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS USING LAPLACE TRANSFORMS: Laplace Transform – Properties – Inverse Laplace transforms – Properties – Solution of linear ordinary differential equations with constant coefficients.	**9 Hours**
Practical Component: • Using Laplace Transforms to Solve Linear ODEs	**4 Hours**
NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS Initial value problems - Single step methods: Taylor's series method – Truncation error – Euler and Improved Euler methods – Fourth order Runge–Kutta method – Multistep method: Milne's predictor - corrector method.	**9 Hours**
Practical Component: • Numerical Solution Using Taylor's Series Method • Numerical Solution Using Euler and Improved Euler Methods • Numerical Solution Using Fourth Order Runge-Kutta Method	**9 Hours**
PARTIAL DIFFERENTIAL EQUATIONS: Solution of PDE by variable separable method - solution of standard types of first order partial differential equations (excluding reducible to standard types) - Lagrange's linear equation – Linear homogeneous partial differential equations of second and higher order with constant coefficients.	**9 Hours**
Practical Component: • Solution of PDE by Variable Separable Method	**4 Hours**
NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS: Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain–Solution of one-dimensional heat equation using Bender Schmidt and Crank Nicholson difference schemes –Solution of one-dimensional wave equation by explicit scheme.	**9 Hours**
Practical Component: • Numerical Solution of Two-Dimensional Laplace's and Poisson's Equations • Numerical Solution of Heat Equation Using Bender-Schmidt and Crank-Nicholson Methods.	**6 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

Textbooks:

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2021.
2. Sastry S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.
3. Thomas, G.B., Weir, M.D., Hass, J., "Thomas' Calculus", Pearson Education, 15th Edition, 2023.

References:

1. Kreyzig E., “Advanced Engineering Mathematics”, 10th Edition, John Wiley and sons, 2023.
2. Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2018.
3. Zill, D.G., Wright, W.S., "Advanced Engineering Mathematics", Jones & Bartlett Learning, 7th Edition, 2020.
4. O'Neil, P.V., "Advanced Engineering Mathematics", Cengage Learning, 7th Edition, 2017.
5. "Numerical Methods for Engineers" by Steven C. Chapra and Raymond P. Canale,Mc Graw Hill, 8th Edition,2021.

Online Resources (Weblinks)

1. MIT OpenCourseWare: Differential Equations
   https://ocw.mit.edu/courses/mathematics/18-03-differential-equations-spring-2010
2. Khan Academy: Differential Equations
   https://www.khanacademy.org/math/differential-equations
3. Paul’s Online Math Notes: Differential Equations
   http://tutorial.math.lamar.edu/Classes/DE/DE.aspx
4. Coursera: Introduction to Differential Equations
   https://www.coursera.org/learn/differential-equations
5. Wolfram MathWorld: Differential Equations
   https://mathworld.wolfram.com/topics/DifferentialEquations.html

Assessment

CAT, Activity and Learning Task(s), MCQ, Open Book Assignment, Worksheet assignment, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, viva-voce.

Course Curated by

Expert from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr.Pradeep.C, Paerless Validation Software for Life Sciences Companies.	Dr. C. Porkodi, PSG College of Technology, Coimbatore. Dr. P. Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore.	Dr. K. Meena Dr. Vijeta Iyer Dr. R. Krishnamoorthy Department of Mathematics

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24PHI102	APPLIED PHYSICS FOR CIRCUIT ENGINEERING (Common to EC, EE, EI an MR)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	9			

Pre-requisite courses	Higher Secondary	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	discover the fundamental concepts of light-matter interactions, including emission, absorption, and Einstein's theory's presentation of stimulated emission's quantum mechanical foundations.
2	comprehend the principles of quantum mechanics, including wave-particle duality, the significance of the wave function, and quantum tunnelling.
3	examine various sources of green energy, including solar, wind, and ocean energy, and assess their efficiency and practical applications.
4	study the properties of semiconductors, magnetic materials, including carrier concentration, transport phenomena, and applications of the Hall effect in sensors.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply the principles of applied optics to demonstrate the operation of laser systems and their applications.	Ap
CO 2	apply quantum mechanical concepts to solve problems related to wave-particle duality and quantum tunnelling.	Ap
CO 3	apply principles of green energy technologies to assess their efficiency and practical applications.	Ap
CO 4	0075nderstanding semiconductor physics concepts to analyze carrier transport phenomena and properties of semiconductor devices.	U
CO 5	apply knowledge of magnetic materials to evaluate their properties and uses in modern applications like spintronics.	Ap
CO 6	apply optics, quantum physics, green energy, and semiconductor physics methods to design practical solutions in experimental setups.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	1												
2	3	1												
3	3	1												
4	3	1									2			
5	3	1												
6	3	1									2			

Course Content

APPLIED OPTICS	9 Hours

Interaction of light and matter - Quantization of electromagnetic radiation – Absorption, Spontaneous emission and Stimulated emission - Einstein's theory of stimulated emission- Population inversion - Sources of excitation - Active medium -Laser beam output- Nd-YAG laser - CO_2 laser - Applications – Laser Imaging, Holography and Laser gyroscopes. **Practical Component** 1. Semiconductor laser: a. Determination of wavelength of laser b. Determination acceptance angle and numerical aperture of an optical fibre. c. Determination of particle size 2. Spectrometer – Determination of wavelength of mercury source using grating	**6 hours**
QUANTUM PHYSICS Necessity of quantum mechanical picture - Planck's concept (hypothesis) - Wave-particle duality - de-Broglie waves - Physical significance of wave function - Schrodinger equation (Time independent and time-dependent) - Particle in a box- Eigen values and Eigen function- Superposition Principle - Quantum mechanical tunnelling through a barrier **Practical Component** 1. Compound pendulum – Determination of acceleration due to gravity 2. Determination of Planck's constant–electroluminescence method.	**9 Hours** **6 hours**
GREEN ENERGY Introduction to Green energy – Solar energy: Energy conversion by photovoltaic principle – Solar cells – Efficiency measurements – Types (First, Second and Third Generation) - Wind energy: Basic components and principle of wind energy conversion systems – Ocean energy: Wave energy – Wave energy conversion devices. Futuristic Energy: Hydrogen – Methane Hydrates – Carbon capture and storage (CCS). **Practical Component** 1. Determination of efficiency of solar cell **2.** Melde's string – Determination of frequency of a tuning fork	**9 Hours** **6 hours**
SEMICONDUCTOR PHYSICS Semiconductors - Intrinsic and extrinsic semiconductors - Variation of carrier concentration with temperature and impurity concentration - Carrier transport in Semiconductors: Drift, mobility and diffusion – Hall Effect in Semiconductors – Applications of Hall Effect - Magnetic field sensor, current sensor, and position sensor - Ohmic contacts: concept and importance - Schottky diode – construction and working - energy band diagram, I-V characteristics. **Practical Component** 1. Determination of band gap of a semiconductor 2. Determination of thermal conductivity of a bad conductor – Lee's Disc method 3. Non-uniform bending – Determination of Young's modulus	**9 Hours** **6 hours**
MAGNETIC MATERIALS Introduction – Bohr magnetron - types of magnetic material – Hysteresis behaviour – Energy product - Hard and soft magnetic materials - Magnetic Anisotropy- Spintronics and Magnetic Semiconductors- Applications – GMR - MRAM (Magneto resistive Random Access Memory) - Nanomagnetic Materials - Magnetocaloric Materials – Magnetic Materials in Renewable Energy – Magnetic levitation. **Practical Component** 1. Determination of magnetic susceptibility of a solid material – B-H curve apparatus	**9 Hours** **6 hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

Textbooks

1. Avadhanulu, M. N., Kshirsagar, P. G., & Arun Murthy, T. V. S., A Textbook of Engineering Physics, S. Chand Publications, New Delhi (2018).
2. Gaur, R. K., & Gupta, S. L., Engineering Physics, Dhanpat Rai Publishing Co Pvt Ltd, New Delhi (Year not provided).
3. Beiser, A., Mahajan, S., & Choudhury, S. R., Concepts of Modern Physics, McGraw Hill Education, New Delhi (2017).
4. Rajendran, V., Applied Physics, Tata McGraw Hill Publishing, New Delhi (2017).

Reference books

1. Lal, Brij, & Subrahmanyam, Properties of Matter, S. Chand & Co Ltd., New Delhi (2014).
2. Prakash, Satya, Quantum Mechanics, Pragati Prakashan Publishers (2015).
3. Thiagarajan, K., & Ghatak, Ajoy, Lasers: Fundamentals and Applications, Springer Science & Business Media (2010)
4. Hill, William Silfvast, Laser Fundamentals, Cambridge University Press, New York (2018).
5. Ultrasonics: Fundamentals, Technology, Applications, 2nd Edition, Marcel Dekker, New York (1988).
6. Sze, S. M., & Ng, K. K., Physics of Semiconductor Devices, Wiley (2020), ISBN: 978-1119090240.
7. Sellmyer, David J., & Skomski, Robert, Permanent Magnetic Materials and Devices,
8. Springer (2017), ISBN: 978-3319315828.

Online Resources (Weblinks)

1. National Institute of Standards and Technology (NIST) - Laser Fundamentals
2. Optics.org - Laser Applications
3. IEEE Xplore - Semiconductor Devices
4. Semiconductor Industry Association - Semiconductor Technology
5. Global Wind Energy Council (GWEC) - Wind Energy
6. Ocean Energy Europe
7. Magnetics - Magnetic Materials

Assessment (Embedded course)

CAT, Mini project, Qualitative assignments (PrBL/Activity based), MCQ, End Semester Examination (ESE), Lab Workbook, Model exam and viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
		Dr. R. Balamurugan Dr. K. Sugandhi Department of Physics

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24MEI103	COMPUTER AIDED – ENGINEERING GRAPHICS (Common to EE, EC, EI, BT)	L	T	P	J	C
		2	0	2	0	3
ES		SDG	9, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	understand the fundamental principles of engineering graphics and their significance.
2	develop proficiency in freehand sketching, usage of drawing instruments, and lettering.
3	gain competency in using computer graphics technologies for graphical communication, including isometric views and various coordinate systems (absolute, relative, polar)

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	apply the principles of engineering graphics to create accurate orthographic and isometric projections	Ap
CO2	design free-hand sketches of orthographic views from pictorial representations to improve spatial understanding and communication of engineering concepts	C
CO3	apply CAD software tools to create, edit, and annotate technical drawings and analyse them using ISO and ANSI standards	Ap
CO4	analyse the parametric and non-parametric CAD models, producing detailed two-dimensional documentation, including sectional views and annotations.	An
CO5	apply geometric and topological concepts to design 3D models for additive manufacturing.	Ap
CO6	apply the principles of engineering graphics to create accurate orthographic and isometric projections	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	2		2							2			
2		1	2								1			
3	2	3	2	2							2			
4		1	1						2		1			
5				2	2			1			1			
6				2	2			1			1			

Course Content

Introduction to Engineering Drawing Principles of Engineering Graphics and their significance, Freehand sketching, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute.	**6 Hours** **6 Hours**
Orthographic and Isometric Projections	**6 Hours**

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes; Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.	**6 Hours**
Overview of Computer Graphics Listing the computer technologies that impact on graphical communication, Isometric Views of lines, Planes, Simple and compound Solids, Coordinates system - Absolute Coordinates, Relative Coordinates, Polar Coordinates.	**6 Hours** **6 Hours**
Customization & CAD Drawing Setting up modules and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Isometric Projections and Solids.	**6 Hours** **6 Hours**
Annotations, layering & other functions Layers to create drawings, create, edit and use customized layers; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and projecting the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Part editing and two-dimensional documentation of models, Shape extractions (Freeform modelling). Planar projection theory includes sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises – Transformation, Rendering and Lighting. Geometry and topology of engineered components: Introduction to Additive manufacturing (AM); Exporting the 3D model.	**4 Hours** **8 Hours**

Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 60

Learning Resources

Textbooks

1. Dhawan, R. K. *A Textbook of Engineering Drawing*. S. Chand Publishing (2019).
2. Bhatt N.D., Panchal V.M. & Ingle P.R., Engineering Drawing, Charotar Publishing House (2014).
3. Shah, M.B. & Rana B.C. Engineering Drawing and Computer Graphics, Pearson Education (2008).

Reference books

1. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
2. Narayana, K.L. & P Kannaiah (2008), Textbook on Engineering Drawing, Scitech Publishers.

Online Resources (Weblinks)

1. https://www.youtube.com/watch?v=8UKg928M4C0
2. https://www.youtube.com/watch?v=JvsJf1huMXQ
3. https://www.youtube.com/watch?v=8lHEizPf-wY

Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. G. Vergin Vino Design Engineer TANCAM, Chennai	Dr. V. Prabhuraja Professor, Department of Mechanical Engineering PSG College of Technology, Coimbatore	Dr. Samuel Ratna Kumaar Assistant Professor – III Department of Mechanical Engineering

Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24EET106	ELECTRICAL MACHINES AND DRIVES	L	T	P	J	C
		3	0	0	0	3
ES		SDG	7, 9			

Pre-requisite courses	Nil	Data Book / Codes / Standards (If any)	Nil

Course Objectives**:	The purpose of taking this course is to:
1	Impart comprehensive knowledge on construction and working principles of electric motors and transformers.
2	Develop the ability to evaluate the performance characteristics of Electric motors, Transformers and various power electronic converter circuits.
3	Foster the capacity to analyze and recommend motor solutions based on application requirements and performance criteria.

Course Outcomes***:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Analyse the principles of DC machines to solve basic electrical problems involving generators and motors.	An
CO 2	Analyse the performance of single-phase transformers by analyzing their types, working principles, and efficiency	An
CO 3	Analyze the characteristics and operations of Induction motors to assess their suitability for various applications.	An
CO 4	Apply power semiconductor devices and design AC-DC converters, DC-DC converters, and voltage source inverters.	Ap
CO 5	Analyze the types and functions of special machines to determine their applicability and effectiveness in various industrial applications	An

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
CO1	3	2											
CO2	3	2											1
CO3	3	2											1
CO4	3	2											2
CO5	2												2

Course Content	
DC MACHINES Construction, working principle and operation of DC generators – EMF equation – working principle and operation of DC motor – DC series and shunt motor – Torque equation – Speed control of DC series and shunt motor - Applications- Case Study: Locomotive application in Indian Railways.	**9 Hours**
TRANSFORMER Construction, working principle and operation of Single-phase power transformer – Types – EMF equation of a transformer – Transformation ratio – Transformer losses and efficiency – Applications – Case Study: Mobile Charger.	**9 Hours**
INDUCTION MACHINES Construction, working principle and operation of Three-phase induction motors – speed-torque characteristic – Construction, working principle and operation of Single-phase induction motors – Types – Applications. Case Study: Tesla EV car.	**9 Hours**
POWER CONVERTERS Construction, operation and VI Characteristics: SCR, MOSFET - Single phase fully Controlled AC-DC converter - DC-DC buck and boost converters - Single-phase and Three-phase voltage source inverters.	**9 Hours**
SPECIAL MACHINES Stepper motor and types – Permanent Magnet DC motor – Brushless DC motor – PMSM – Servo motor – Selection of motors for automotive and robotics applications.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**_**	**Practical Hours:**	**_**	**Project Hours:**	**_**	**Total Hours:**	**45**

Learning Resources*
Textbooks
1. D.P. Kothari and I.J. Nagrath, “Electric Machines”, McGraw Hill Education, 5th Edition, 2017. 2. Muhammad H. Rashid, “Power Electronics - circuits, devices and applications”, Prentice Hall of India, 3rd Edition, 2014. 3. Gopal K. Dubey, “Fundamentals of Electrical Drives”, Narosa Publishing House, New Delhi, 2nd Edition, 2015.
Reference books/ Web Links
1. B.L. Thereja, “Fundamentals of Electrical Engineering and Electronics”, S Chand and Company Limited, 2020. 2. J.B. Gupta, “Theory and Performance of Electrical Machines”, S.K.Kataria and Sons, New Delhi, 15th Edition, 2018. 3. S.K. Pillai, “A First Course on Electrical Drives”, New Age International Publication, New Delhi, 4th Edition, 2023. 4. Janardhanan E.G, “Special Electrical Machines" PHI Learning 1st Edition, 2014.
Online Resources
https://archive.nptel.ac.in/courses/108/105/108105155/ https://archive.nptel.ac.in/courses/108/102/108102146/

Assessment (Theory course)
CAT, Activity and Learning Task(s)*, Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
1. Dr. S. Surya Prakash, Robert Bosch, Coimbatore 2. Dr. Rajesh Kumar, Robert Bosch, Coimbatore	Dr. M. Mathan Kumar Assistant Professor (Sr) SRM University Trichy		Dr.N. Vinoth Kumar, EEE, KCT
Recommended by BoS on	14/08/2024		
Academic Council Approval	No.: 27	**Date**	24/08/2024

24ECI102	ELECTRON DEVICES AND CIRCUITS (Common to EE, EC)	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	provide a solid foundation in the principles of semiconductor diodes and their applications.
2	equip students with the comprehensive knowledge on structure, operation, biasing and configurations of BJT and MOSFET.
3	develop analytical skills for applying small signal models of BJT and MOSFET amplifiers to determine gain and frequency response.
4	equip students with the ability to evaluate the performance of multistage, differential, and tuned amplifiers and predict their gain and frequency response.
5	foster an understanding of feedback, power amplifiers and oscillators and analyze their performance.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply the basics of semiconductor diodes to analyze the VI characteristics and operational behaviour.	Ap
CO 2	analyze the structure, operation, and biasing techniques of BJT and MOSFET devices.	An
CO 3	analyze the small signal models of BJT and MOSFET amplifiers to determine gain and frequency response.	An
CO 4	examine the performance of multistage, differential, and tuned amplifiers to predict their gain and frequency response	An
CO 5	distinguish between various feedback amplifiers and oscillator circuits and assess the efficiency of various power amplifier	An
CO 6	demonstrate the characteristics of semiconductor devices and frequency response of amplifiers.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2	1			1	1							
2	1	1	2		1	1							
3	1		2		1	1							
4	1		2		1	1							
5	1			1	1	1							

6	2				1	1							

Course Content

DIODES AND THEIR APPLICATIONS Structure, operation and VI Characteristics of PN junction diode, Zener diode - Diffusion and transition capacitances of PN junction diode - LEDs and Photo diodes - Applications of diodes: Clippers and Clampers - Half wave and Full wave rectifiers with filter - Zener voltage regulator.	**6 Hours**
Practical Component • Design of Clipper and Clamper circuit. • Half wave and full wave rectifiers with filter. • Design of Voltage regulator using Zener diode.	**9 Hours**
BJT AND MOSFET BJT - Structure, operation and VI characteristics - Load line, Quiescent point, CE, CB and CC configurations - Biasing: Fixed base bias, voltage divider bias, emitter bias - BJT as a switch. MOSFET - Structure, operation and VI characteristics - Enhancement and Depletion modes - Biasing of MOSFET: CS configuration - BJT vs MOSFET.	**10 Hours**
Practical Component • Characteristics of BJT under CE configuration. • Characteristics of MOSFET under CS configuration.	**6 Hours**
SMALL SIGNAL AMPLIFIERS USING BJT AND MOSFET BJT small signal model, Analysis of CE amplifier - Gain and frequency response - MOSFET small signal model: Analysis of CS Amplifier and Source follower, Gain and frequency response - High frequency analysis of BJT and MOSFET.	**10 Hours**
Practical Component • Frequency response of CE amplifier. • Frequency response of CS amplifier.	**6 Hours**
MULTISTAGE, DIFFERENTIAL AND TUNED AMPLIFIERS RC coupled amplifier, Differential amplifier - Common mode and Difference mode analysis, CMRR - Tuned amplifiers: Single tuned and double tuned - Gain and frequency response.	**9 Hours**
Practical Component • Analysis of RC coupled amplifier.	**3 Hours**
LARGE SIGNAL AMPLIFIERS AND OSCILLATORS Advantages of negative feedback - Voltage, Current, Series, Shunt feedback amplifiers - Power amplifiers: Class A, Class B and Class C amplifiers - Analysis of Class B push-pull power amplifier. Positive feedback - Conditions for oscillations, RC phase shift, Wien bridge Hartley, Colpitts and Crystal oscillators.	**10 Hours**
Practical Component • Analysis of Class B push-pull power amplifier. • Design of RC phase shift oscillator.	**6 Hours**

Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total Hours:	75

Learning Resources

Textbooks:
1. Jacob Millman, Christos C Halkias and Satyabrata Jit, Electron Devices and Circuits, Tata McGraw Hill, 4th Edition (2015). 2. Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits-Theory and Applications, Oxford University Press, 7th Edition (2017).
References:
1. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson Education,11th Edition (2015). 2. Thomas L. Floyd, Electronic Devices, Pearson Education, 9th Edition (2012). 3. David A. Bell, Fundamentals of Electronic Devices and Circuits, Oxford University Press, 5th Edition (2009).
Online Resources (Weblinks)
1. https://onlinecourses.nptel.ac.in/noc21_ee80/preview 2. https://onlinecourses.nptel.ac.in/noc20_ee89/preview

Assessment (Embedded course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Ms. T. Jeevaranjani, Bosch Global Software Technologies	Dr. I. S. Akila, Coimbatore Institute of Technology Dr. P. Palanisamy, NIT-Trichy	Dr. B. Gopinath, Ms. R. Dhivya Praba, Ms. A. Kalaiselvi, Mr. D. Allin Joe, Ms. T. Jaspar Vinitha Sundari, Dr. K. Paramasivam, Department of ECE	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24INP103	INNOVATION PRACTICUM – II	L	T	P	J	C
		0	0	2	0	1
ES	(Common to All branches)	SDG	9, 11, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	equip students with essential tools and techniques for leveraging open-source technologies to develop proof-of-concepts and prototypes
2	provide hands-on experience and participants will gain a comprehensive understanding of the entire product development process
3	final prototyping, empowering them to transform their ideas into tangible outcomes

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	analyse the effectiveness of various electronic tools and techniques in product development processes	An
CO 2	develop and implement functional software prototypes using open-source tools	Ap
CO 3	design and fabricate 3D models using digital fabrication techniques	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2	2	2	2									
2	2	2	2		2									
3	2	2	3	2	2									

Course Content

INTRODUCTION TO OPEN-SOURCE TOOLS AND TECHNIQUES Explore the concept of open-source, its underlying principles and its contrast with proprietary software, Discuss the advantages of using open-source tools, such as lower costs, increased innovation, educational value, and community support, walk through to the commonly used open-source tools for electronics design (KiCad, FreeCAD), software development (Python, Eclipse), and fabrication (Cura, LinuxCNC).	**3 Hours**
ELECTRONICS FUNDAMENTALS AND TOOLS Introduction to basic electronic components (resistors, capacitors, transistors, etc.), Understanding of electronic circuits and their functions, Hands-on practice with CircuitJS and Falstad, Simulating and analysing electronic circuits, Introduction to Arduino and Raspberry Pi, exploring their capabilities and applications, Designing PCBs using KiCad and EasyEDA, Understanding PCB fabrication processes	**6 Hours**
SOFTWARE PROTOTYPING AND TOOLS Benefits of rapid prototyping in product development, Iterative design and testing, Wireframing tools (Balsamiq, Figma), UI design tools (Sketch, Figma), Programming	**6 Hours**

languages (Python, JavaScript), Testing frameworks (Selenium), No-code platforms (Bubble, Adalo, Wix, AppGyver), Building functional prototypes without extensive coding	
FABRICATION AND PROTOTYPING Overview of fabrication techniques (3D printing, laser cutting, CNC machining), Prototyping methods for physical products, using tools like Blender, TinkerCAD, or Fusion 360, Creating 3D models for physical prototypes, Hands-on experience with laser cutting and engraving, Understanding their applications and limitations	**7 Hours**
SIMULATION & DEMONSTRATION Integrated project demonstration, explaining the design process, technical choices, and outcomes, simulation showcase to demonstrate their understanding of various technical tools and prototyping techniques	**8 Hours**

Theory Hours:	Tutorial Hours:	Practical Hours:	Project Hours:	Total Hours:
0	0	30	0	30

Learning Resources

Textbooks:

1. Damir Godec, Joamin Gonzalez-Gutierrez, Axel Nordin, Eujin Pei, Julia Ureña Alcázar, A guide to additive manufacturing, Springer – 2022. https://doi.org/10.1007/978-3-031-05863-9
2. Introducing SolidWorks, Dassault Systems.

References:

1. Insight into Electronics
2. Microcontroller Programming with Arduino and Python
3. Fundamentals of 3D modelling

Online Resources (Weblinks)

1. Google Play store apps:
   a. https://play.google.com/store/apps/details?id=com.electronicslab
   b. https://play.google.com/store/apps/details?id=it.android.demi.elettronica
2. https://engservices-ece.sites.olt.ubc.ca/files/2020/01/SolidWorks-3D-Printing-Tutorial-R2.pdf

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert from Industry	Expert(s) from Higher Education Institution	Internal Expert
Dr. Mahesh Veezhinathan Director - Innovation Practicum Associate VP - Forge. Innovation	-	Dr. Samuel Ratna Kumar P S Assistant Professor – III Department Mechanical Engineering

Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24HSP112	HOLISTIC WELLNESS-II (Common to all Department)	L	T	P	J	C
		0	0	2	0	1
HS		SDG	3, 4			

Pre-requisite courses	Holistic Wellness-I	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	build on the foundation laid in Holistic Wellness -I and deepening into the practices and principles of holistic wellness.
2	explore advanced techniques in mental, emotional, and spiritual well-being, with an emphasis on creating sustainable wellness habits.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply advanced techniques in mindfulness, meditation, and stress management.	Ap
CO 2	understand the role of community and social connections in wellness.	U
CO 3	develop resilience and adaptability in maintaining wellness.	E
CO 4	refine and sustain a personalized holistic wellness plan.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1						2		2						
2						2								
3						2					3			
4						2					3			

Course Content

ADVANCED MINDFULLNESS AND MEDITATION: • Deepening mindfulness practices for enhanced mental clarity. • Exploring different forms of meditation (e.g., guided, transcendental, movement-based). • Hands-on activity: Daily meditation practice and journaling reflections.	**6 Hours**
EMOTIONAL RESILIENCE AND MENTAL HEALTH: • Building emotional resilience through positive psychology practices. • Cognitive-behavioural strategies for managing stress and anxiety. • Hands-on activity: Developing and practicing a resilience toolkit.	**6 Hours**
SOCIAL AND ENVIRONMENTAL WELLNESS: • The impact of social connections and community on wellness. • Creating a supportive environment for personal growth. • Hands-on activity: Building a community wellness project or group activity.	**6 Hours**
INTERNAL GROWTH AND PURPOSE:	**6 Hours**

• Exploring the deeper aspects of internal wellness and self-actualization. • Reflective practices for discovering life purpose and meaning. • Hands-on activity: Creating a vision board or personal mission statement.	
SUSTAINING WELLNESS PRACTICES: • Strategies for maintaining wellness habits over the long term. • Adapting wellness plans to life changes and challenges. • Hands-on activity: Revising and finalizing a long-term personal wellness plan.	**6 Hours**

Theory Hours: 0	Tutorial Hours: 0	Practical Hours: 30	Project Hours:	Total Hours: 30

Learning Resources

Textbooks:

1. Hanh, Thich Nhat. The Miracle of Mindfulness: An Introduction to the Practice of Meditation. Beacon Press, Boston (1975).
2. Tolle, Eckhart. The Power of Now: A Guide to Spiritual Enlightenment. New World Library, Novato (1997).
3. Patel, Kamlesh. Heartfulness Way: Heart-Based Meditations for Spiritual Transformation, Kamlesh Patel, 2018.

References:

1. Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
2. James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
3. Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
4. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015).
5. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
6. Lipton, Bruce., The Biology of Belief 10th Anniversary Edition: Unleashing the Power of Consciousness, Matter & Miracles, Hay House, Carlsbad (2015).
7. Kalderdon Adizes Ichak., What Matters in Life: Lessons I Learned from Opening My Heart
8. ., WS Press, Newtown, PA(2023).
9. Murphy, Joseph., The Power of Your Subconscious Mind [Original Edition (Complete)], Prentice-Hall, Englewood Cliffs (1963).
10. Kamlesh D. Patel., Designing Destiny: The Heartfulness Way, Heartfulness Institute, Chennai (2021)

Online Resources (Weblinks)

- Introduction to Psychology
- Guided Meditation
- Life skills and value education
- James Allen Library

Assessment (Practical course)

Participation, Practical activities and assignments, personal wellness plan and reflection.

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
		Dr. Ezhilarasi Principal- KCT

Recommended by BoS on			
Academic Council Approval	No: 27	**Date**	24.08.2024

SEMESTER III

24HSP005	Mastering Conversations	L	T	P	J	C
		0	0	2	0	1
HS		SDG	4 & 8			

Pre-requisite courses	NIL	Data Book / Codes / Standards (If any)	NIL

Course Objectives:	The purpose of taking this course is to:
1	Demonstrate understanding of different perspectives by analyzing complex personal and professional situations.
2	Engage in thoughtful dialogue and discussions about complex, real-world issues, utilizing critical thinking to assess different viewpoints.
3	Apply role-playing as a tool to enhance understanding of workplace dynamics, conflict resolution, and team collaboration.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Empathize with and understand people in both professional and personal contexts, reflecting on situations from multiple perspectives and participating in activities that mirror career-related scenarios.	Ap
CO 2	Analyze and converse critically on complex subjects, demonstrating the ability to approach and deal with various social contexts effectively.	An
CO 3	Exhibit skills in role-playing and enacting given situations to navigate diverse social interactions and career-related contexts.	C

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1						3			3	2	3			
2									1	2				
3									3	2				

Course Content

Practical Component / Roleplays Dynamics	**6 Hours**
Introduction to Role play - Benefits of role plays - Importance of gesture, tone and modulation-Skill development through role play activities - Types of role plays -Conversation Building through communicative functions-Initiating a dialogue- Framing questions- Receiving feedback.	

Practical Component /Roleplays on Social Skill Social Interactions: - (Ordering food at a restaurant- Making a reservation at a hotel-- Shopping at a store-- Attending a party or social gathering). Travel and Tourism:(Asking for directions- Booking a flight or hotel-- Exploring a new city- Interacting with local people). Community and Volunteering:(Participating in a charity event- Volunteering at a local organization- Discussing community issues- Organizing a community project).	**6 Hours**
Practical Component / Roleplays on Education and Technology Education and Personal Growth: (Setting goals (Short term & Long term)- Creating a study plan - Participating in a workshop - Reflecting on personal growth) Technology and Online Interactions: (Participating in an online meeting- Creating a social media post- Writing an email or text message- Making an online purchase) Technology and Science: (Explaining a scientific concept- Discussing emerging technologies- participating in Hackathons- Presenting a research paper)	**6 Hours**
Practical Component / Roleplays on Strategic Insights Critical Thinking: (Evaluating a news article-solving a moral dilemma-Decision with incomplete information-Assessing a historical event) Problem-Solving: (Resolving a conflict- Negotiating a deal - Making a complaint- Apologizing for a mistake) Business and Entrepreneurship: (Pitching an idea- Negotiating a contract- Conducting a market Research - Presenting a product launch)	**6 Hours**
Practical Component / Roleplays on Cultural Exchange Cultural Exchange: (Sharing customs and traditions- Discussing cultural differences- Exploring historical events- Participating in a cultural festival) Media and Entertainment: (Event planning- Creating an advertisement-Digital Marketing-Conducting interviews- Creating news broadcast-Writing and Performing a script- Enacting one act plays) Arts and Culture: (Visiting an art gallery - Attending/ organizing a concert or play - Discussing literature- Creating a piece of art)	**6 Hours**
Theory Hours: 0 **Tutorial Hours: 0** **Practical Hours: 30** **Project Hours: 0** **Total Hours: 30**	

Learning Resources
Reference books/ Web Links
1.Bonwell, C. C., & Eison, J. A. (1991). Active learning: Creating excitement in the classroom. Washington, DC: The George Washington University. 2. Harbour, E., & Connick, J. (2005). Role playing games and activities rules and tips. Retrieved from https://www.businessballs.com/roleplayinggames.htm 3. Lebaron, J., & Miller, D. (2005). The potential of jigsaw role playing to promote the social construction of knowledge in an online graduate education course. Retrieved from http://paws.wcu.edu/jlebaron/Jigsaw-FnlTCRpdf_050812.pdf 4. Davies, A. (2018). Teaching and learning through role-play: A practical guide. Maidenhead, UK: McGraw-Hill Education. 5. Young, K. C. (2016). The art of role play: Developing realistic scenarios for skill development. Boston, MA: Pearson. 6. Yardley-Matwiejczuk, K. M. (1997). Role play: Theory and practice. London, UK: SAGE Publications Ltd.

Online Resources
https://www.niu.edu/citl/resources/guides/instructional-guide https://positivepsychology.com/role-playing-scripts/

Assessment	
Formative	Summative
Assignments / Mini project), Quiz, Lab	Quizzes and written assignments, Participation in group activities

Course Curated By			
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**		**Internal Expert(s)**
Mr.Vijayan Ramanathan, Project manager, Toppan Merrill. Technologies, Coimbatore.	Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University Chennai Dr. E. Justin Ruben, CIT, Coimbatore		Dr. Arokia Lawrence Vijay Dr. Tissaa Tony
Recommended by BoS on	16/08/2024		
Academic Council Approval	No.: 27	**Date**	24/08/2024

24INM201	Universal Human Values II: Understanding Harmony (Common to All Branches)	L	T	P	J	C
		1	0	0	0	1
HS		SDG	3,4,5,10,12,13,14,15,16,17			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Introduce the concept and significance of value education in shaping a meaningful and fulfilling life.
2	Enable students to understand the human being as a co-existence of self and body and the harmony within.
3	Develop an understanding of harmony in relationships, family, and society.
4	Help students appreciate the interconnectedness and harmony in nature and existence.
5	Instill the importance of ethical behaviour in personal, professional, and social contexts.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Understand the foundational concepts of value education and human aspirations.	U
CO2	Analyze the human being as a holistic entity comprising self and body.	An
CO3	Evaluate and cultivate harmonious relationships within the family and society.	E
CO4	Interpret the interconnectedness in nature and recognize harmony in existence.	U
CO5	Apply holistic understanding to professional ethics and sustainable living.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1						3	3	3	3		3			
2						3	3	3	3		3			
3						3	3	3	3		3			
4						3	3	3	3		3			
5						3	3	3	3		3			

Course Content

Introduction to Value Education Value Education- Self-exploration as the Process for Value Education- Basic Human Aspirations and their Fulfilment- Right Understanding, Relationship and Physical Facility- Happiness and Prosperity – Current Scenario- Method to Fulfil the Basic Human Aspirations.	**3 Hours**
Harmony in the Human Being Human Being as Co-existence of the Self and the Body- Distinguishing between the Needs of the Self and the Body- The Body as an Instrument of the Self- Understanding Harmony in the Self- Harmony of the Self with the Body- Programs to Ensure Self-regulation and Health.	**3 Hours**

Harmony in the Family and Society Harmony in the Family –The Basic Unit of Human Interaction-'Trust' – The Foundational Value in Relationship-Respect – As the Right Evaluation- Other Values in Human-to-Human Relationship- Understanding Harmony in the Society Lecture Vision for the Universal Human Order.	**3 Hours**
Harmony in the Nature (Existence) Understanding Harmony in Nature- Interconnectedness, Self-regulation and Mutual Fulfilment among the Four Orders of Nature- Realizing Existence as Co-existence at All Levels- The Holistic Perception of Harmony in Existence.	**3 Hours**
Implications of the Holistic Understanding- A Look at Professional Ethics Basis for Universal Human Values-Definitiveness of (Ethical) Human Conduct - professional Ethics in the Light of Right Understanding-A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Holistic Technologies, Production Systems-and Management Models-Typical Case Studies Strategies for Transition towards Value-based Life and Profession	**3 Hours**

Theory Hours: 15	**Tutorial Hours:**	**Practical Hours:**	**Project Hours:**	**Total Hours: 15**

Learning Resources

Textbooks:

Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

References:

Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, Jeevan Vidya:Publishers, 1999.

Online Resources (Weblinks)

https://www.uhv.org.in/uhv-ii

Assessment (Theory course)

Presentation, MCQ, Assignment, Case Study and E Chart.

Course Curated by

Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
	Sh. Umesh Jadhav, NCCIP (National Co-oridnation Committee)-AICTE	Dr.S.Sivakumar, Associate Professor, SFS Dr.R.Prakasam, Assistant Professor, Department of Physics Mr.J.Sivaguru, Assistant Professor, Department of Mechatronics
Recommended by BoS on	03-05-2025	
Academic Council Approval		**Date** 26-06-2025

24INM102	Indian knowledge Systems in Science and Engineering (Common to All branches)	L	T	P	J	C
		1	0	0	0	1
HS		SDG	5,16			

Pre-requisite courses	24INM001 Introduction to Indian Knowledge systems(IKS)	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Explore the Role of Traditional Knowledge in Basic Scientific Concepts
2	Know the science behind the establishment of traditional architecture
3	Revive ancient Indian aerospace, metallurgy and navigation technologies
4	Revitalize ancient textile traditions through sustainable practices, promoting eco- friendly materials
5	Explore and integrate ancient Indian medical systems like Ayurveda, Siddha & Rasa Shastra

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	understanding Indigenous Knowledge Systems (IKS) in Science and Technology	U
CO 2	apply Traditional Design Principles in Civil Engineering	Ap
CO 3	explore of Ancient Aerospace Technologies for Aeronautical Engineering	E
CO 4	know the sustainable traditional textile practices for ecofriendly atmosphere	R
CO 5	gain knowledge of Ancient Medical Practices for Biotechnologists	U

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	2	2	2	1	2	3	1	2	1	3			
2	2	2	2	2	1	2	2	1	2	1	3			
3	2	2	2	2	1	2	2	1	2	1	3			
4	2	2	2	2	1	2	2	1	2	1	3			
5	2	2	2	2	1	2	2	1	2	1	3			

Course Content

IKS in Basic Sciences Study of ancient Indian concepts such as atomism (paramāṇu)- the five elements (Panchabhūta)- Exploration of alchemical practices, metallurgy-development of zero, decimal systems, algebra, and trigonometry - works by scholars such as Brahmagupta and Aryabhata- detailing planetary motions and timekeeping systems.	**3 hours**
IKS in Civil Engineering Evolution from rock-cut caves to grand temples like Madurai Meenakshi and Brihadeeswarar.- Vastu Shastra- The Concept of "Mandala- Courtyard Design- Sacred Geometry- Panchabhuta- Chhatri- dome-shaped canopy- Prana Vayu- Shilpa Shastra- Sthapatya Veda- Kaalchakra- Brahmasthan.	**3 hours**

IKS in Mechanical Engineering Exploration of ancient metallurgical techniques-including ore extraction-alloying, furnace design-Vimana (Flying Machines) - Shakti (Energy Source) -Aerospace materials- Vimana Shapes -Ancient Navigation- Vedic Astronomy- Flight Principles in Nature- Matrika Systems-Indian shipbuilding techniques and navigation methods.	**3 hours**
IKS in Textile technology Introduction to Ancient Indian Textiles- Cultural and Historical Context -Traditional Dyeing Techniques-Weaving Techniques and Patterns-Khadi- -Natural Fibers and Materials-Cotton,Silk,Wool and Jute-Sustainable Practices and Eco-Friendly Technologies-Organic Cotton Farming-Recycling and Repurposing.	**3 hours**
IKS in medicine Ayurveda- Siddha Medicine- Rasa Shastra- Herbal Medicine- Nadi Pariksha- Chikitsa- Yoga and Pranayama- Surgical Techniques -Charaka Samhita - Sushruta Samhita— Panchagavya usage-Medicinal Plants and Herbal Remedies-Agricultural Practices and Crop Diversity-Sacred and Ritual Plants.	**3 hours**

Theory	Tutorial	Practical	Project	Total
Hours: 15	Hours: 0	Hours: 0	Hours: 0	Hours: 15

Learning Resources

Textbooks:

1. Indian Knowledge Systems: A Sustainable Approach: The Science of Self-Healing" by Vasant Lad, Excel India Publisher, 2024.
2. Indigenous Knowledge Systems: Towards a Holistic Inclusive Conservation, Satarupa Dutta Majumder, Manohar Publishers & Distributors, 2019.

References:

1. Indian Knowledge System: Integrating Heritage with Engineering, Gagan Bansal, Deep Science Publishing, 2025

Online Resources (Weblinks)

www.deepscienceresearch.com/dsr/catalog/book/70

Assessment (Theory course)

Presentation, MCQ, Assignment, Case Study and E Chart.

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
	Dr K Sangeetha, Professor and Head-Textile Department, IKS-Nodal officer, Bharathiar University,Coimbatore-46.	Dr.R.Prakasam, AssistantProfessor, Department of Physics. Capt-A.R.Arul, Assistant Professor, Department of Physics

Recommended by BoS on	25-04-2025		
Academic Council Approval		**Date**	26-06-2025

24ECT201	Electromagnetic Waves and Waveguides	L	T	P	J	C
		3	0	0	0	3
PC		SDG	3, 9, 15			

Pre-requisite courses	24PHI102	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce the fundamental laws governing static and time varying electric and magnetic fields.
2	Teach the behaviour of electromagnetic fields in different materials.
3	Equip the students to derive wave propagation characteristics and boundary conditions using Maxwell's equations.
4	Provide the solution through wave equations for lossy and lossless media, and analyze the effects in conductors, dielectrics, and free space.
5	Make the students to design and evaluate waveguide structures for practical applications.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply fundamental laws of electromagnetics to solve problems involving static electric and magnetic fields.	Ap
CO2	Analyze the behaviour of fields in electric and magnetic materials.	An
CO3	Apply the implications of electromagnetic concepts to derive Maxwell's equations	Ap
CO4	Build solutions using wave equations for conducting and non-conducting media.	E
CO5	Design and evaluate modes in rectangular waveguide.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2		2		2		2				2	
2	3	2		2		2		2				2	
3	3	3	2	2		2		2				2	
4	3	3	2	2		2		2			2	2	
5	3	3	2	2		2		2			2	2	

Course Content	
STATIC ELECTRIC AND MAGNETIC FIELD Co-ordinate Systems – Gradient, Divergence, Curl – Charges distributed uniformly on an infinite line, finite line and infinite sheet – Gauss Law – Biot-Savart's Law– Magnetic Field intensity due to infinite and finite wire carrying current I – Ampere's circuital law – Lorentz force equation – Force on a wire carrying a current placed in a magnetic field.	**12 Hours**
ELECTRIC AND MAGNETIC FIELDS IN MATERIALS Poisson's and Laplace's equation – Electric Polarization - Electrostatic energy - Energy density – Boundary conditions for electric fields – Point form of ohm's law – Continuity equation for current – Energy density in magnetic fields – Magnetization and Permeability - Magnetic boundary conditions.	**8 Hours**
TIME VARYING ELECTRIC AND MAGNETIC FIELDS Faraday's law – Transformer and Motional electromotive forces - Displacement current – Maxwell's equations in integral form and differential form –Maxwell's equation in Phasor form - Poynting Vector and the flow of power – Poynting theorem.	**7 Hours**
ELECTROMAGNETIC WAVES Wave equations for conducting and non-conducting media - Wave equations in Phasor form –Uniform plane waves in perfect dielectrics, conductors and free space - Skin effect- Introduction to EMI shielding. **Case Study: Biological effects of Electromagnetic Waves.**	**7 Hours**
WAVEGUIDES Waves between parallel planes of perfect conductors- Transverse Electric waves and Transverse Magnetic waves, Characteristics of TE and TM waves, Transverse Electromagnetic waves, TM and TE waves in rectangular waveguides. Introduction to rectangular cavity resonator. **Case study: Waveguides in Radar Systems**.	**11 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. William H.Hayt, J A Buck, Engineering Electromagnetics, Tata McGraw Hill Education Private Limited, 9th Edition (2020).
2. E.C. Jordan and K.G. Balmain, Electromagnetic Waves and Radiating Systems, Prentice Hall of India, 2nd Edition (2015).
3. J.D.Ryder, Networks, Lines and Fields, PHI, New Delhi, 2nd Edition (2015).

References:

1. Mathew N. O. Sadiku, Elements of Electro Magnetics, 7th edition, Oxford, New York (2010).
2. S.Ramo, J.R.Whinnery and T.VanDuzer, Fields and Waves in Communications Electronics, John Wiley & Sons, 3rd Edition (2003).

Online Resources (Web Links)

1. https://nptel.ac.in/courses/108104087
2. https://nptel.ac.in/courses/108106157

Assessment (Theory course)
SA I and SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

Course Curated By			
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**		**Internal Expert(s)**
Mr. A. Chandra Mouli, Senior Engineer, Bharat Electronics Limited, Bangalore.	Dr. P. Sandeep Kumar, Assistant Professor, Department of ECE, SRM University, Chennai.		Dr. A. Amsaveni, Mr. R. Darwin, Department of Electronics and Communication Engineering.
Recommended by BoS on	30.04.2025		
Academic Council Approval	No: 28	**Date**	26.06.2025

24ECT202	Signals and Systems	L	T	P	J	C
		3	1	0	0	4
PC		SDG	9, 11			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce the fundamental concepts of continuous and discrete time signals and systems and their properties.
2	Enable the students to represent CT and DT signals using Fourier Series and Fourier Transform
3	Enable the students to analyze the CT and DT systems using Fourier transform.
4	Equip the students to apply Z-Transform for analysis and characterization of discrete-time systems.
5	Provide a strong foundation in sampling theory and reconstruction techniques.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Distinguish different types of signals and systems.	An
CO 2	Analyze Continuous Time signals and system using Fourier Series and Fourier Transform.	An
CO 3	Analyze Discrete Time signals and system using Fourier Series and Fourier Transform.	An
CO 4	Apply the Z-Transform to analyze and interpret discrete-time signals and systems.	An
CO 5	Explain sampling of continuous time signals.	U

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2			2							2	2
2	3	2			2							2	2
3	3	3	2	2	2							2	3
4	3	3	2	2	2							2	3
5	3	3			3							2	3

Course Content	
CONTINUOUS AND DISCRETE TIME SIGNALS AND SYSTEMS Continuous Time (CT) &Discrete Time (DT) signals- Classification - standard signals – basic operations on signals - Continuous time and discrete time systems - properties - Linear Time Invariant (LTI) systems - Stability - Causality - Convolution Integral, Convolution sum.	**16 Hours**
FOURIER ANALYSIS OF CT SIGNALS AND SYSTEMS Fourier series analysis of periodic signals- spectrum - Properties of Continuous Time Fourier Series (CTFS) - Convergence of CTFS - Representation of aperiodic signals by Continuous Time Fourier Transform (CTFT) - spectrum - Properties of CTFT - Convergence of CTFT - CT system representation by differential equation - Frequency response of systems characterized by differential equations. **Case Study:** Vibration Analysis in Mechanical Systems	**13 Hours**
FOURIER ANALYSIS OF DT SIGNALS AND SYSTEMS Discrete Time Fourier Series (DTFS) - spectrum - Properties - Discrete Time Fourier Transform (DTFT) - Properties - discrete time system representation by difference equations - Frequency response of systems characterized by difference equations.	**13 Hours**
Z TRANSFORM ANALYSIS OF SIGNALS AND SYSTEMS Z transform - RoC - Forward and Inverse Transform use Residue, long Division, Partial Fraction methods - Properties of Z transform - Pole-zero plot- Analysis and characterization of LTI system using Z transform. **Case Study:** Digital Filter Design and Analysis	**12 Hours**
SAMPLING Representation of continuous time signals by its samples - Sampling theorem – Reconstruction of a signal from its samples, aliasing – Perfect Reconstruction. **Case Study:** Voice Signal Processing in Mobile Phones	**6 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**15**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**60**

Learning Resources

Textbooks:

1. Alan V. Oppenheim, Alan S. Willsky, S.HamidNawab, "Signals and Systems", Pearson Education, 2nd Edition, 2015
2. Simon Haykin, Barry Van Veen, "Signals and Systems", John Wiley & Sons, 3rd Edition, 2012

References:

1. H. P. Hsu, "Signals and Systems" Schaum's Outline Series, McGraw Hill Professional, 3rd Edition, 2013.
2. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, 4th Edition, 2014.
3. V. Krishnaveni, A. Rajeswari, "Signals and System" Wiley, 1st Edition, 2012.
4. M. J. Roberts, "Signals and Systems Analysis using Transform method and MATLAB",McGraw-Hill Education, Second Edition, 2011
5. K. Lindner, "Signals and Systems", McGraw Hill International,1999

Online Resources (Web Links)

1. **NPTEL**: https://nptel.ac.in/courses/108104100,
2. **NPTEL**: https://onlinecourses.nptel.ac.in/noc21_ee28/preview
3. **MIT OpenCourseWare**: https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/

4. **Coursera -** https://www.coursera.org/courses?query=signal%20processing
5. **EdX -** https://www.edx.org/learn/engineering/iitbombay-signals-and-systems-part-1 and part-II
6. **Udemy**: https://www.udemy.com/course/signals-and-systems-from-basics-to-advance

Assessment (Theory course)
SA I and SA II, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
Dr. Arjun Raj, Sr. Technical Lead, Brake System Engineering, Bosch Global Software Technologies Private Limited.	Dr. V. Krishnaveni, Professor and HOD, ECE, PSG College of Technology, Coimbatore.	Dr. A.Vasuki, Department of Electronics and Communication Engineering.
Recommended by BoS on	**30.04.2025**	
Academic Council Approval	**No: 28**	**26.06.2025**

24ECI203	Linear Integrated Circuits (Common to ECE, EEE, E&I)	L	T	P	J	C
		3	0	2	0	4
PC		SDG	3, 9			

Pre-requisite courses	24ECI102, 24EII101	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce operational amplifiers, their structure, configurations, and characteristics.
2	Enable the students to design and analysis of analog circuits using op-amps and special ICs.
3	Equip the students to use the filters and waveform generators in appropriate applications.
4	Provide the knowledge on Analog to Digital and Digital to Analog techniques.
5	Equip the students to acquire practical skills through hands-on experiments with linear integrated circuits.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Describe op-amp structure, stages, and characteristics through basic experiments.	U
CO 2	Analyze and implement inverting, non-inverting, and differential amplifiers using op-amps.	An
CO 3	Analyze op-amp circuits such as adders, subtractors, integrators, differentiators, clippers, and clampers.	An
CO 4	Design and evaluate filters and waveform generators using op-amps and IC 555.	C
CO 5	Apply DAC and ADC techniques using R-2R, weighted resistor, flash, SAR, and dual-slope converters.	Ap
CO 6	Evaluate voltage regulator ICs through experiments and analyse the working of PLLs and VCOs in frequency control and modulation.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2											
2	3	3	2										
3	3	3	2	2									
4	3	2	3	2	2				1				
5	3	2	2	2	2								
6	3	2	2	2	1				1				

Course Content	
BASICS OF OPERATIONAL AMPLIFIERS Basics of Operational Amplifiers – Ideal Operational Amplifier – General operational amplifier stages and internal circuit diagrams of IC 741, DC and AC performance characteristics, Open and closed loop configurations – Voltage follower, Inverting amplifier, Non-inverting amplifier, Differential amplifier. **PRACTICAL COMPONENT** • Inverting and non-inverting amplifiers	**9 Hours** **3 Hours**
APPLICATIONS OF OPERATIONAL AMPLIFIERS Adder and subtractor, Instrumentation amplifiers, V-to-I and I-to-V converters, Differentiators and Integrators, Precision rectifiers, Wave shaping circuits (Clipper and Clampers), Log and Antilog amplifiers, Analog voltage multiplier circuit and its applications, Comparators, Schmitt trigger. **PRACTICAL COMPONENT** • Adder and subtractor • Integrator and differentiator • Clipper and clamper	**9 Hours** **9 Hours**
FILTERS AND WAVEFORM GENERATORS Filters: Comparison between passive and active filters, Active filters: Low-pass, high-pass and band-pass filters – Waveform Generators: Sine, Square, Triangle, Sawtooth wave generators – IC 555 Timer: Monostable operation and its applications, Astable operation and its applications. **PRACTICAL COMPONENT** • Active filters • Waveform generation • Astable and Monostable multivibrators using IC 555 Timer	**9 Hours** **9 Hours**
DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS D/A converter: Specifications, Weighted resistor type, R-2R ladder type – Sample and hold circuit – A/D Converter: Specifications, Flash type, Successive Approximation type, Dual Slope type, Sigma-delta converter. **PRACTICAL COMPONENT** • Digital to Analog conversion • Analog to Digital conversion	**9 Hours** **6 Hours**
SPECIAL FUNCTION ICs IC Voltage regulators: Three terminal fixed and adjustable voltage regulators, IC 723 general purpose regulator, Monolithic switching regulator – Frequency to Voltage and Voltage to Frequency converters – PLL: Operation of PLL, Voltage Controlled Oscillator, PLL applications: AM and FM detection, FSK modulation and demodulation and frequency multiplier. **PRACTICAL COMPONENT** • IC Voltage regulator	**9 Hours** **3 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**75**

Learning Resources
Textbooks
1. D. Roy Choudhry and Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 6th Edition (2021). 2. Ramakant A. Gayakwad and Rekha S., Op-Amps and Linear Integrated Circuits, Pearson Education, 4th Edition (Revised) (2021).
Reference books
1. Jacob Millman, Christos Halkias and Chetan Parikh, Integrated Electronics, McGraw Hill Education, 2nd Edition (2018). 2. Coughlin Robert F. and Driscoll Frederick F., Operational Amplifiers and Linear Integrated Circuits, PHI, 6th Edition (2011). 3. S Salivahanan and V. S. Kanchana Bhaskaran, Linear Integrated Circuits and Applications, McGraw Hill Education, 1st Edition (2018).
Online Resources (Web Links)
1. https://onlinecourses.nptel.ac.in/noc24_ee73/preview 2. https://onlinecourses.nptel.ac.in/noc20_ee13/preview 3. https://training.ti.com/ti-precision-labs-op-amps Open source software tools 4. Falstad Circuit Simulator: https://www.falstad.com/circuit/

Assessment (Embedded course)
SA I, SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce.

Course Curated By			
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**		**Internal Expert(s)**
Mr. S. Chella Kumar, Staff CAD Engineer, Infinera India Pvt. Ltd., Bengaluru. Ms. Candida John, Sembcorp Energy India Limited.	Dr.V.P.Harigovindan, National Institute of Technology-Puducherry. Dr. Albert Alexander, VIT Vellore.		Dr. P. Thirumoorthi, Department of EEE, Dr. B. Gopinath, Department of ECE, Mr. M. V. Umesh, Department of E & I.
Recommended by BoS on	30.04.2025		
Academic Council Approval	No: 28	**Date**	26.06.2025

24EEI203	DIGITAL SYSTEM DESIGN (Common to ECE, EEE, E&I)	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9,12			

Pre-requisite courses	24ECI102, 24EII201	Data Book / Codes book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Impart foundational knowledge of number systems, binary codes, Boolean algebra, and logic simplification techniques.
2	Develop analytical and practical skills in designing and implementing combinational and sequential circuits
3	Build competency in digital system design using state machine, programmable logic devices like FPGA and Verilog HDL programming.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply number systems and Boolean algebra to design basic digital circuits.	Ap
CO 2	Design and analyze the structure and functionality of various combinational circuits.	An
CO 3	Interpret the logic flow of sequential circuits and analyze their performance under different design constraints.	An
CO 4	Examine state transitions and circuit behaviour in synchronous sequential circuits using state diagrams and tables.	An
CO 5	Apply Verilog HDL constructs with various modelling styles to simulate and test digital logic circuits.	Ap
CO 6	Develop, simulate and implement digital systems using logic gates and simulation tools.	E

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
CO1	3	1	1										
CO2	3	2	1										
CO3	3	3	1										
CO4	2	2	2										
CO5	2	2	2		2								
CO6	3	3	2		3			2	2				

Course Content	
FUNDAMENTALS OF DIGITAL SYSTEMS Review of number systems, Logic gates, Binary codes and code converters - Boolean algebra and theorems - Sum of Product and Product of Sum simplification - Canonical forms - minterm and maxterm - Simplification of Boolean expressions - Karnaugh map (upto 4 variables). Basic IC Terminologies, Characteristics of Digital Logic families: TTL, ECL and CMOS logic. **Practical Component** • Implementation of Boolean Function using Gates. • Implementation of code converters using K-map.	**9 Hours** **6 Hours**
DESIGN OF COMBINATIONAL LOGIC CIRCUITS Design of Combinational Circuits: Adders, Subtractors, Parallel Adder, Carry Look Ahead Adder, Digital Comparator, Parity Generator/Checker, Encoder, Decoder, Multiplexer, De-Multiplexer, Implementation of Boolean function using Multiplexer. **Practical Component** • Design and implementation of Adder / Subtractor circuits. • Design of combinational circuit using MUX/DEMUX.	**9 Hours** **6 Hours**
SEQUENTIAL LOGIC CIRCUITS Latches and Flip Flops: SR, JK, T and D, Characteristic Equation, Excitation Table, Types of Triggering, Master Slave Flip Flop - Counters: Synchronous, Asynchronous Counter, Modulo-N Counter, Ring Counter - Shift Registers and its types. **Practical Component** • Design and implementation of Synchronous Counter. • Design and implementation of Asynchronous Counter.	**9 Hours** **6 Hours**
STATE MACHINE DESIGN AND FPGA Classification of Sequential Circuits: Moore and Mealy Model, Design of Synchronous Sequential Circuit: State Diagram, State Table, State Reduction, State Assignment, Hazards in sequential circuits - Introduction to PLD and FPGA architectures. **Practical Component** • Design and implementation of synchronous sequential circuits	**9 Hours** **3 Hours**
VERILOG HDL PROGRAMMING Overview of Digital Design with Verilog HDL- Basic concepts- Modules and Ports- Gate-Level Modeling- Dataflow Modeling- Behavioral Modeling-Verilog HDL programming examples: gates, multiplexer, encoders, adders, flip flops, counters. **Practical Component** • Simulation of Combinational Logic using Verilog HDL • Simulation of Sequential Logic using Verilog HDL • Realization of simple digital module in FPGA	**9 Hours** **9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**75**

Learning Resources

Textbooks

1. M. Morris Mano, “Digital Logic and Computer Design”, Pearson India Education Services Pvt. Ltd., New Delhi, 2018.
2. Samir Palnitkar, “Verilog HDL A guide to Digital Design and Synthesis” 2nd edition, Pearson, 2003.

Reference books

1. M. Morris Mano and Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, Pearson India Education Services Pvt. Ltd., New Delhi, 2017.
2. Thomas L. Floyd, “Digital Fundamentals”, 11th Edition, Pearson Education Limited, 2021.
3. Raj Kamal, “Digital Systems: Principles and Design”, 3rd Edition, Pearson Education Limited, 2014.
4. John M. Yarbrough, “Digital Logic: Applications and Design”, West Publishing Company, 2006.
5. David J. Comer, “Digital Logic & State Machine Design”, Oxford University Press, 2012.

Online Resources (weblinks)

1. https://onlinecourses.nptel.ac.in/noc21_ee39/preview
2. https://www.coursera.org/learn/digital-systems
3. https://nptel.ac.in/courses/108106086

Open Source Software Tools

4. https://www.yosyshq.com/
5. https://circuitverse.org/simulator/
6. https://www.falstad.com/circuit/

Assessment (Embedded course)

SA I and SA II, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions		Internal Expert(s)
Mr.S.P.Prasaanth, Senior Verification Engineer, Dyson Operations, Singapore. Ms.Suganya M, Lead Sotware Engineer Bosch Global Software Technologies PVT Ltd.	Dr.P.Palanisamy, Professor, National Institute of Technology, Trichy.		Dr. K.Paramasivam, Professor / EEE Dr. B. Gopinath, ASP / ECE Dr. I. Jeya Daisy, AP/ EIE
Recommended by BoS on	07.05.2025		
Academic Council Approval	No: 28	**Date**	26.06.2025